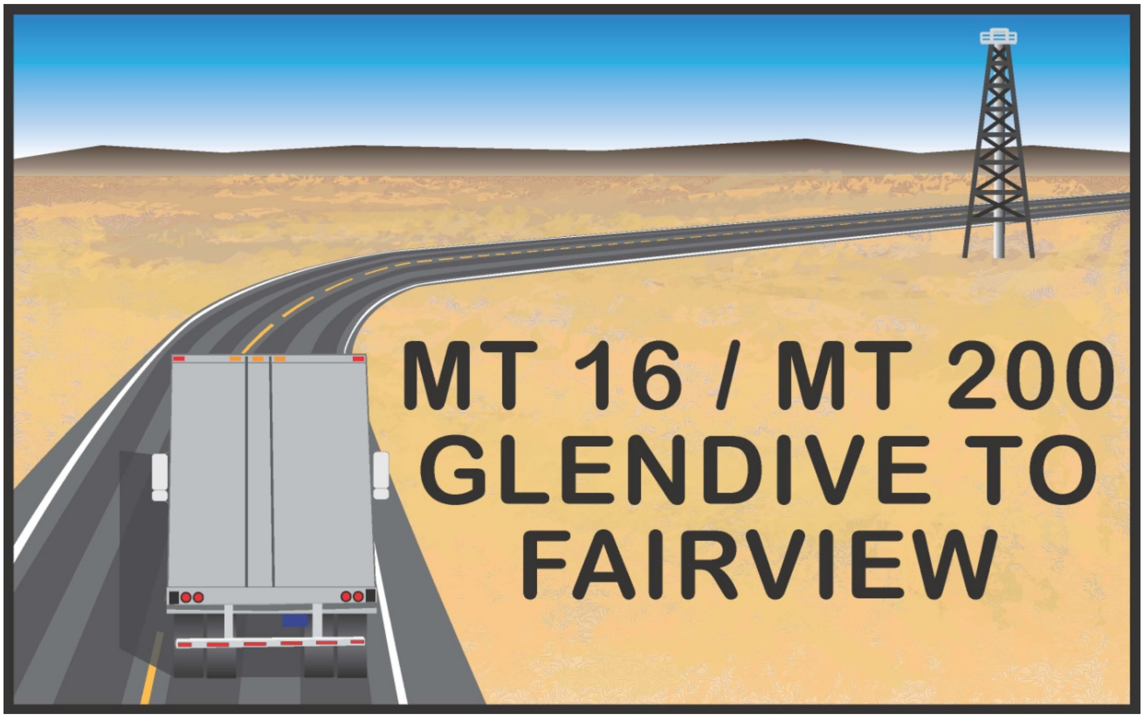
Appendix B

Existing and Projected Condition Report



EXISTING AND PROJECTED CONDITIONS REPORT

PREPARED FOR:

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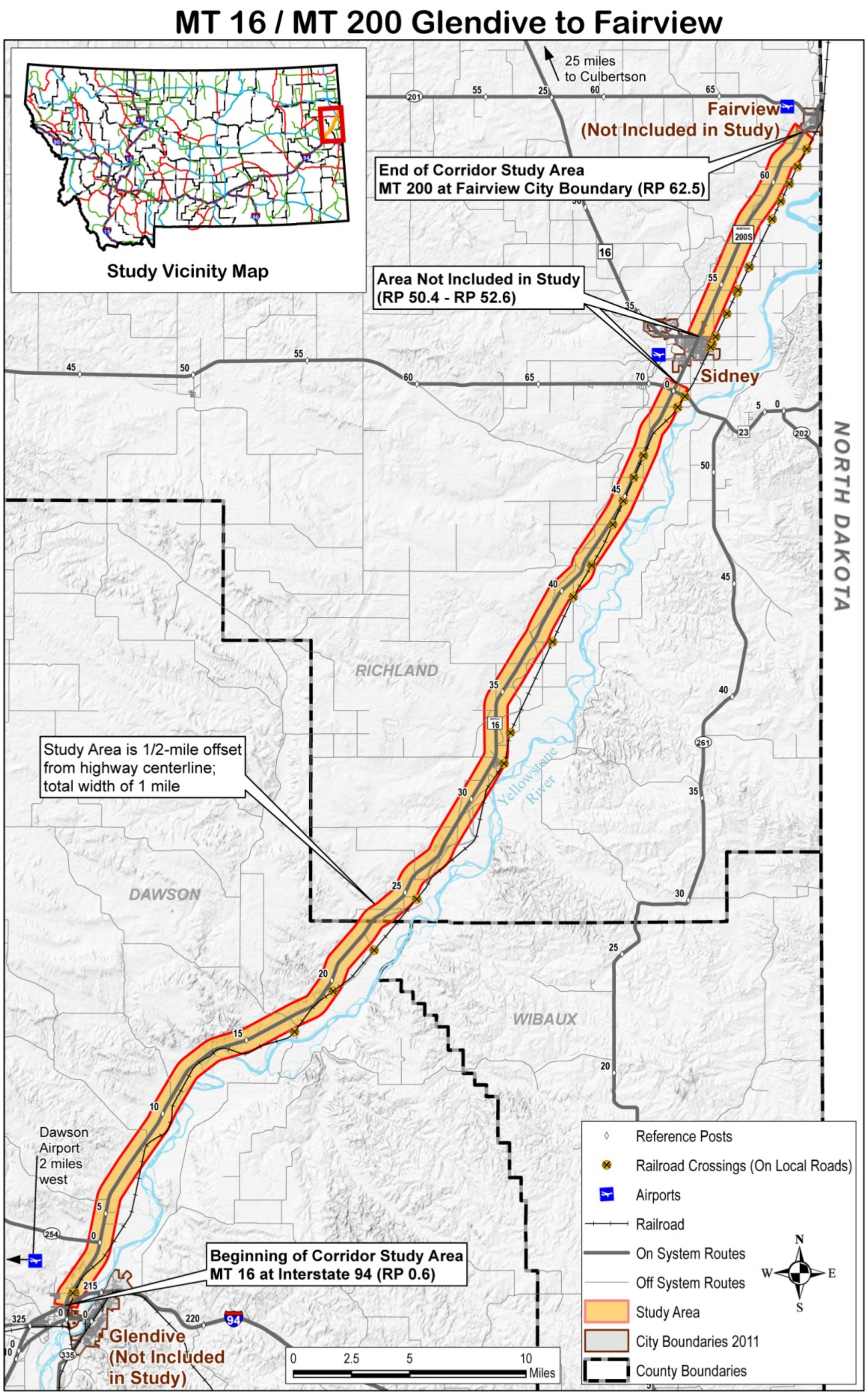
1.0 INTRODUCTION

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



Source: MDT, 2012; DOWL HKM, 2012.

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.

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.

Table 2.2 Corridor Utilities

Location			Utility Type
RP	Distance from Centerline	Side of Roadway	
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	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

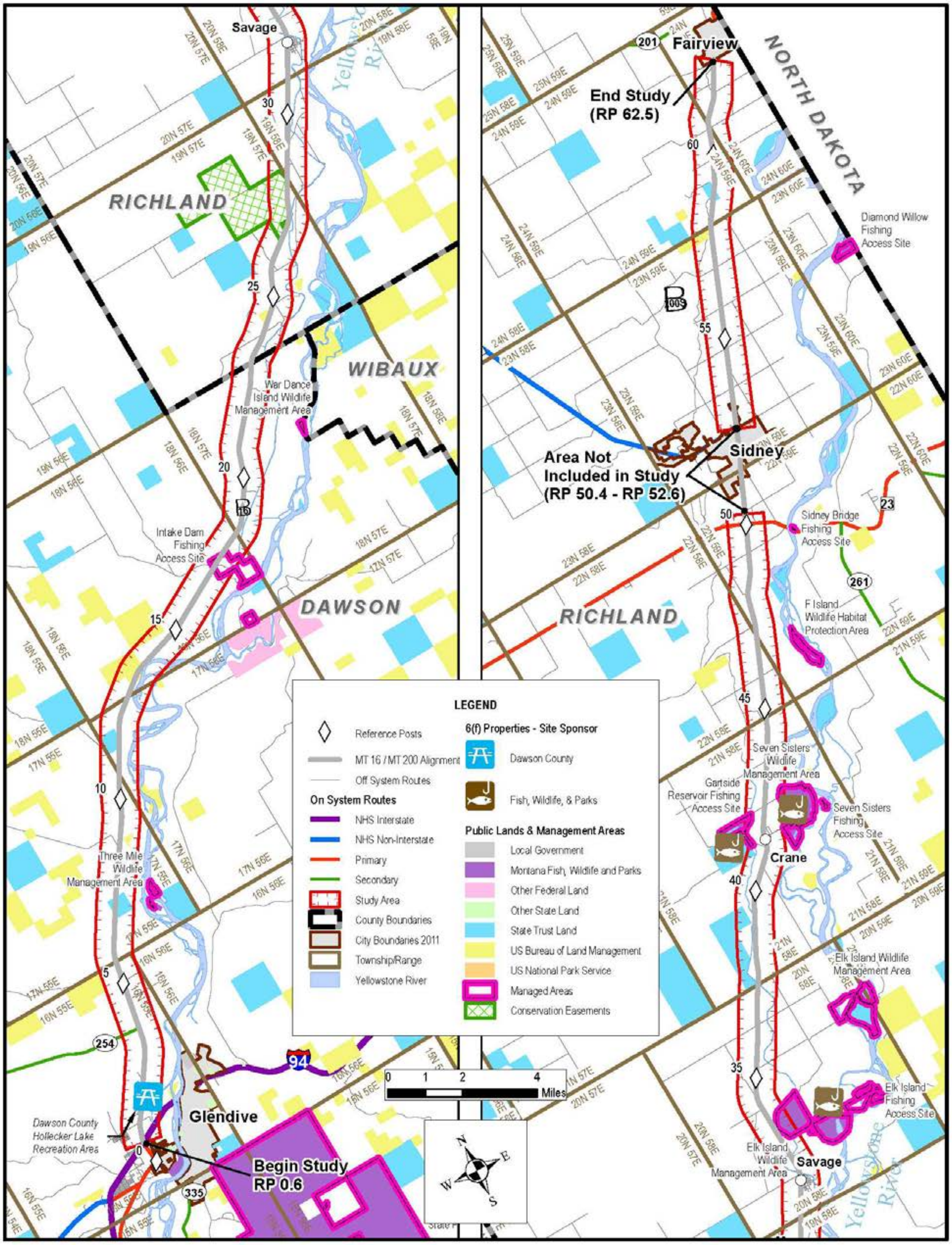
Source: MDT, 2012.

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 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.

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

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.

Table 2.4 Design Criteria - Rural Minor and Rural Principal Arterials

Element			Criteria	
			Rural Minor Arterial	Rural Principal Arterial
Design Controls	Design Speed	70 mph	60 mph	70 mph
	Level of Service (LOS) (Level Terrain)		B	B
Roadway Elements	Travel Lane Width		12 ft	12 ft
	Shoulder Width		Varies	Varies
	Cross Slope	Travel Lane	2%	2%
		Shoulder	2%	2%
Earth Cut Sections	Ditch	Inslope	6:1 (Width: 10 ft)	6:1 (Width: 10 ft)
		Width	10 ft Minimum	10 ft Minimum
		Slope	20:1 towards back slope	20:1 towards back slope
	Backslope; Cut Depth at Slope Stake	0 to 5 ft	5:1	5:1
		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
Earth Fill Slopes	Fill Height at Slope Stake	0 to 10 ft	6:1	6:1
		10 ft to 20 ft	4:1	4:1
		20 ft to 30 ft	3:1	3:1
		> 30 ft	2:1	2:1
Alignment Elements	Stopping Sight Distance		570 ft	730 ft
	Passing Sight Distance		2135 ft	2480 ft
	Minimum Horizontal Curve Radius $(e_{max}=8\%)$		1200 ft	1810 ft
	Vertical Curvature (K-Value)	Crest Vertical Curve	151	247
		Sag Vertical Curve	136	181
	Maximum Grade	Level Terrain	3%	3%
		Rolling Terrain	4%	4%
	Minimum Vertical Clearance		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 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 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
Glendive to Savage	MT 16 Northbound	23 Percent
	MT 16 Southbound	23 Percent
Savage to Crane	MT 16 Northbound	31 Percent
	MT 16 Southbound	19 Percent
Crane to Sidney	MT 16 Northbound	24 Percent
	MT 16 Southbound	22 Percent
Sidney to Fairview	MT 200 Eastbound	17 Percent
	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

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

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

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

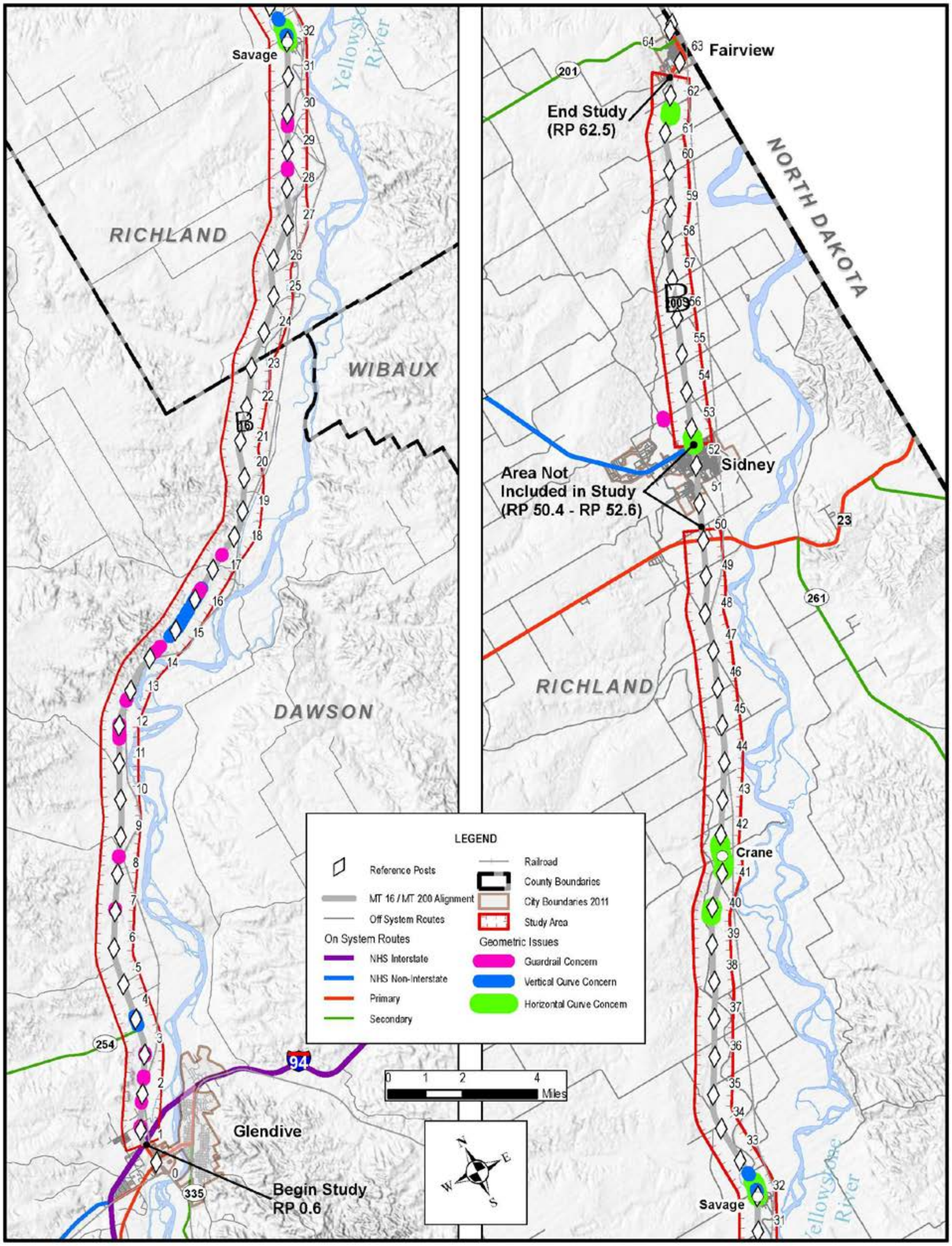
Source: DOWL HKM, 2012.

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.

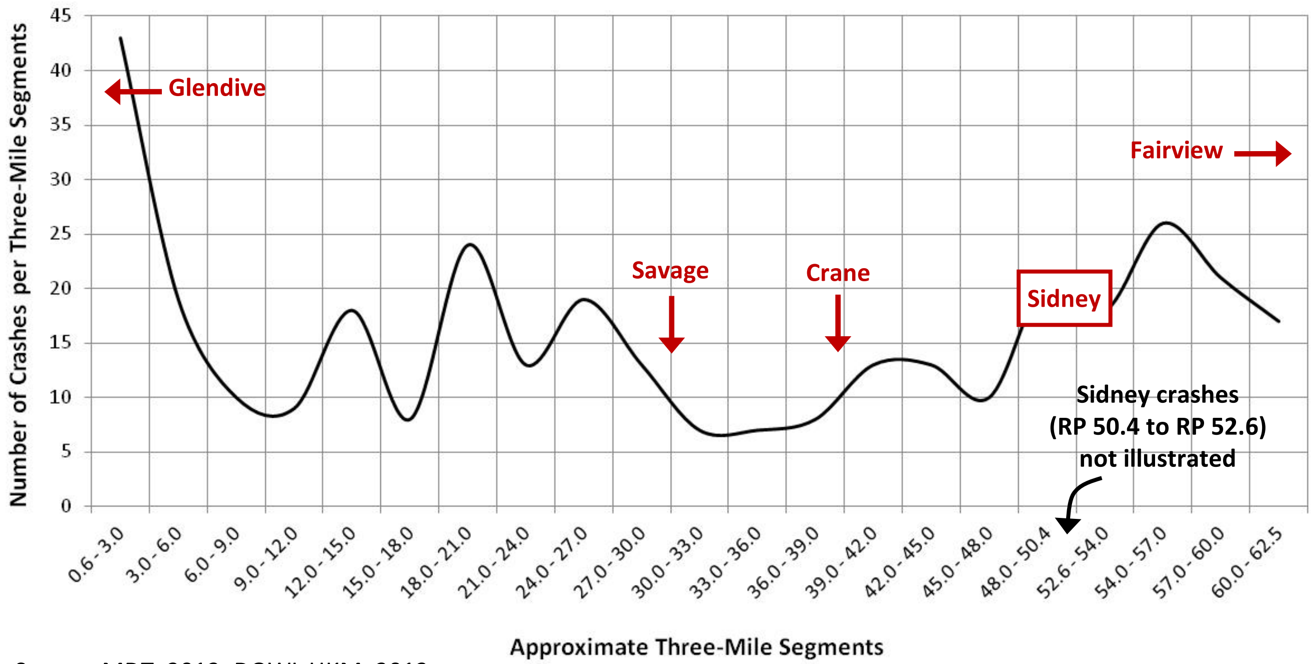
2.1.3 Crash Analysis

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.

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



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:

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

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 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:

$$\text{Severity Index} = \frac{8(\text{Fatal \& Incapacitating Injury}) + 3(\text{Other Injury}) + 1(\text{Property Damage})}{\text{Total Number of Crashes}}$$

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

$$\text{Severity Rate} = (\text{Crash Rate})(\text{Severity Index})$$

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)

Criteria	Rural NINHS		Rural Primary	
	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.

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.
(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.

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*
  - 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

- *RP 53.0 to RP 63.0*
    - 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

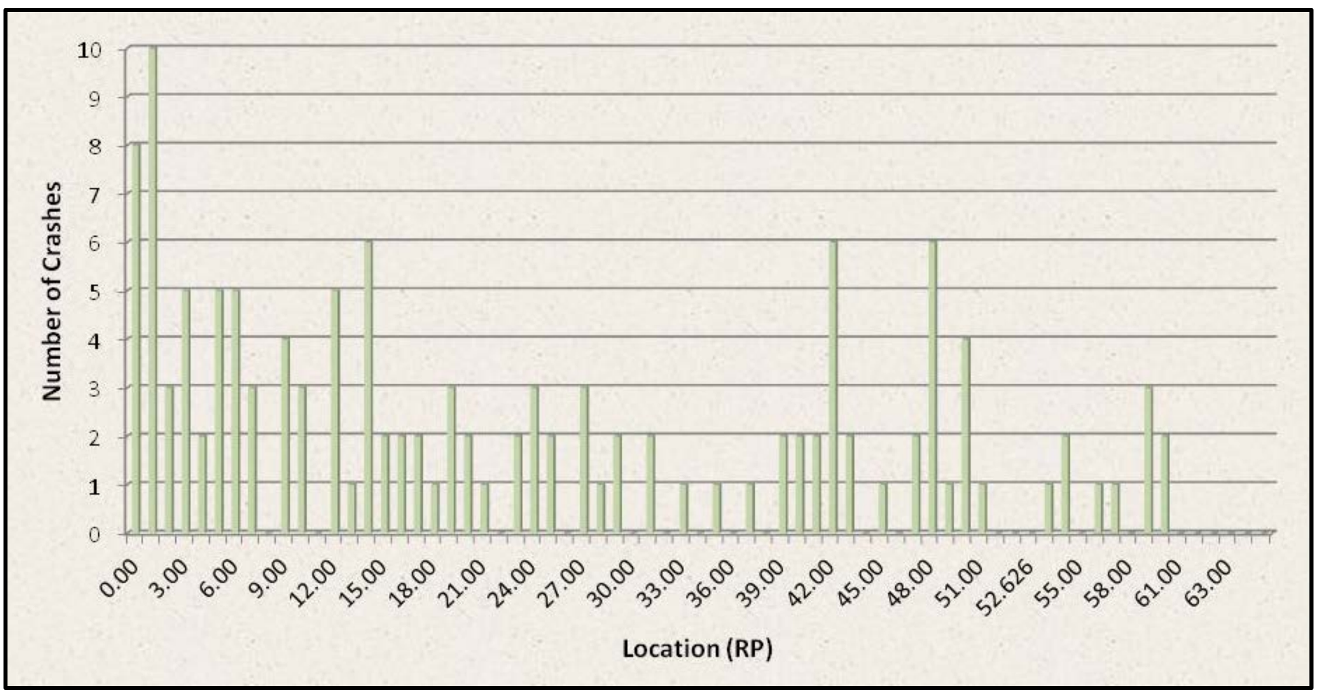
Light and Road Conditions

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.

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

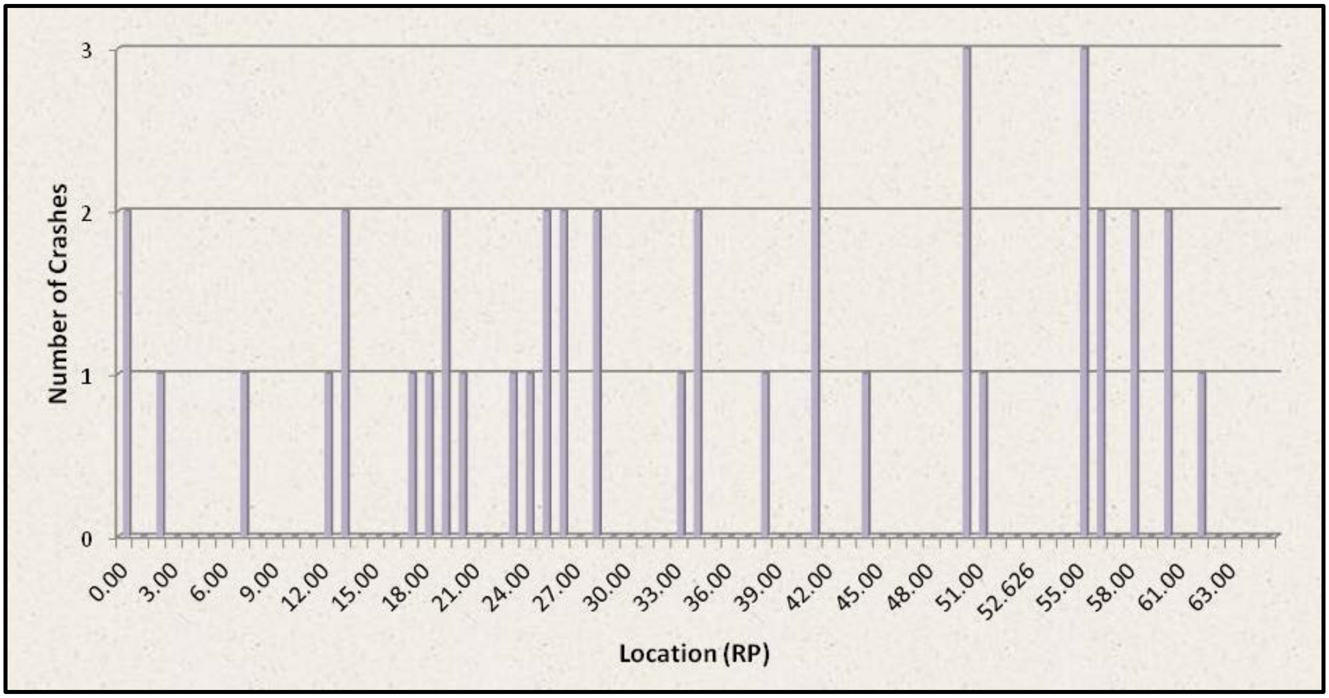


Source: MDT, 2012.

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.

Table 2.11 Access Points within Study Corridor

	Private Driveways[1]		Commercial Access[2]		Road Access[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.
(1) 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.
(4) The Farm Field Access category includes access points originating from a farm field.

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 Points	Total Length (Miles)	Access Point Density (Access Points Per Mile)	Reduction in FFS (1) (mph)
Number	Name	Start RP	End RP				
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	2.5 to 5.0
3	Crane to Sidney	41.5	50.4	110	8.9	12.4	
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.
(1) Free-flow speed (miles/hour).

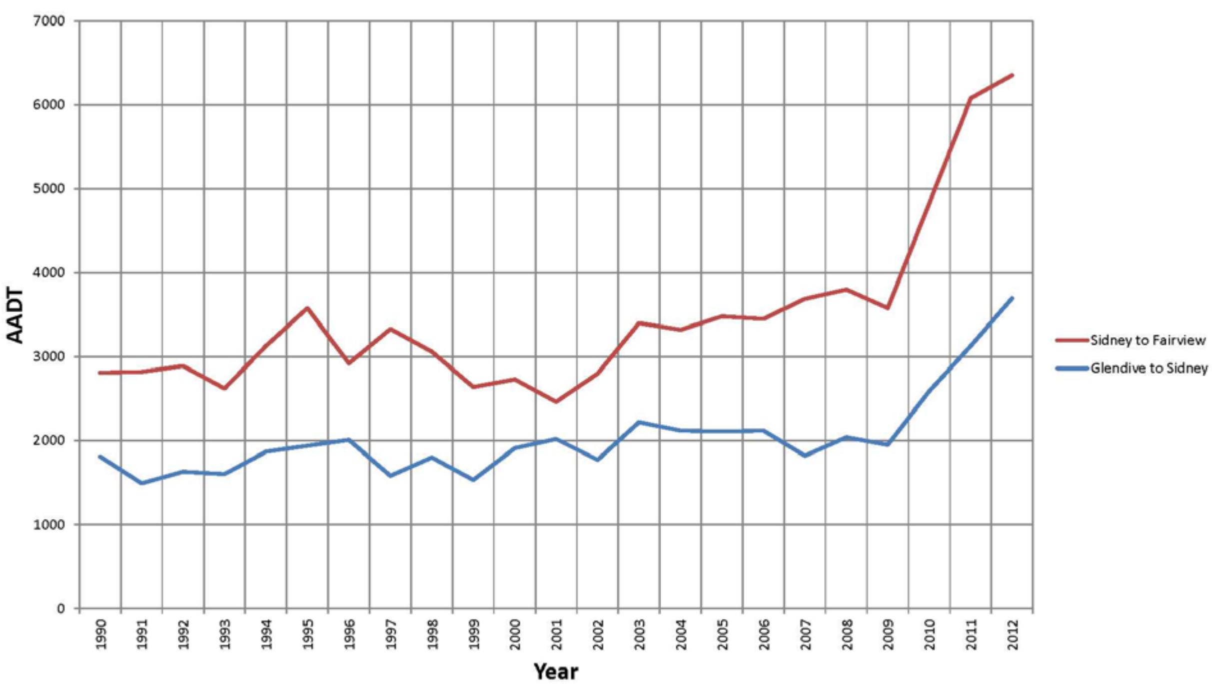
2.1.5 Traffic Volumes

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 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.

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 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] (%)
A	≤35.0
B	>35.0 to 50.0
C	>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.
[1] Percent time-spent-following.

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.

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

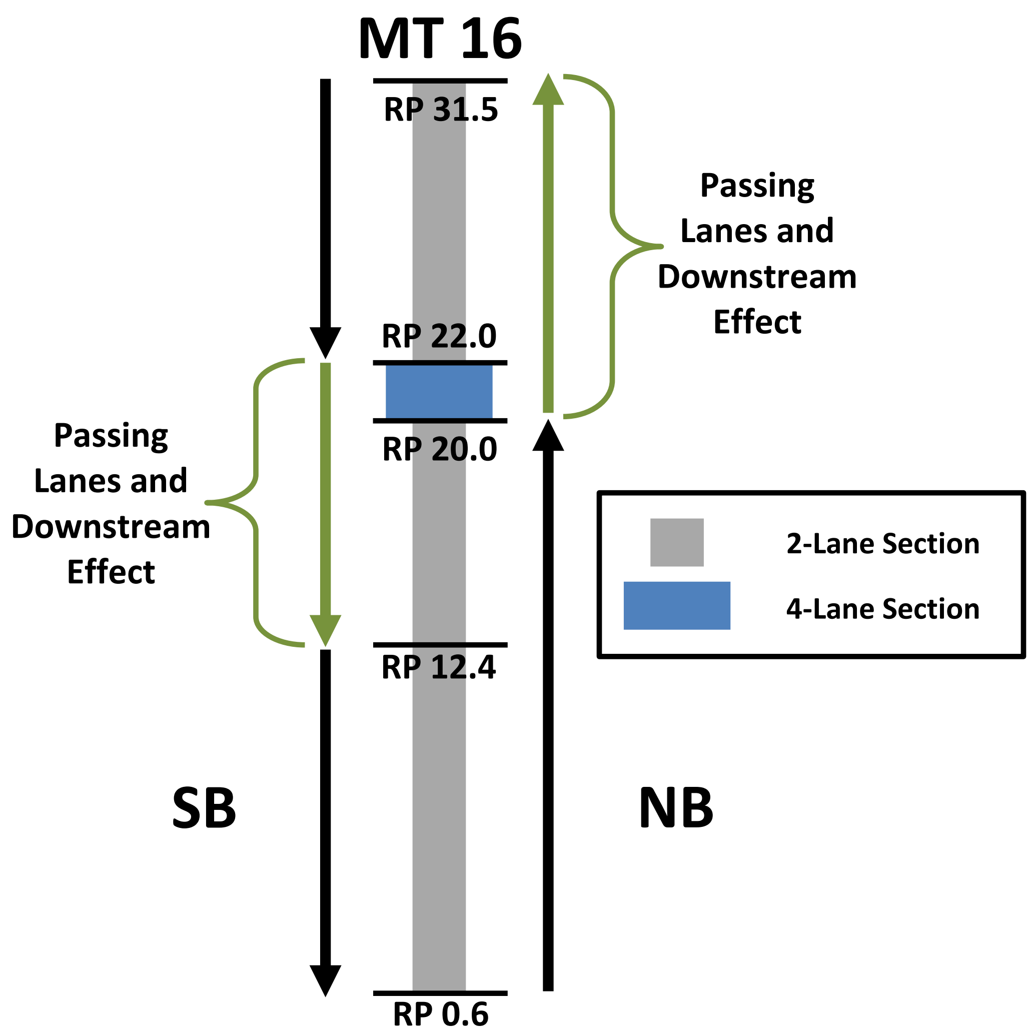
Table 2.15 Class I Two-lane Highway Operational Analysis Results (2012)

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

Source: DOWL HKM, 2012.
Note: Shaded gray rows indicate analyzed sections with passing lanes and their associated downstream effect.
(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.

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.

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 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

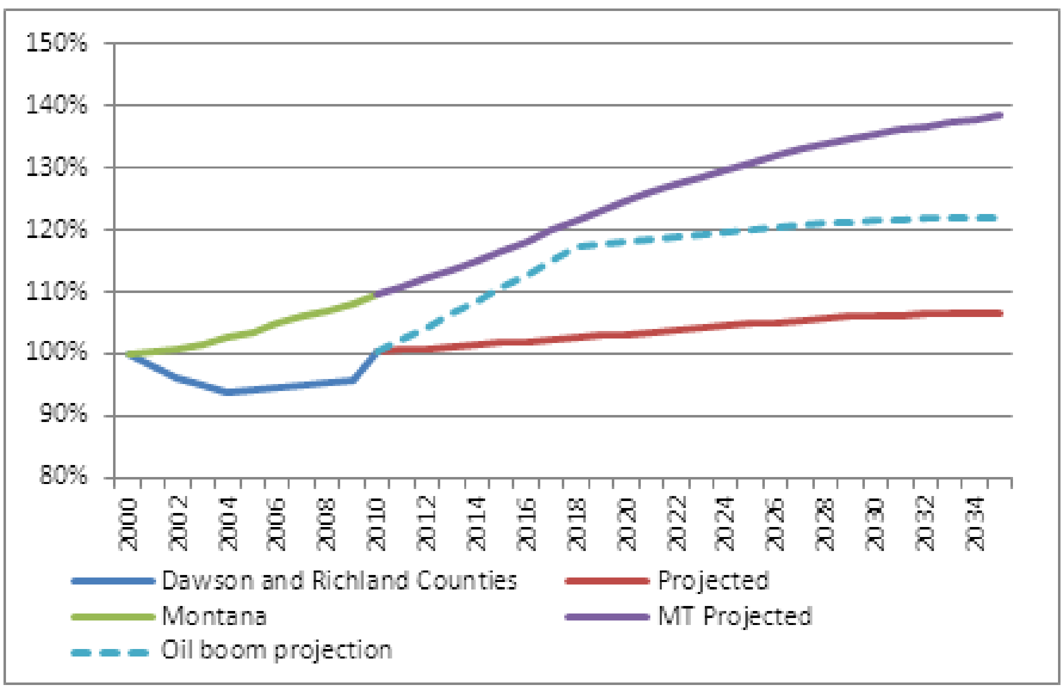
Category		Montana	Richland County	Dawson County
Population	County / State	989,415	9,746	8,966
	Largest City in County Sidney (Richland County) Glendive (Dawson County)	NA	5,191	4,935
Race	White	89%	97%	97%
	American Indian	6%	3%	3%
Ethnicity	Hispanic or Latino	3%	3%	2%
Housing	Total housing units	482,825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

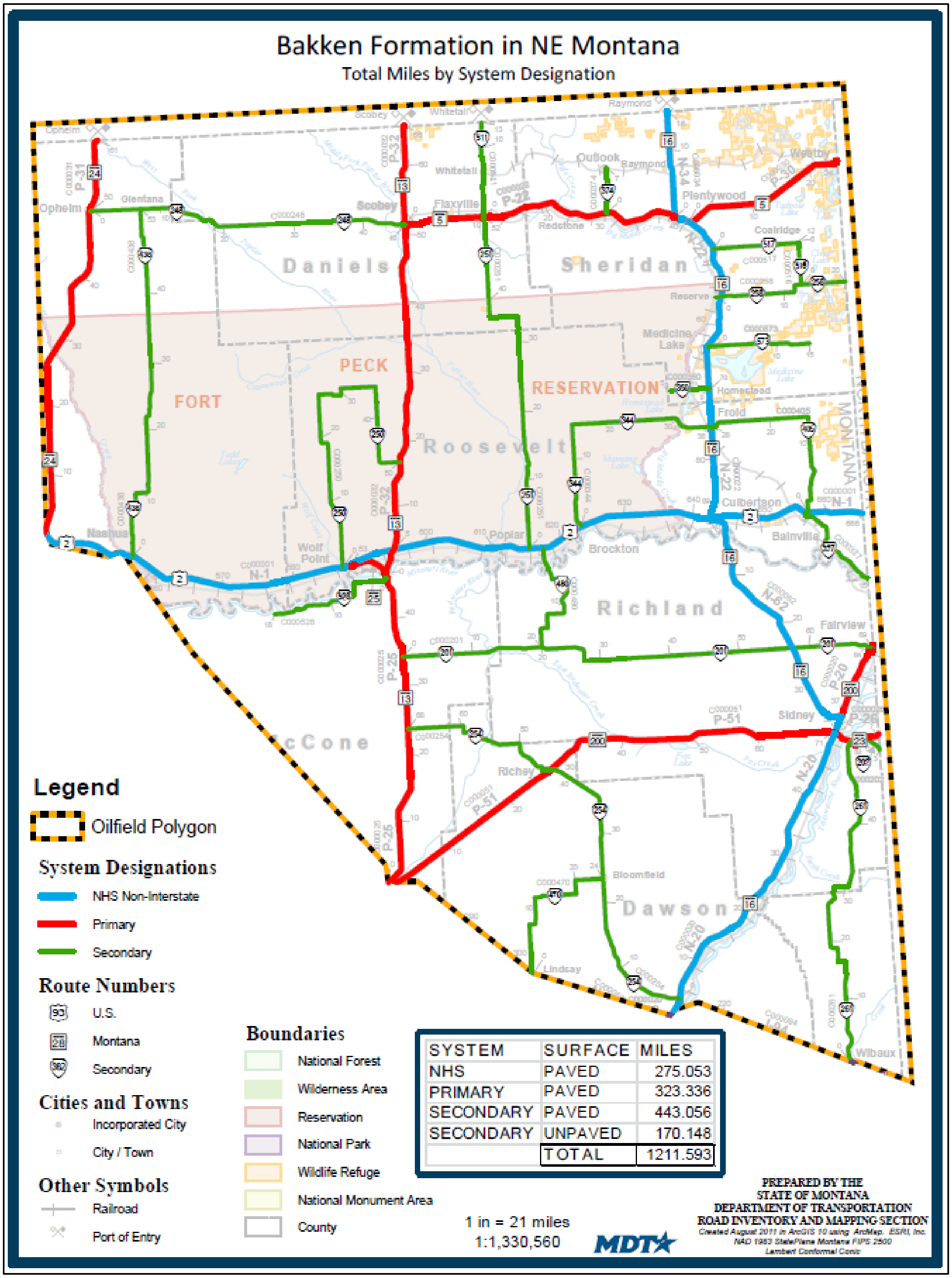
Source: MDT, 2012.

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.

Figure 2-9 Bakken Formation in Montana



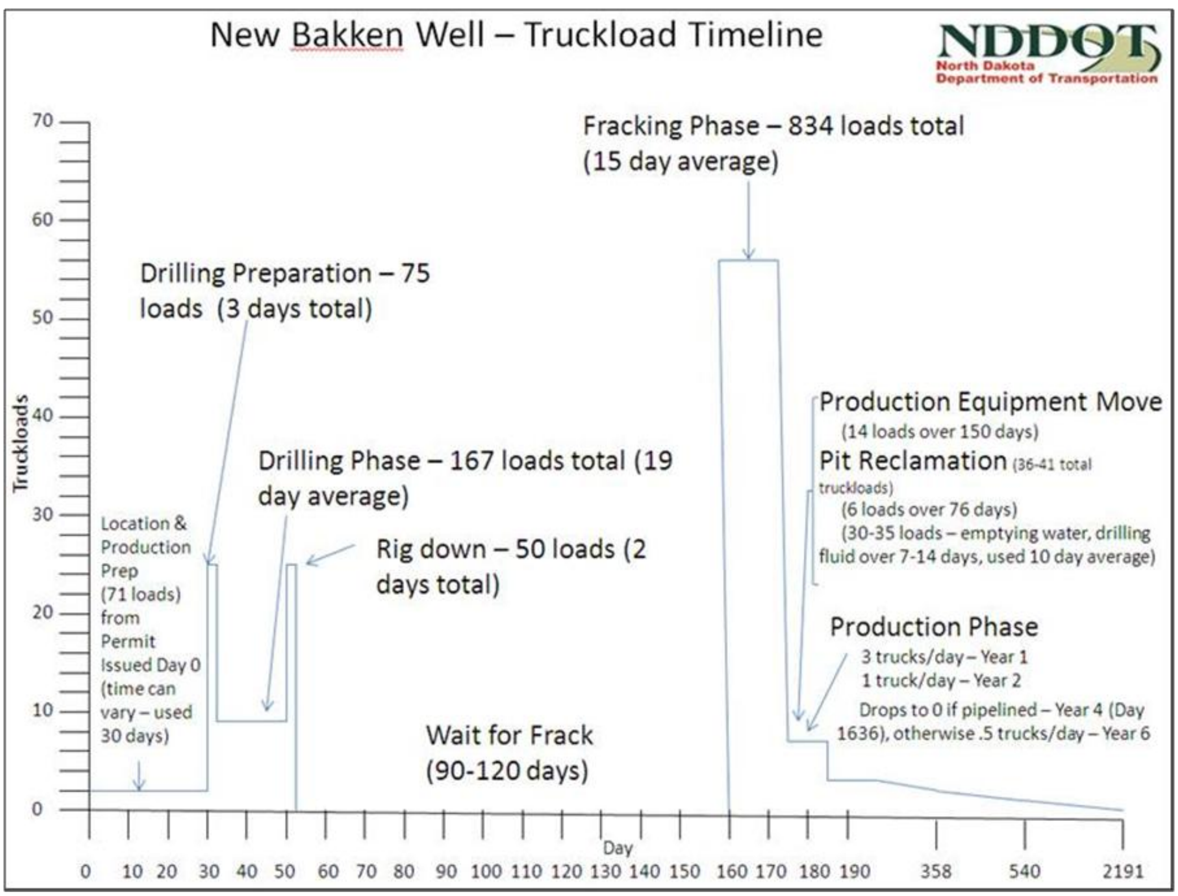
SYSTEM	SURFACE	MILES
NHS	PAVED	275.053
PRIMARY	PAVED	323.336
SECONDARY	PAVED	443.056
SECONDARY	UNPAVED	170.148
	TOTAL	1211.593

Source: MDT, 2012.

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



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.

Culbertson Corridor Planning Study (ongoing) – 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.

Sidney Truck Route Study (2009) – 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 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.

Dawson County / Glendive Growth Policy (2006) –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 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 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.

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
Bird	*Charadrius melodus*	Piping Plover	Listed Threatened, Critical Habitat
	Sterna antillarum athalassos	Interior Least Tern	Listed Endangered
	Grus Americana	Whooping Crane	Listed Endangered
	Centrocercus urophasianus	Greater Sage Grouse	Candidate
	Anthrus spragueii	Sprague's Pipit	Candidate

Source: USFWS, 2011.

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.

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	Various Locations Throughout Corridor
Fort Keogh to Fort Buford Wagon Trail	Historic Roadway	
Red Trail auto trail from the late 1910s and 1920s	Historic Roadway	

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.

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

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

Glendive to Sidney (RP 0.6 to RP 50.4)

Historical Background Growth Calculation (1990 to 2008)

$[(2{,}040/1{,}810)^{(1/(2008-1990)}] - 1 \approx$ **0.7%**

Recent Growth Calculation (2008 to 2012)

$[(3{,}697/2{,}040)^{(1/(2012-2008)}] - 1 \approx$ **16.0%**

Sidney to Fairview (RP 52.6 to RP 62.5)

Historical Background Growth Calculation (1990 to 2008)

$[(3{,}800/2{,}810)^{(1/(2008-1990)}] - 1 \approx$ **1.7%**

Recent Growth Calculation (2008 to 2012)

$[(6{,}357/3{,}800)^{(1/(2012-2008)}] - 1 \approx$ **13.7%**

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.

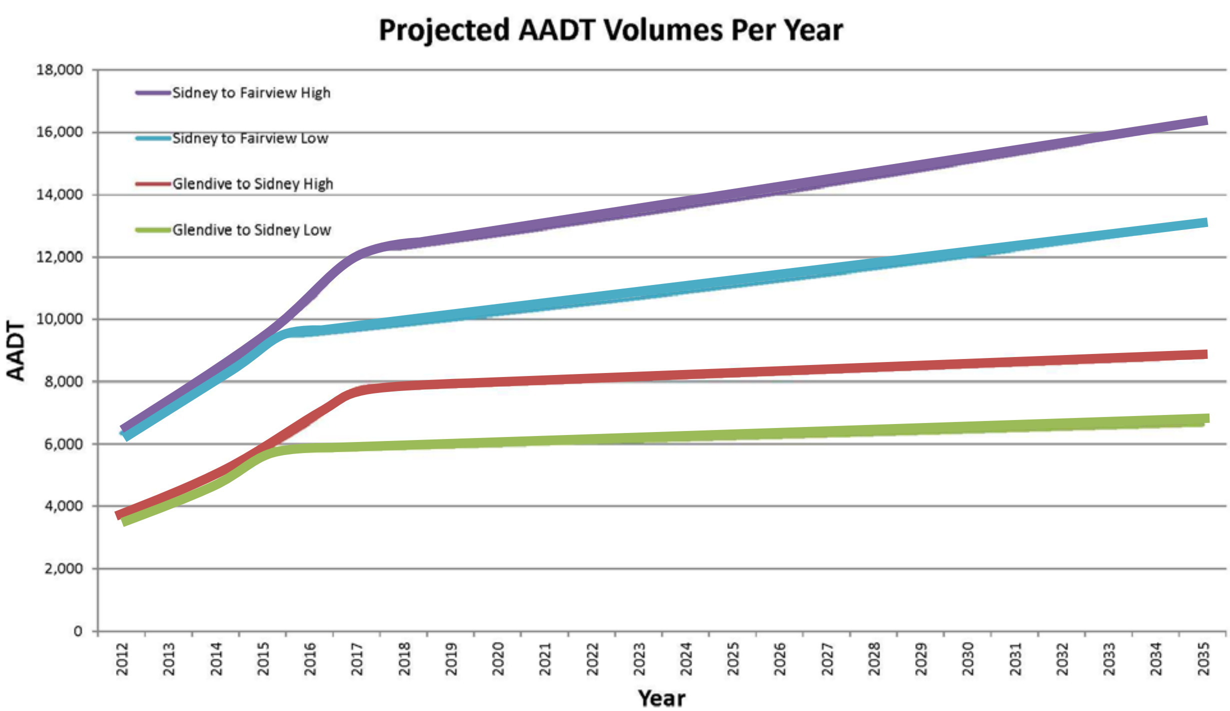
Projected Traffic Volume Calculation Formula

$$(\text{Current Volume})*(1+[\text{Growth Rate in Decimal Form}])^{\text{Number of Years}} = \text{Future Year Volume}$$

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.

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
Corridor Segment	Glendive to Savage	MT 16 Northbound RP 0.6 to RP 20.0	54.6	C	60.3	C
		MT 16 Southbound RP 0.6 to RP 12.4	54.9	C	61.7	C
		MT 16 Northbound RP 20.0 to RP 31.5	39.3	B	47.3	B
		MT 16 Southbound RP 12.4 to RP 22.0	37.7	B	45.7	B
		MT 16 Southbound RP 22.0 to RP 31.5	55.3	C	60.1	C
	Savage to Crane	MT 16 Northbound RP 31.5 to RP 41.5	51.3	C	59.2	C
		MT 16 Southbound RP 31.5 to RP 41.5	57.3	C	64.7	C
	Crane to Sidney	MT 16 Northbound RP 41.5 to RP 50.4	52.2	C	59.5	C
		MT 16 Southbound RP 41.5 to RP 50.4	64.7	C	72.8	D
	Sidney to Fairview	MT 200 Eastbound RP 52.6 to RP 62.5	71.3	D	77.4	D
		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.

(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

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.

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.

MT 200 / CR 129 Intersection Signing 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.

30 km NE of Glendive – NE 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.

Sidney – Southwest 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.

Slide Repair – NE of Glendive / MT11-1 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.

Fairview Intersection Improvements 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 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.

SF 119 – Glendive Rumble Strips 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.

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

<table>
<tr><th colspan="2">Condition</th><th>Issue / Concern</th></tr>
<tr><td rowspan="4">Transportation System Conditions</td><td>Physical Features</td><td><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.</td></tr>
<tr><td>Geometric Conditions</td><td><u>Horizontal Alignment</u>
• Seven (7) locations do not meet current MDT standards.
<u>Vertical Alignment</u>
• Thirteen (13) locations do not meet current MDT standards.
<u>Clear Zones</u>
• Fifteen (15) locations do not meet current MDT standards.</td></tr>
<tr><td>Safety</td><td>• 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 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</td></tr>
<tr><td>Operational Conditions</td><td>• 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.</td></tr>
</table>

Condition	Issue / Concern
Environmental Conditions	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 • 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

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Helena, Montana 59624

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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 ± to 62.5 ±)

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

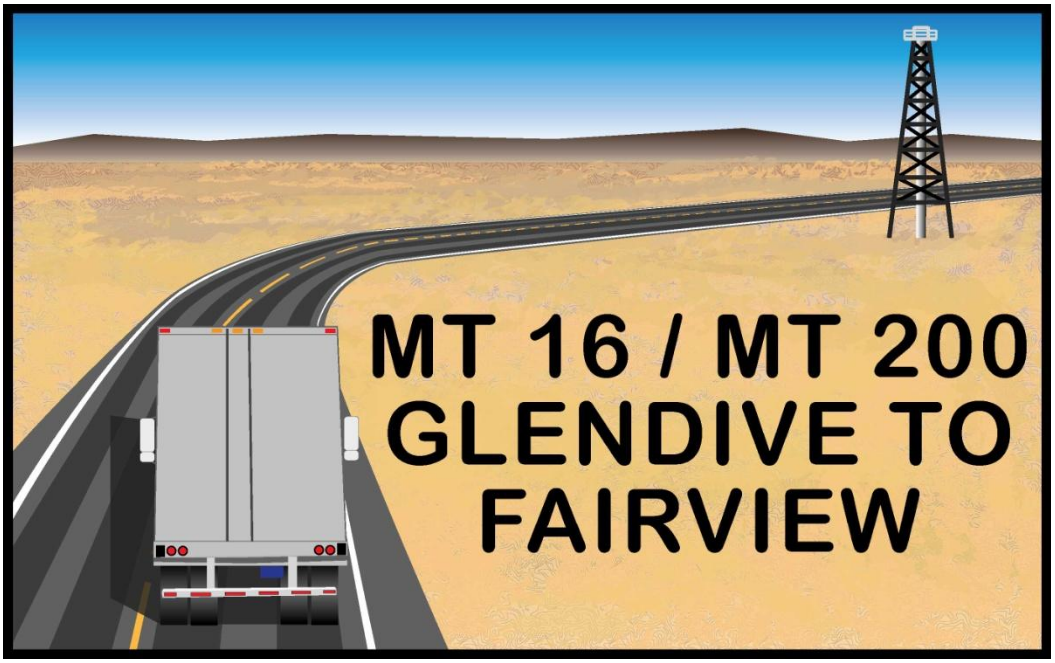
- First Hay Creek at RP 59.5. Photos 70 and 71.
- Second Hay Creek at RP 60.1. Photo 72.

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:

MONTANA MDT DEPARTMENT OF TRANSPORTATION

PREPARED BY:

DOWL HKM

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Helena, Montana 59624
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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.

<u>Segment 1: Glendive to Savage from Approximate (RP 0.6 ± to RP 31.5 ±)</u>

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.

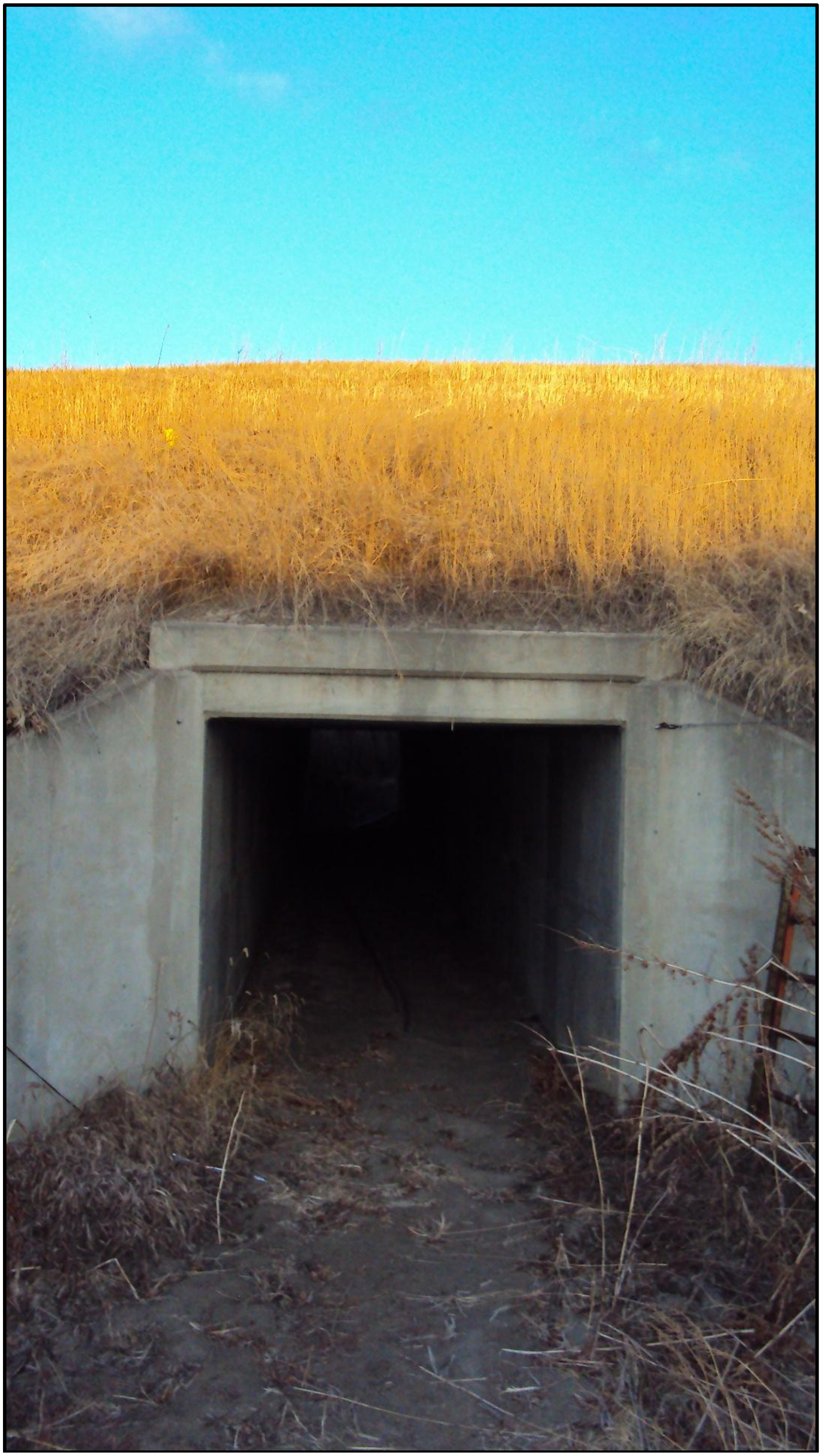


Photo 8. Looking west at a box culvert/wildlife underpass under MT 16. East side slope transitions from 4:1 to 2:1 approximately 18 feet from northbound travel lane. RP 2.4.

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.

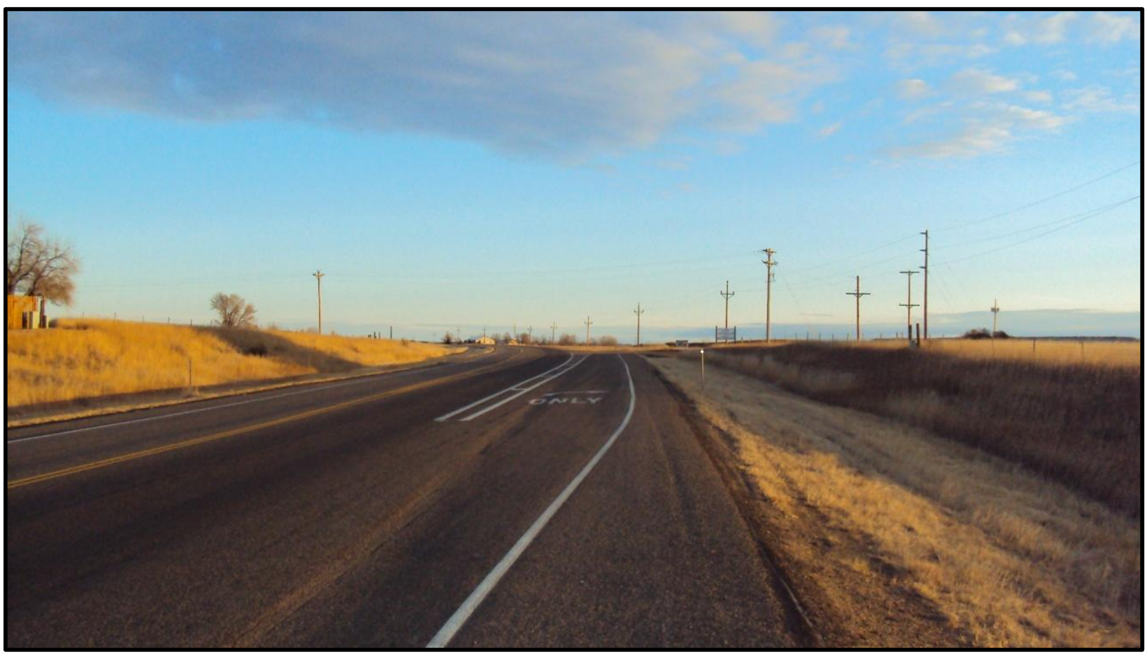


Photo 10. Looking north on MT 16 at northbound right-turn lane. RP 3.1.

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.

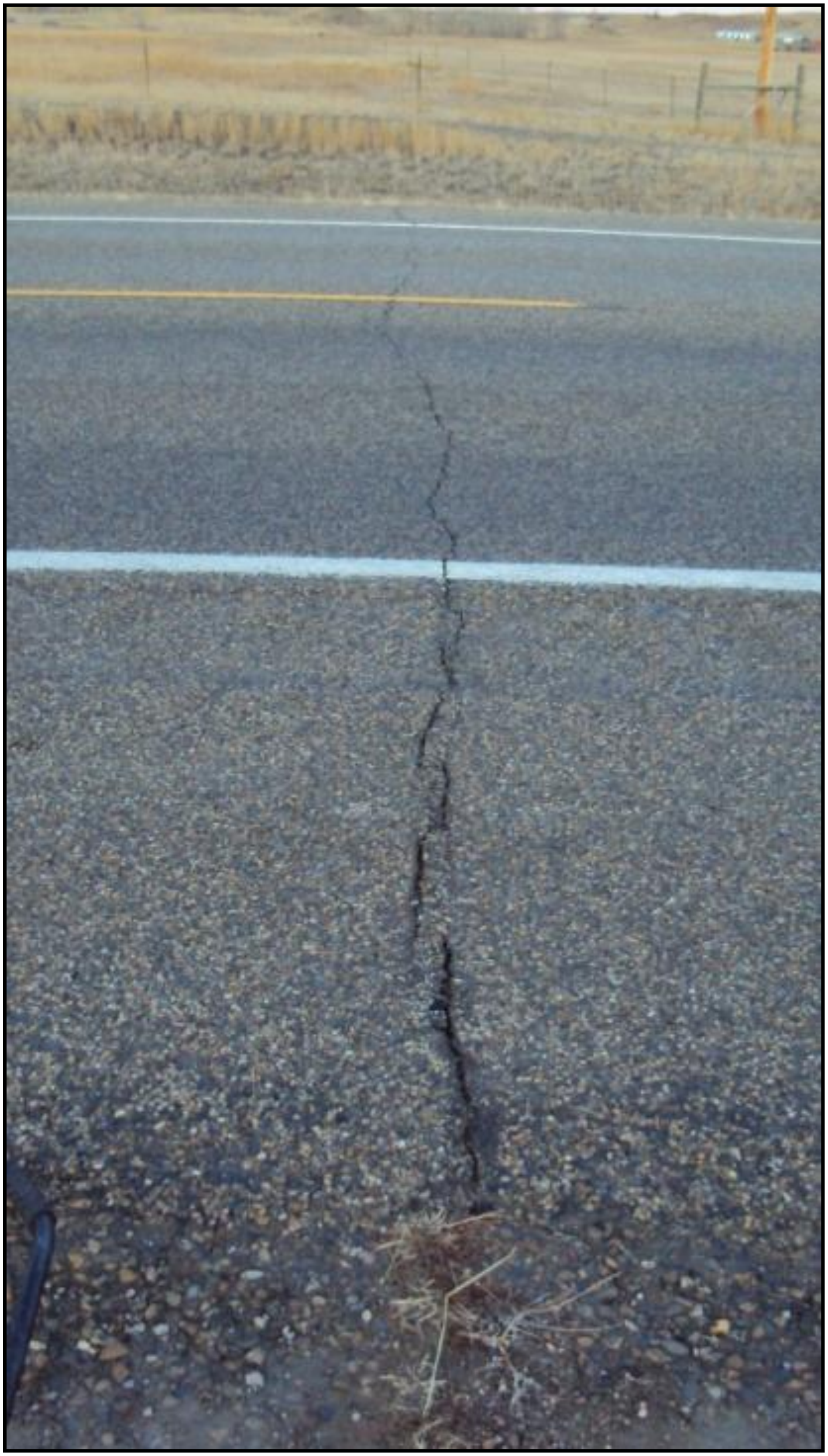


Photo 13. Looking across MT 16 at transverse pavement cracking. Pavement cracking within the travel way measured approximately 0.25 inches in width, approximately every 85 feet. RP 5.4.

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.

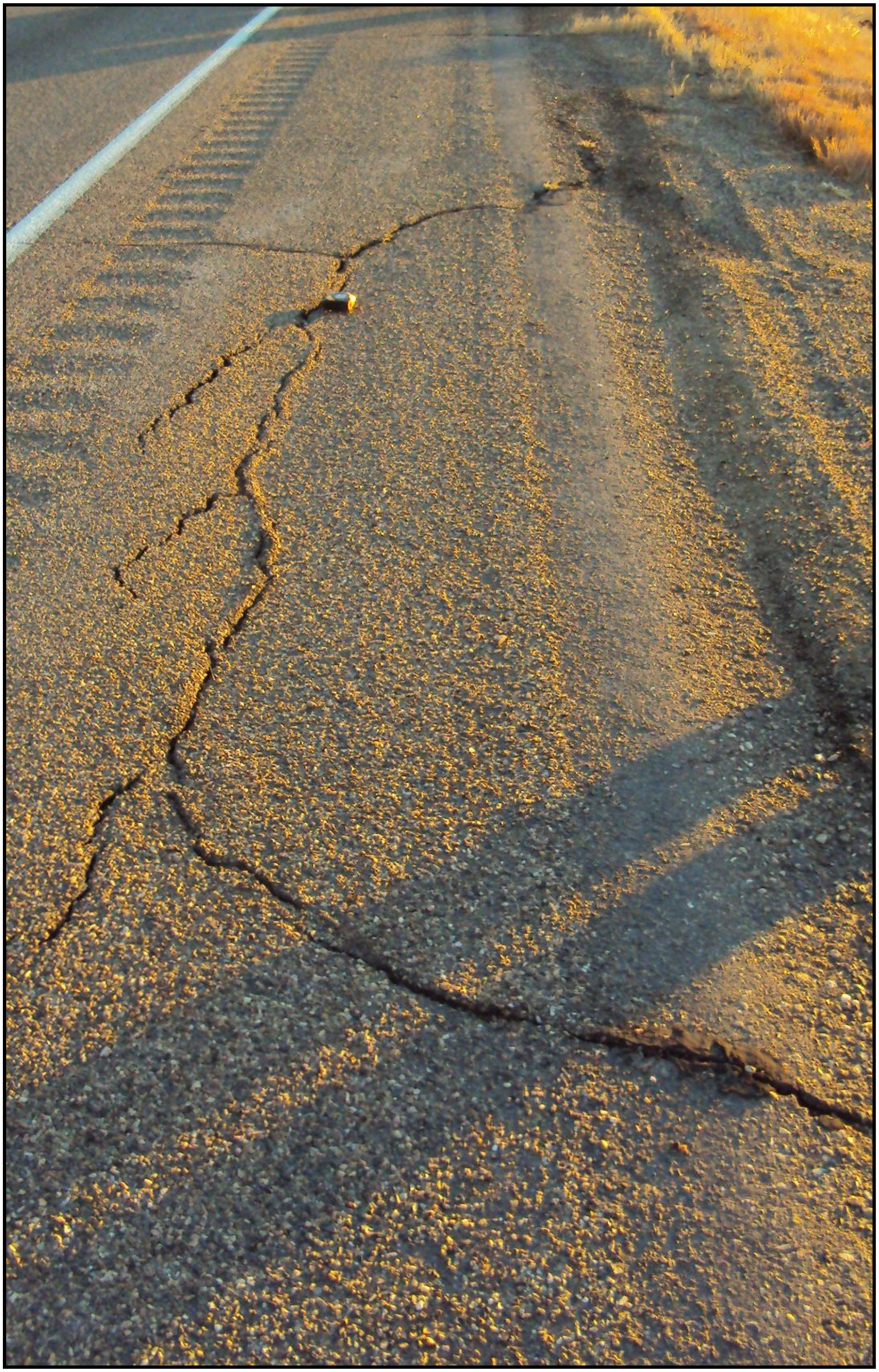


Photo 29. Looking across MT 16 at transverse pavement cracking. Pavement cracking within the travel way measured approximately 0.5 inches in width, approximately every 45 feet. RP 14.1.

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

I00094213+03641

I00094213+03642

P000200004+03011

P000200007+00501

P00020010+00721

P00020012+05321

P00020015+04781

P00020025+00631

P00020031+02501

No picture available

P00020031+01071, P00020032+03991, P00020032+06521

P00020037+05151

P00020041+03501

P00020046+06831

P00020051+06421

P00020059+05101

P00020060+00061

INITIAL ASSESSMENT FORM FOR STRUCTURE :

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**
Str Owner Code, Description : **1 State Highway Agency**
Maintained by Code, Description : **1 State Highway Agency**
Intersecting Feature : **DEER CREEK**
Kilometer Post, Mile Post : **6.92 km 4.30**
Structure on the State Highway System : X
Latitude : **47°09'45"**
Structure on the National Highway System : X
Longitude : **104°42'10"**
Str Meet or Exceed NBIS Bridge Length : X

Construction Data

Construction Project Number : **F 245(16)**
Construction Station Number : **222+90.00**
Construction Drawing Number : **6520**
Construction Year : **1964**
Reconstruction Year : **1974**

Traffic Data

Current ADT : **1,880** 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 :	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 : **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 :
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 : **13.11 m**
(50A) Curb Width : **0.00 m**
(50B) Curb Width : **0.00 m**
Skew Angle : °

Structure Vertical and Horizontal Clearance Data Inventory Route :

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

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020004+03011
Continue

Inspection Data

Sufficiency Rating : **89.7**
Health Index : **100**
Structure Status :**Not Deficient**

Inspection Due Date : 20 January 2012
(91) Inspection Fequency (months) : **24**

NBI Inspection Data

(90) Date of Last Inspection : 20 January 2010
Last Inspected By : Troy Hafele - 2056
(90) Inspection Date :
Inspected By :

(58) Deck Rating : 7
(59) Superstructure Rating : 8
(60) Substructure Rating : 7
(72) App Rdwy Align : 8

(68) Deck Geometry : 6
(67) Structure Rating : 7
(69) Under Clearance : N
(41) Posting Status : A

(36C) Approach Rail Rating : 1
(36A) Bridge Rail Rating : 0
(36B) Transition Rating : 1
(36D) End Rail Rating : 1

(62) Culvert Rating : N
(61) Channel Rating : 8
(71) Waterway Adequacy : 8
(113) Scour Critical : 5

Unrepaired Spalls : 0 m sq
Deck Surfacing Depth : 0.00 in

Inspection Hours

Crew Hours for inspection : 1
Helper Hours : -1
Special Crew Hours : -1
Special Equipment Hours : -1

Snooper Required : N
Snooper Hours for inspection : -1
Flagger Hours : -1

Inspection Work Candidates		Status	Priority	Effected Structure Unit	Scope of Work	Action	Covered Condition States
Candidate ID	Date Requested						

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020004+03011

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	448	sq.m.	X	100	0	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

01/20/2010 - 2008 Sandblasted and sealed deck. UZEZ
01/14/2008 - None. (34.14 X 13.11 = 447.575) OOBZ
01/24/2005 - None CZHC
12/26/2000 - Chip seal cover raveling off on driving lane. OLHN
10/02/1996 - None WFPC
01/01/1993 - None REFI

Inspection Notes:

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 109 - P/S Conc Open Girder										
	1	1	204	m.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

01/20/2010 - 6 T beams. UZEZ
01/14/2008 - None OOBZ
01/24/2005 - None CZHC
12/26/2000 - None OLHN
10/02/1996 - None WFPC
01/01/1993 - None REFI

Inspection Notes:

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 205 - R/Conc Column										
	1	3	2	ea.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

01/20/2010 - None UZEZ
01/14/2008 - None OOBZ
01/24/2005 - None CZHC
12/26/2000 - None OLHN
10/02/1996 - None WFPC
01/01/1993 - None REFI

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020004+03011
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 215 - R/Conc Abutment										
	1	2	32	m.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

01/20/2010 - None UZEZ
01/14/2008 - None OOBZ
01/24/2005 - None CZHC
12/26/2000 - None OLHN
10/02/1996 - None WFPC
01/01/1993 - None REFI

Inspection Notes:

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 234 - R/Conc Cap										
	1	1	13	m.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

01/20/2010 - None UZEZ
01/14/2008 - None OOBZ
01/24/2005 - None CZHC
12/26/2000 - None OLHN
10/02/1996 - None WFPC
01/01/1993 - None REFI

Inspection Notes:

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										
	1	1	12	ea.		100	0	0		
						%	%	%	%	%

Previous Inspection Notes :

01/20/2010 - Quantity does not include bearings buried in backwalls 0 6 6 0 = 12. UZEZ
01/14/2008 - None OOBZ
01/24/2005 - None CZHC
12/26/2000 - Dirt on rt outside bearing device at abut. 3. OLHN
10/02/1996 - None WFPC
01/01/1993 - None REFI

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020004+03011
Continue

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

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 334 - Metal Rail Coated										
	1	2	68	m.		95	5	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

01/20/2010 - Thrie beam with freckled rust on posts. UZEZ
01/14/2008 - None. (34.14 X 2 = 68.28) OOBZ
01/24/2005 - None CZHC
12/26/2000 - None OLHN
10/02/1996 - None WFPC
01/01/1993 - None REFI

Inspection Notes:

General Inspection Notes

01/20/2010 - None UZEZ
01/14/2008 - New end rail section 2007. OOBZ
01/24/2005 - None CZHC
12/26/2000 - None OLHN
10/02/1996 - Sufficiency Rating Calculation Accepted by ops$a0241 at 8/15/97 14:13:57 WFPC
OPS$A0241 inspection comments -
Structure P00020004+03011 -
Date 10/2/96 -
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

01/01/1993 - Sufficiency Rating Calculation Accepted by ops$u5963 at 3/10/97 11:34:36 REFI
Sufficiency Rating Calculation Accepted by ops$u9004 at 2/19/97 14:59:01

01/01/1991 - Updated with tape 1992 NB92
02/01/1989 - Updated with tape 1991 NB91
01/01/1987 - Updated with tape 1988 NB88
01/01/1985 - Updated with tape 1986 NB86
01/01/1983 - Updated with tape 1984 NB84
12/01/1980 - Updated with tape 1983 NB83
12/01/1978 - Updated with tape 1980 NB80

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

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

Intersecting Feature : THREE MILE CREEK

Kilometer Post, Mile Post : 11.33 km 7.04

Structure on the State Highway System : X

Latitude : 47°11'56"

Structure on the National Highway System : X

Longitude : 104°40'57"

Str Meet or Exceed NBIS Bridge Length : X

Construction Data

Construction Project Number :

Construction Station Number : 0+00.00

Construction Drawing Number : none

Construction Year : 1964

Reconstruction Year :

Traffic Data

Current ADT : 1,880 ADT Count Year : 2009 Percent Trucks : 2 %

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

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 : 0.00 m

(50B) Curb Width : 0.00 m

Skew Angle : °

Structure Vertical and Horizontal Clearance Data Inventory Route :

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

INITIAL ASSESSMENT FORM FOR STRUCTURE : P00020007+00501

Continue

Inspection Data

Sufficiency Rating : **89.7**
Health Index : **100**
Structure Status :**Not Deficient**

Inspection Due Date : 12 January 2013
(91) Inspection Fequency (months) : **24**

NBI Inspection Data

(90) Date of Last Inspection : 12 January 2011
(90) Inspection Date :
Last Inspected By : Troy Hafele - 2056
Inspected By :

(58) Deck Rating : N
(59) Superstructure Rating : N
(60) Substructure Rating : N
(72) App Rdwy Align : 8
(68) Deck Geometry : 6
(67) Structure Rating : 7
(69) Under Clearance : N
(41) Posting Status : A
(36C) Approach Rail Rating : N
(36A) Bridge Rail Rating : N
(36B) Transition Rating : N
(36D) End Rail Rating : N
(62) Culvert Rating : 7
(61) Channel Rating : 7
(71) Waterway Adequacy : 8
(113) Scour Critical : 8

Unrepaired Spalls : 0 m sq
Deck Surfacing Depth : 0.00 in

Inspection Hours

Crew Hours for inspection : 1
Helper Hours : -1
Special Crew Hours : -1
Special Equipment Hours : -1
Snooper Required : N
Snooper Hours for inspection : -1
Flagger Hours : -1

Inspection Work Candidates		Status	Priority	Effected Structure Unit	Scope of Work	Action	Covered Condition States
Candidate ID	Date Requested						

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 240 - Steel Culvert galvanized DBL SSPPA 11ft 2in S x 7ft 2in R x 82.6 ft L										
	1	2	50	m.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

01/12/2011 - outlet ends have 1' of manure/sediment. Inlet end has concrete and outlet end has riprap slope protection. TH NZCZ
01/05/2009 - None IZIP
01/17/2007 - None XZBK
01/24/2005 - None CZHE
12/30/2002 - Same comments as last insp. WJCZ
12/26/2000 - Same comments as last insp. OLHZ
12/04/1998 - 1 foot of silt at the bottoms of pipes. GACS
10/02/1996 - None TVGN
10/01/1994 - None REFI

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020007+00501
Continue

General Inspection Notes

01/12/2011 - None	NZCZ
01/05/2009 - None	IZIP
01/17/2007 - None	XZBK
01/24/2005 - None	CZHE
12/30/2002 - None	WJCZ
12/26/2000 - None	OLHZ
12/04/1998 - None	GAGS
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 - 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	TVGN
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	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
01/01/1985 - Updated with tape 1986	NB86
01/01/1983 - Updated with tape 1984	NB84

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020010+00721

Location : 6M SW INTAKE 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
Intersecting Feature : LOWER 7 MILE CREEK
Kilometer Post, Mile Post : 16.21 km 10.07
Structure on the State Highway System : X
Latitude : 47°14'08"
Structure on the National Highway System : X
Longitude : 104°38'51"
Str Meet or Exceed NBIS Bridge Length : X

Construction Data

Construction Project Number : F 245(19)
Construction Station Number : 527+92.00
Construction Drawing Number : 8050
Construction Year : 1967
Reconstruction Year :

Traffic Data

Current ADT : 1,880 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 :	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		
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
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 : 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 : 0.00 m
(50B) Curb Width : 0.00 m
Skew Angle : °

Structure Vertical and Horizontal Clearance Data Inventory Route :

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

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020010+00721
Continue

Inspection Data

Sufficiency Rating : **89.7**
Health Index : **100**
Structure Status :**Not Deficient**

Inspection Due Date : 20 January 2012
(91) Inspection Fequency (months) : **24**

NBI Inspection Data

(90) Date of Last Inspection : 20 January 2010

(90) Inspection Date :

Last Inspected By : Troy Hafele - 2056

Inspected By :

(58) Deck Rating :	7	(68) Deck Geometry :	6	(36C) Approach Rail Rating :	1	(62) Culvert Rating :	N
(59) Superstructure Rating :	8	(67) Structure Rating :	7	(36A) Bridge Rail Rating :	0	(61) Channel Rating :	8
(60) Substructure Rating :	7	(69) Under Clearance :	N	(36B) Transition Rating :	1	(71) Waterway Adequacy :	8
(72) App Rdwy Align :	8	(41) Posting Status :	A	(36D) End Rail Rating :	1	(113) Scour Critical :	5

Unrepaired Spalls : 0 m sq

Deck Surfacing Depth : 0.00 in

Inspection Hours

Crew Hours for inspection :	1.5	Snooper Required :	N
Helper Hours :	-1	Snooper Hours for inspection :	-1
Special Crew Hours :	-1	Flagger Hours :	-1
Special Equipment Hours :	-1		

Inspection Work Candidates		Status	Priority	Effected Structure Unit	Scope of Work	Action	Covered Condition States
Candidate ID	Date Requested						

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020010+00721

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	515	sq.m.	X	100	0	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

01/20/2010 - Deck was sandblasted and sealed in 2008. Some exposed aggregate. UZLZ
01/14/2008 - None. (40.23 X 12.80 = 514.944) OIBZ
01/24/2005 - None CTHG
12/26/2000 - Chip and seal cover starting to ravel off on driving lanes. OLHL
10/02/1996 - None MJVV
01/01/1993 - None REFI

Inspection Notes:

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 109 - P/S Conc Open Girder										
	1	1	241	m.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

01/20/2010 - 6 T beams. UZLZ
01/14/2008 - None OIBZ
01/24/2005 - None CTHG
12/26/2000 - None OLHL
10/02/1996 - None MJVV
01/01/1993 - None REFI

Inspection Notes:

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 205 - R/Conc Column										
	1	2	2	ea.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

01/20/2010 - None UZLZ
01/14/2008 - None OIBZ
01/24/2005 - None CTHG
12/26/2000 - None OLHL
10/02/1996 - None MJVV
01/01/1993 - None REFI

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020010+00721
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 215 - R/Conc Abutment										
	1	2	31	m.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

01/20/2010 - None UZLZ
01/14/2008 - None OIBZ
01/24/2005 - None CTHG
12/26/2000 - None OLHL
10/02/1996 - None MJVV
01/01/1993 - None REFI

Inspection Notes:

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 234 - R/Conc Cap										
	1	1	12	m.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

01/20/2010 - None UZLZ
01/14/2008 - None OIBZ
01/24/2005 - None CTHG
12/26/2000 - None OLHL
10/02/1996 - None MJVV
01/01/1993 - None REFI

Inspection Notes:

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										
	1	1	12	ea.		100	0	0		
						%	%	%	%	%

Previous Inspection Notes :

01/20/2010 - Quantity does not include bearings buried in backwall 0 6 6 0 = 12. UZLZ
01/14/2008 - None OIBZ
01/24/2005 - None CTHG
12/26/2000 - Dirt on both outside bearings at abut 1. OLHL
10/02/1996 - None MJVV
01/01/1993 - None REFI

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020010+00721
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 334 - Metal Rail Coated										
	1	2	80	m.		95	5	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

01/20/2010 - Thrie beam with freckled rust on the posts. UZLZ
01/14/2008 - None. (40.23 X 2 = 80.46) OIBZ
01/24/2005 - None CTHG
12/26/2000 - None OLHL
10/02/1996 - None MJVV
01/01/1993 - None REFI

Inspection Notes:

General Inspection Notes

01/20/2010 - None UZLZ
01/14/2008 - New end sections 2007. OIBZ
01/24/2005 - Same as previously reported. CTHG
12/26/2000 - Bridge at bottom of vertical. Berm starting to wash at right side abut.3. OLHL
10/02/1996 - Sufficiency Rating Calculation Accepted by ops$a0241 at 8/15/97 14:19:33 MJVV
OPS$A0241 inspection comments -
Structure P00020010+00721 -
Date 10/2/96 -
Previous comments > Sufficiency Rating Calculation Accepted by ops$u5963 at 3/10/97 11:34:37
Sufficiency Rating Calculation Accepted by ops$u9004 at 2/19/97 14:59:02

01/01/1993 - Sufficiency Rating Calculation Accepted by ops$u5963 at 3/10/97 11:34:37 REFI
Sufficiency Rating Calculation Accepted by ops$u9004 at 2/19/97 14:59:02

01/01/1991 - Updated with tape 1992 NB92
02/01/1989 - Updated with tape 1991 NB91
01/01/1987 - Updated with tape 1988 NB88
01/01/1985 - Updated with tape 1986 NB86
01/01/1983 - Updated with tape 1984 NB84
12/01/1980 - Updated with tape 1983 NB83
12/01/1978 - Updated with tape 1980 NB80

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020012+05321

Location : 4M SW INTAKE 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**
Intersecting Feature : **MORGAN CREEK**
Kilometer Post, Mile Post : **20.17 km 12.53**
Structure on the State Highway System : X
Latitude : **47°15'54"**
Structure on the National Highway System : X
Longitude : **104°37'08"**
Str Meet or Exceed NBIS Bridge Length : X

Construction Data

Construction Project Number : **F 245(19)**
Construction Station Number : **657+59.00**
Construction Drawing Number : **8056**
Construction Year : **1967**
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	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**

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 : **5 Prestressed concrete**
Span Design Code, Description : **4 Tee Beam**

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**

Approach Span

Number of Spans : **0**
Material Type Code, Description :
Span Design Code, Description :

(52) Out-to-Out Width : **12.80 m**
(50A) Curb Width : **0.00 m**
(50B) Curb Width : **0.00 m**
Skew Angle : °

Structure Vertical and Horizontal Clearance Data Inventory Route :

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

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020012+05321
Continue

Inspection Data

Sufficiency Rating : **90.8**
Health Index : **100**
Structure Status :**Not Deficient**

Inspection Due Date : 20 January 2012
(91) Inspection Fequency (months) : **24**

NBI Inspection Data

(90) Date of Last Inspection : 20 January 2010
Last Inspected By : Troy Hafele - 2056
(90) Inspection Date :
Inspected By :

(58) Deck Rating :	7	(68) Deck Geometry :	6	(36C) Approach Rail Rating :	1	(62) Culvert Rating :	N
(59) Superstructure Rating :	8	(67) Structure Rating :	7	(36A) Bridge Rail Rating :	0	(61) Channel Rating :	8
(60) Substructure Rating :	7	(69) Under Clearance :	N	(36B) Transition Rating :	1	(71) Waterway Adequacy :	8
(72) App Rdwy Align :	6	(41) Posting Status :	A	(36D) End Rail Rating :	1	(113) Scour Critical :	5

Unrepaired Spalls : 0 m sq
Deck Surfacing Depth : 0.00 in

Inspection Hours

Crew Hours for inspection :	1.5	Snooper Required :	N
Helper Hours :	-1	Snooper Hours for inspection :	-1
Special Crew Hours :	-1	Flagger Hours :	-1
Special Equipment Hours :	-1		

Inspection Work Candidates

Candidate ID	Date Requested	Status	Priority	Effected Structure Unit	Scope of Work	Action	Covered Condition States

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020012+05321
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	476	sq.m.	X	100	0	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

01/20/2010 - 2008 Sandblasted and sealed deck. UCFD

Inspection Notes:

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 109 - P/S Conc Open Girder										
	1	1	222	m.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

01/20/2010 - 6 T beams. UCFD
01/14/2008 - None OSBZ
01/24/2005 - None CSHI
12/26/2000 - None OLHQ
10/02/1996 - None UOJA
01/01/1993 - None REFI

Inspection Notes:

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 205 - R/Conc Column										
	1	2	2	ea.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

01/20/2010 - None UCFD
01/14/2008 - None OSBZ
01/24/2005 - None CSHI
12/26/2000 - None OLHQ
10/02/1996 - None UOJA
01/01/1993 - None REFI

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020012+05321
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 215 - R/Conc Abutment										
	1	2	31	m.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

01/20/2010 - None UGFD
01/14/2008 - None OSBZ
01/24/2005 - None CSHI
12/26/2000 - None OLHQ
10/02/1996 - None UOJA
01/01/1993 - None REFI

Inspection Notes:

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 234 - R/Conc Cap										
	1	1	12	m.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

01/20/2010 - None UGFD
01/14/2008 - None OSBZ
01/24/2005 - None CSHI
12/26/2000 - None OLHQ
10/02/1996 - None UOJA
01/01/1993 - None REFI

Inspection Notes:

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										
	1	1	12	ea.		100	0	0		
						%	%	%	%	%

Previous Inspection Notes :

01/20/2010 - Quantity does not include bearings buried in backwalls 0 6 6 0 = 12. UGFD
01/14/2008 - None OSBZ
01/24/2005 - Same as previously reported. CSHI
12/26/2000 - Dirt is on both outside bearing devices at both abutments. OLHQ
10/02/1996 - None UOJA
01/01/1993 - None REFI

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020012+05321
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 334 - Metal Rail Coated										
	1	2	74	m.		95	5	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

01/20/2010 - Thrie beam posts have some freckled rust. UGFD
01/14/2008 - None. (37.19 X 2 = 74.38) OSBZ
01/24/2005 - Same as previously reported. CSHI
12/26/2000 - Concrete spalling at lt outside curb at abut 3 near wingwall. OLHQ
10/02/1996 - None UOJA
01/01/1993 - None REFI

Inspection Notes:

General Inspection Notes

01/20/2010 - None UGFD
01/14/2008 - New end sections 2007. OSBZ
01/24/2005 - Same as previously reported. CSHI
12/26/2000 - The approach sectoin has numerous cracking in asphault. Bridge is in slight vertical. OLHQ
10/02/1996 - Sufficiency Rating Calculation Accepted by ops$a0241 at 8/15/97 14:22:20 UOJA
OPS$A0241 inspection comments -
Structure P00020012+05321 -
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 14:59:03

01/01/1993 - Sufficiency Rating Calculation Accepted by ops$u5963 at 3/10/97 11:34:37 REFI
Sufficiency Rating Calculation Accepted by ops$u9004 at 2/19/97 14:59:03

01/01/1991 - Updated with tape 1992 NB92
02/01/1989 - Updated with tape 1991 NB91
01/01/1987 - Updated with tape 1988 NB88
01/01/1985 - Updated with tape 1986 NB86
01/01/1983 - Updated with tape 1984 NB84
12/01/1980 - Updated with tape 1983 NB83
12/01/1978 - Updated with tape 1980 NB80

INITIAL ASSESSMENT FORM FOR STRUCTURE : P00020015+04781

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

General Location Data

District Code, Number, Location : **04 Dist 4 GLENDIVE**
County Code, Location : **021 DAWSON**
Kind fo Hwy Code, Description : **3 3 State Hwy**
Str Owner Code, Description : **1 State Highway Agency**
Intersecting Feature : **THIRTEEN MILE CREEK**

Division Code, Location : **43 MILES CITY**
City Code, Location : **00000 RURAL AREA**
Signed Route Number : **00016**
Maintained by Code, Description : **1 State Highway Agency**
Kilometer Post, Mile Post : **24.90 km 15.47**

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

Latitude : **47°16'60"**
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**

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 : **10**
Material Type Code, Description : **4 Steel continuous**
Span Design Code, Description : **2 Stringer/Multi-beam or Girder**

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 : **1 Monolithic concrete (concurrently placed with struct**
Deck Protection Type : **0 None**
Deck Membrain Type : **0 None**

(52) Out-to-Out Width : **13.01 m**
(50A) Curb Width : **0.00 m**
(50B) Curb Width : **0.00 m**
Skew Angle : °

Structure Vertical and Horizontal Clearance Data Inventory Route :

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

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020015+04781
Continue

Inspection Data

Sufficiency Rating : **90.8**
Health Index : **94**
Structure Status :**Not Deficient**

Inspection Due Date : 12 January 2013
(91) Inspection Fequency (months) : **24**

NBI Inspection Data

(90) Date of Last Inspection : 12 January 2011
(90) Inspection Date :
Last Inspected By : Troy Hafele - 2056
Inspected By :

(58) Deck Rating :	6	(68) Deck Geometry :	6	(36C) Approach Rail Rating :	1	(62) Culvert Rating :	N
(59) Superstructure Rating :	7	(67) Structure Rating :	7	(36A) Bridge Rail Rating :	1	(61) Channel Rating :	7
(60) Substructure Rating :	7	(69) Under Clearance :	N	(36B) Transition Rating :	1	(71) Waterway Adequacy :	6
(72) App Rdwy Align :	8	(41) Posting Status :	A	(36D) End Rail Rating :	1	(113) Scour Critical :	5

Unrepaired Spalls : 0 m sq
Deck Surfacing Depth : 7.50 in

Inspection Hours

Crew Hours for inspection :	1.5	Snooper Required :	N
Helper Hours :	-1	Snooper Hours for inspection :	-1
Special Crew Hours :	-1	Flagger Hours :	-1
Special Equipment Hours :	-1		

Inspection Work Candidates

Candidate ID	Date Requested	Status	Priority	Effected Structure Unit	Scope of Work	Action	Covered Condition States
D41-FY2007-000025	23 January 2007	Approved	Low	All Spans	Bridge	Spot Paint (flex)	

Repair rust area on pile.

Spot painting. Approved. DRC

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020015+04781

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	1316	sq.m.	X	0	100	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

01/12/2011 - Span 1 has random map cracking. Spalls have been epoxy patched(Span 10 photo). TH NTBZ

01/05/2009 - None IKBZ

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) XUBN

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. CZHK

12/30/2002 - Same as last insp. WPCZ

12/26/2000 - None OLIA

12/04/1998 - Transverse cracking on deck over bent #3. Spalled fillet lt bay at bent #8. GAHA

10/02/1996 - None URUK

10/01/1994 - None REFI

08/09/1973 - None EIBD

Inspection Notes:

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 107 - Paint Stl Opn Girder 5 - 10 1/2w x 29 3/4h inch I beams per span										
	1	1	506	m.		100	0	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

01/12/2011 - None NTBZ

01/05/2009 - None IKBZ

01/17/2007 - None XUBN

01/24/2005 - None CZHK

12/30/2002 - None WPCZ

12/26/2000 - None OLIA

12/04/1998 - None GAHA

10/02/1996 - None URUK

10/01/1994 - None REFI

08/09/1973 - None EIBD

Inspection Notes:

********** 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 181 - Pnt Vrt X-Frame										
	1	1	231	m.		100	0	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

01/12/2011 - None NTBZ
01/05/2009 - None IKBZ
01/17/2007 - Obtain quantity this element. XUBN
01/24/2005 - None CZHK
12/30/2002 - None WPCZ
12/26/2000 - _ OLIA

Inspection Notes:

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 202 - Paint Stl Column										
	1	3	45	ea.		85	5	5	5	0
						%	%	%	%	%

Previous Inspection Notes :

01/12/2011 - Bottoms of most H piling have some peeling paint with surface rust, numerous other misc spots also have surface rust. Some of these areas have scaling rust. See element 220 for exposed footings(photo Bent 10). TH NTBZ
01/05/2009 - None IKBZ
01/17/2007 - Area with exposed steel have section loss and pitting. photo(Bent 4 2nd from right TH 1-13-10). XUBN
01/24/2005 - Same as previusly reported. CZHK
12/30/2002 - Piling in same condition. WPCZ
12/26/2000 - Paint is still peeling and light rust occurring. OLIA
12/04/1998 - Paint coming off from piling at bottoms at bents 7,8,9 and 10. GAHA
10/02/1996 - None URUK
10/01/1994 - None REFI
08/09/1973 - None EIBD

Inspection Notes:

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	2	30	m.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

01/12/2011 - Abut 1 and 11(photo) both have riprap. TH NTBZ
01/05/2009 - None IKBZ
01/17/2007 - None XUBN
01/24/2005 - Same as previously reported. CZHK
12/30/2002 - Same as last report. WPCZ
12/26/2000 - Same comments as last insp. OLIA
12/04/1998 - Light spalling around bearings and light crack by 2nd from rt beam at abut. #11. GAHA
10/02/1996 - None URUK
10/01/1994 - None REFI
08/09/1973 - None EIBD

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020015+04781
Continue

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

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										
	1	2	22	ea.		90	10	0	0	
						%	%	%	%	%

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 NTBZ
01/05/2009 - None IKBZ
01/17/2007 - None XUBN
01/24/2005 - Same as previously reported. CZHK
12/30/2002 - Same as last insp. WPCZ
12/26/2000 - The second from lt has vertical cracking. Spall in footing 2nd from rt at bent 10 also. OLIA
12/04/1998 - Spall in footing 2nd from rt at bent #10. GAHA
10/02/1996 - None URUK
10/01/1994 - None REFI
08/09/1973 - None EIBD

Inspection Notes:

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 234 - R/Conc Cap Bents 2 - 10										
	1	1	108	m.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

01/12/2011 - Bents 4(photo) and 8(2009 photo) caps are water stained. TH NTBZ
01/05/2009 - None IKBZ
01/17/2007 - None XUBN
01/24/2005 - Same as previously reported. CZHK
12/30/2002 - Caps have not changed. WPCZ
12/26/2000 - Same as last insp. OLIA
12/04/1998 - Vertical cracking in caps at bents 7,8 and 9. GAHA
10/02/1996 - None URUK
10/01/1994 - None REFI
08/09/1973 - None EIBD

Inspection Notes:

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

Element Description

Element 305 - Assm Jt w/o Seal Bent 4 and 8

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	2	26	m.		100	0	0		
						%	%	%	%	%

Previous Inspection Notes :

01/12/2011 - Bent 4(photo). TH NTBZ
01/05/2009 - None IKBZ
01/17/2007 - Bent 4 joint width even across deck .057mm. Bent 8 joint .012mm wider at LT fog line, .045mm RT and .057mm LT. XUBN
01/24/2005 - None CZHK
12/30/2002 - None WPCZ
12/26/2000 - None OLIA
12/04/1998 - None GAHA
10/02/1996 - None URUK
10/01/1994 - None REFI
08/09/1973 - None EIBD

Inspection Notes:

Element 311 - Moveable Bearing Bent 4 Span 3=5, Span 4=5 and Bent 8 Span 7=5, Span 8=5

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	1	20	ea.		100	0	0		
						%	%	%	%	%

Previous Inspection Notes :

01/12/2011 - None NTBZ
01/05/2009 - None IKBZ

Inspection Notes:

Element 313 - Fixed Bearing Bent 2=5, Bent 3=5, Bent 5=5, Bent 6=5, Bent 7=5, Bent 9=5, Bent 10=5

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	1	35	ea.		100	0	0		
						%	%	%	%	%

Previous Inspection Notes :

01/12/2011 - Bearings at Abut 1 and 11 are buried in the backwalls and are not included in quantity. TH NTBZ
01/05/2009 - None IKBZ
01/17/2007 - None XUBN
01/24/2005 - None CZHK
12/30/2002 - None WPCZ
12/26/2000 - None OLIA
12/04/1998 - None GAHA
10/02/1996 - None URUK
10/01/1994 - None REFI
08/09/1973 - None EIBD

Inspection Notes:

********** 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 334 - Metal Rail Coated painted 5 inch box beam and I beam posts with 16w x 12h concrete curb										
	1	2	202	m.		75	20	5	0	0
						%	%	%	%	%

Previous Inspection Notes :

01/12/2011 - rail has some primer showing and scrape marks with surface rust. Posts have some freckled rust. Rail is 3" from face of curb. TH	NTBZ
01/05/2009 - None	IKBZ
01/17/2007 - None. (101.19 X 2 = 202.38)	XUBN
01/24/2005 - Same as previously reported.	CZHK
12/30/2002 - Same as last insp.	WPCZ
12/26/2000 - Same as last insp.	OLIA
12/04/1998 - Paint comming off with light rust occurring.	OAHA
10/02/1996 - None	URUK
10/01/1994 - None	REFI
08/09/1973 - None	EIBD

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

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 NTBZ

01/05/2009 - None IKBZ

01/17/2007 - None XUBN

01/24/2005 - None CZHK

12/30/2002 - None WPCZ

12/26/2000 - None OLIA

12/04/1998 - Bridge is at bottom of vertical curve. GAHA

10/02/1996 - Sufficiency Rating Calculation Accepted by ops$u5963 at 11/17/97 13:05:37 URUK
OPS$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$u5963 at 3/10/97 11:34:37 REFI
Sufficiency Rating Calculation Accepted by ops$u9004 at 2/19/97 14:59:04

01/01/1993 - Updated with tape 1994 NB94

01/01/1991 - Updated with tape 1992 NB92

10/01/1988 - Updated with tape 1991 NB91

01/01/1987 - Updated with tape 1988 NB88

01/01/1985 - Updated with tape 1986 NB86

01/01/1983 - Updated with tape 1984 NB84

12/01/1980 - Updated with tape 1983 NB83

12/01/1978 - Updated with tape 1980 NB80

08/09/1973 - Sufficiency Rating Calculation Accepted by ops$a0241 at 8/15/97 14:24:54 EIBD
OPS$A0241 inspection comments -
Structure P00020015+04781 -
Date 8/9/73 -
Previous comments > Sufficiency Rating Calculation Accepted by ops$u5963 at 3/10/97 11:34:37
Sufficiency Rating Calculation Accepted by ops$u9004 at 2/19/97 14:59:04

INITIAL ASSESSMENT FORM FOR STRUCTURE :

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 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 : BURNS CREEK

Kilometer Post, Mile Post : 40.33 km 25.06

Structure on the State Highway System : X

Structure on the National Highway System : X

Str Meet or Exceed NBIS Bridge Length : X

Latitude : 47°22'24"

Longitude : 104°25'33"

Construction Data

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

Construction Station Number : 108+27.00

Construction Drawing Number : 20707

Construction Year : 2010

Reconstruction Year :

Traffic Data

Current ADT : 1,830 ADT Count Year : 2009 Percent Trucks : 3 %

Structure Loading, Rating and Posting Data

Loading Data :

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	

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 : 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 : 3

Material Type Code, Description : 5 Prestressed concrete

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

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 : 1 Monolithic concrete (concurrently placed with struct

Deck Protection Type : 1 Epoxy Coated Reinforcing

Deck Membrain Type : 0 None

(52) Out-to-Out Width : 13.00 m

(50A) Curb Width : 0.00 m

(50B) Curb Width : 0.00 m

Skew Angle : 8°

Structure Vertical and Horizontal Clearance Data Inventory Route :

Over / Under Direction Name	Inventory Route	South, West or Bi-directional Travel			North or East Travel		
		Direction	Vertical	Horizontal	Direction	Vertical	Horizontal
Route On Structure	P00020	Both	99.99 m	12.00 m	N/A		

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020025+00631

Continue

Inspection Data

Sufficiency Rating : **89.9**
Health Index : **100**
Structure Status :**Not Deficient**

Inspection Due Date : 12 January 2013
(91) Inspection Fequency (months) : **24**

NBI Inspection Data

(90) Date of Last Inspection :	24 August 2011	Last Inspected By :	Troy Hafele - 2056
(90) Inspection Date :		Inspected By :	

(58) Deck Rating :	7		(68) Deck Geometry :	6		(36C) Approach Rail Rating :	1		(62) Culvert Rating :	N	
(59) Superstructure Rating :	8		(67) Structure Rating :	7		(36A) Bridge Rail Rating :	1		(61) Channel Rating :	7	
(60) Substructure Rating :	7		(69) Under Clearance :	N		(36B) Transition Rating :	1		(71) Waterway Adequacy :	6	
(72) App Rdwy Align :	8		(41) Posting Status :	A		(36D) End Rail Rating :	1		(113) Scour Critical :	8	

Unrepaired Spalls : 0 m sq

Deck Surfacing Depth : 0.00 in

Inspection Hours

Crew Hours for inspection :	2		Snooper Required :	N	
Helper Hours :	-1		Snooper Hours for inspection :	-1	
Special Crew Hours :	-1		Flagger Hours :	-1	
Special Equipment Hours :	-1				

Inspection Work Candidates		Status	Priority	Effected Structure Unit	Scope of Work	Action	Covered Condition States
Candidate ID	Date Requested						

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020025+00631
Continue

Element Inspection Data

********** Span : Main-0 - Spans 1 - 3 **********

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 26 - Conc Deck/Coatd Bars , epoxy (13.0m x 59.61m = 774.93m, plan paving notch)										
	1	2	775	sq.m.	X	100	0	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

08/24/2011 - Abut 1 right corner has 1 diagonal crack. Cracking over Bents 2 and 3, upto 1.25mm in width. Abut 4 has several diagonal cracks and 1 longitudinal crack (photo). Decks ride is wavy. TH YZDY
01/05/2011 - waiting to pour deck. TH KZMZ

Inspection Notes:

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 109 - P/S Conc Open Girder , 5 Type A I beams per span (plan = 292.5m)										
	1	2	293	m.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

08/24/2011 - None YZDY
01/05/2011 - (photo of Span 1 and 2 with no deck). TH KZMZ

Inspection Notes:

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 202 - Paint Stl Column Bents 2=5 and 3=5, 508mm Diameter x 12.7mm wall thickness painted steel pile filled with concrete										
	1	2	10	ea.		100	0	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

08/24/2011 - (photo Bent 2). TH YZDY

CHANGED FROM ELEMENT 205 SINCE THESE ARE STEEL - NMS

Inspection Notes:

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 / SSW and 4 / NNE (15.7m x 2 = 31.4m ,plan)										
	1	1	31	m.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

08/24/2011 - both Abut 1 (photo) and 4 (photo) have riprapped slopes. Contractor is placing gravel and topsoil over riprap. TH YZDY
01/05/2011 - Abut 4 under construction (photo). TH KZMZ

Inspection Notes:

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 234 - R/Conc Cap Bents 2 and 3 (12.3m x 2 = 24.6m)										
	1	1	25	m.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

08/24/2011 - (photo Bent 2). TH YZDY

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020025+00631

Continue

********** 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	1	20	ea.		100	0	0		
						%	%	%	%	%

Previous Inspection Notes :

08/24/2011 - Bearings at Abut 1 and 4 are buried in the backwalls and are not included in quantity. TH YZDY

01/05/2011 - Bearings at Abut 1 and 4 are buried in the backwalls and are not included in quantity. TH KZMZ

Inspection Notes:

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 334 - Metal Rail Coated , galvanized W830, double box beam rail with H posts on top of .5m x .15m concrete curb										
	1	2	120	m.		100	0	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

08/24/2011 - (plan = 120.1m). TH YZDY

01/05/2011 - can't install until after deck is poured. TH KZMZ

Inspection Notes:

General Inspection Notes

08/24/2011 - 11' underclearance to water. TH YZDY

01/05/2011 - Opened to traffic on 4-14-11 but not paved until 7-1-11. TH 7-14-11 KZMZ

INITIAL ASSESSMENT FORM FOR STRUCTURE : P00020031+02501

Location : 1M S SAVAGE Structure Name: none

General Location Data

District Code, Number, Location : 04 Dist 4 GLENDIVE
County Code, Location : 083 RICHLAND
Kind fo Hwy Code, Description : 3 3 State Hwy
Str Owner Code, Description : 1 State Highway Agency
Intersecting Feature : GARDEN COULEE /STOCKPASS
Structure on the State Highway System : X Latitude : 47°26'44"
Structure on the National Highway System : X Longitude : 104°21'10"
Str Meet or Exceed NBIS Bridge Length : X

Division Code, Location :43 MILES CITY
City Code, Location :00000 RURAL AREA
Signed Route Number :00016
Maintained by Code, Description :1 State Highway Agency
Kilometer Post, Mile Post : 50.32 km 31.27

Traffic Data

Current ADT : 1,830 ADT Count Year : 2009 Percent Trucks : 3 %

Construction Data

Construction Project Number :
Construction Station Number : 0+00.00
Construction Drawing Number : none
Construction Year : 1975
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 : 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)

Approach Span

Number of Spans : 0
Material Type Code, Description :
Span Design Code, Description :

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

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

Structure Vertical and Horizontal Clearance Data Inventory Route :

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

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020031+02501
Continue

Inspection Data

Sufficiency Rating : **89.9**
Health Index : **90**
Structure Status :**Not Deficient**

Inspection Due Date : 05 January 2013
(91) Inspection Fequency (months) : **24**

NBI Inspection Data

(90) Date of Last Inspection : 05 January 2011
(90) Inspection Date :
Last Inspected By : Troy Hafele - 2056
Inspected By :

(58) Deck Rating : N
(59) Superstructure Rating : N
(60) Substructure Rating : N
(72) App Rdwy Align : 8

(68) Deck Geometry : 6
(67) Structure Rating : 6
(69) Under Clearance : N
(41) Posting Status : A

(36C) Approach Rail Rating : N
(36A) Bridge Rail Rating : N
(36B) Transition Rating : N
(36D) End Rail Rating : N

(62) Culvert Rating : 6
(61) Channel Rating : 8
(71) Waterway Adequacy : 6
(113) Scour Critical : 8

Unrepaired Spalls : 0 m sq
Deck Surfacing Depth : 0.00 in

Inspection Hours

Crew Hours for inspection : 1
Helper Hours : -1
Special Crew Hours : -1
Special Equipment Hours : -1

Snooper Required : N
Snooper Hours for inspection : -1
Flagger Hours : -1

Inspection Work Candidates		Status	Priority	Effected Structure Unit	Scope of Work	Action	Covered Condition States
Candidate ID	Date Requested						

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 240 - Steel Culvert , DBL CMP galvanized 10 ft x 123.5 ft										
	1	2	75	m.		70	30	0	0	
						%	%	%	%	%

Previous Inspection Notes :

01/05/2011 - South pipe has rust 1' up(photo) looking SE downstream at 40' from inlet. North pipe has 6" of sediment(photo). Both inlet and outlet ends have concrete slope protection. Changed from 70,10,20 to 70,30 percent. TH KJLZ
12/29/2008 - None ZZBC
01/17/2007 - The south pipe has rust with /- 1/16 of an inch section loss on the invert. XWCF
01/24/2005 - Same as previously reported. ZXDZ
01/24/2003 - Same as last report. HIMZ
12/26/2000 - Heavey rusting occurring at bottom of south pipe, galvanizing coating is gone. OLIP
12/04/1998 - Light rust on bottoms of both culverts. GAIV
10/02/1996 - _ HNWC

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020031+02501

Continue

General Inspection Notes

01/05/2011 - None KJLZ

12/29/2008 - None ZZBC

01/17/2007 - None XWCF

01/24/2005 - None ZXDZ

01/24/2003 - None HIMZ

12/26/2000 - None OLIP

12/04/1998 - None GAIV

10/02/1996 - Sufficiency Rating Calculation Accepted by ops$a0241 at 8/15/97 14:28:21 HNWC
OPS$A0241 inspection comments -
Structure P00020031+02501 -
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 14:59:05

10/01/1994 - Sufficiency Rating Calculation Accepted by ops$u5963 at 3/10/97 11:34:37 REFI
Sufficiency Rating Calculation Accepted by ops$u9004 at 2/19/97 14:59:05

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

01/01/1985 - Updated with tape 1986 NB86

01/01/1983 - Updated with tape 1984 NB84

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020032+01071

Location : SAVAGE Structure Name: none

General Location Data

District Code, Number, Location : **04 Dist 4 GLENDIVE**

County Code, Location : **083 RICHLAND**

Kind fo Hwy Code, Description : **3 3 State Hwy**

Str Owner Code, Description : **1 State Highway Agency**

Intersecting Feature : **USBR MAIN CANAL**

Division Code, Location :**43 MILES CITY**

City Code, Location :**00000 RURAL AREA**

Signed Route Number :**00016**

Maintained by Code, Description :**1 State Highway Agency**

Kilometer Post, Mile Post : **51.66 km 32.10**

Structure on the State Highway System : X

Structure on the National Highway System : X

Str Meet or Exceed NBIS Bridge Length : X

Latitude : **47°27'26"**

Longitude : **104°20'36"**

Construction Data

Construction Project Number : **F RF-245(26)**

Construction Station Number : **175+52.00**

Construction Drawing Number : **10466**

Construction Year : **1974**

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 :	**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 : **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 : **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 : **0.00 m**

(50B) Curb Width : **0.00 m**

Skew Angle : **30°**

Structure Vertical and Horizontal Clearance Data Inventory Route :

Over / Under Direction Name	Inventory Route	South, West or Bi-directional Travel			North or East Travel		
		Direction	Vertical	Horizontal	Direction	Vertical	Horizontal
Route On Structure	P00020	Both	99.99 m	13.26 m	N/A		

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020032+01071
Continue

Inspection Data

Sufficiency Rating : **87.8**
Health Index : **91.81**
Structure Status :**Not Deficient**

Inspection Due Date : 29 December 2012
(91) Inspection Fequency (months) : **48**

NBI Inspection Data

(90) Date of Last Inspection :	29 December 2008	Last Inspected By :	Greg Int-Hout - 2050
(90) Inspection Date :		Inspected By :	

(58) Deck Rating :	6	(68) Deck Geometry :	6	(36C) Approach Rail Rating :	1	(62) Culvert Rating :	N
(59) Superstructure Rating :	7	(67) Structure Rating :	7	(36A) Bridge Rail Rating :	1	(61) Channel Rating :	8
(60) Substructure Rating :	7	(69) Under Clearance :	N	(36B) Transition Rating :	1	(71) Waterway Adequacy :	8
(72) App Rdwy Align :	6	(41) Posting Status :	A	(36D) End Rail Rating :	1	(113) Scour Critical :	8

Unrepaired Spalls : 0 m sq

Deck Surfacing Depth : 0.00 in

Inspection Hours

Crew Hours for inspection :	1	Snooper Required :	N
Helper Hours :	-1	Snooper Hours for inspection :	-1
Special Crew Hours :	-1	Flagger Hours :	-1
Special Equipment Hours :	-1		

Inspection Work Candidates		Status	Priority	Effected Structure Unit	Scope of Work	Action	Covered Condition States
Candidate ID	Date Requested						

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	0	100	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

12/29/2008 - Total spalls less than 2pct. (28.96 X 14.14 = 409.494) ZZBF
01/24/2005 - Same as previously reported. ZJDZ
12/26/2000 - Large spalls in south bound lane and some others in north bound lanes. This was caused by fire. OLIR
10/02/1996 - None VSOU
01/01/1993 - None REFI

Inspection Notes:

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 109 - P/S Conc Open Girder										
	1	3	174	m.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/29/2008 - None ZZBF
01/24/2005 - Same as previously reported. ZJDZ
12/26/2000 - Large spalled area at lower flange of rt outside beam. OLIR
10/02/1996 - None VSOU
01/01/1993 - None REFI

Inspection Notes:

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	2	35	m.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/29/2008 - None ZZBF
01/24/2005 - None ZJDZ
12/26/2000 - None OLIR
10/02/1996 - None VSOU
01/01/1993 - None REFI

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020032+01071

Continue

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

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 334 - Metal Rail Coated										
	1	3	58	m.		80	20	0	0	0
						%	%	%	%	%

Element Description

Previous Inspection Notes :

12/29/2008 - Minor rust and peeling paint. (28.96 X 2 = 57.92) ZZBF
01/24/2005 - Same as previously reported. ZJDZ
12/26/2000 - Paint is gone and light coating of rust occurring. OLIR
10/02/1996 - None VSOU
01/01/1993 - None REFI

Inspection Notes:

General Inspection Notes

12/29/2008 - None ZZBF
01/24/2005 - None ZJDZ
12/26/2000 - None OLIR
10/02/1996 - Sufficiency Rating Calculation Accepted by ops$a0241 at 8/15/97 14:29:52 VSOU
OPS$A0241 inspection comments -
Structure P00020032+01071 -
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 14:59:06

01/01/1993 - Sufficiency Rating Calculation Accepted by ops$u5963 at 3/10/97 11:34:37 REFI
Sufficiency Rating Calculation Accepted by ops$u9004 at 2/19/97 14:59:06

01/01/1991 - Updated with tape 1992 NB92
02/01/1989 - Updated with tape 1991 NB91
01/01/1987 - Updated with tape 1988 NB88
01/01/1985 - Updated with tape 1986 NB86
01/01/1983 - Updated with tape 1984 NB84
12/01/1980 - Updated with tape 1983 NB83
12/01/1978 - Updated with tape 1980 NB80

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :
P00020032+03991

Location : 1M N SAVAGE Structure Name: none

General Location Data

District Code, Number, Location : 04 Dist 4 GLENDIVE
County Code, Location : 083 RICHLAND
Kind fo Hwy Code, Description : 3 3 State Hwy
Str Owner Code, Description : 1 State Highway Agency
Intersecting Feature : DUNLAP CREEK
Structure on the State Highway System : X
Structure on the National Highway System : X
Str Meet or Exceed NBIS Bridge Length : X
Latitude : 47°27'41"
Longitude : 104°20'34"

Division Code, Location : 42 WOLF POINT
City Code, Location : 00000 RURAL AREA
Signed Route Number : 00016
Maintained by Code, Description : 1 State Highway Agency
Kilometer Post, Mile Post : 52.13 km 32.39

Construction Data

Construction Project Number : F RF-245(26)
Construction Station Number : 190+60.00
Construction Drawing Number : 10470
Construction Year : 1974
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 :	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
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 : 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 : 0.00 m
(50B) Curb Width : 0.00 m
Skew Angle : °

Structure Vertical and Horizontal Clearance Data Inventory Route :

Over / Under Direction Name	Inventory Route	South, West or Bi-directional Travel			North or East Travel		
		Direction	Vertical	Horizontal	Direction	Vertical	Horizontal
Route On Structure	P00020	Both	99.99 m	13.26 m	N/A		

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020032+03991
Continue

Inspection Data

Sufficiency Rating : **87.8**
Health Index : **98.16**
Structure Status :**Not Deficient**

Inspection Due Date : 29 December 2012
(91) Inspection Fequency (months) : **48**

NBI Inspection Data

(90) Date of Last Inspection : 29 December 2008

Last Inspected By : Greg Int-Hout - 2050

(90) Inspection Date :

Inspected By :

(58) Deck Rating : 7
(59) Superstructure Rating : 8
(60) Substructure Rating : 7
(72) App Rdwy Align : 8

(68) Deck Geometry : 6
(67) Structure Rating : 7
(69) Under Clearance : N
(41) Posting Status : A

(36C) Approach Rail Rating : 1
(36A) Bridge Rail Rating : 1
(36B) Transition Rating : 1
(36D) End Rail Rating : 1

(62) Culvert Rating : N
(61) Channel Rating : 8
(71) Waterway Adequacy : 8
(113) Scour Critical : 5

Unrepaired Spalls : 0 m sq

Deck Surfacing Depth : 0.00 in

Inspection Hours

Crew Hours for inspection : 1
Helper Hours : -1
Special Crew Hours : -1
Special Equipment Hours : -1

Snooper Required : N
Snooper Hours for inspection : -1
Flagger Hours : -1

Inspection Work Candidates		Status	Priority	Effected Structure Unit	Scope of Work	Action	Covered Condition States
Candidate ID	Date Requested						

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020032+03991

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

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	2	526	sq.m.	X	100	0	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

12/29/2008 - None. (37.19 X 14.14 = 525.867) ZZBK
01/24/2005 - Same as previously reported. ZNDZ
12/26/2000 - Light mapcracking to deck. OLJA
10/02/1996 - None IRBF
01/01/1993 - None REFI

Inspection Notes:

Element 109 - P/S Conc Open Girder

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	3	224	m.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/29/2008 - None ZZBK
01/24/2005 - None ZNDZ
12/26/2000 - None OLJA
10/02/1996 - None IRBF
01/01/1993 - None REFI

Inspection Notes:

Element 202 - Paint Stl Column

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	2	12	ea.		80	20	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

12/29/2008 - Lose of paint at water line, minor rust. ZZBK
01/24/2005 - same as previously reported. ZNDZ
12/26/2000 - Paint scalling from all piling. OLJA
10/02/1996 - None IRBF
01/01/1993 - None REFI

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020032+03991

Continue

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

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	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/29/2008 - Minor spalls.	ZZBK
01/24/2005 - None	ZNDZ
12/26/2000 - None	OLJA
10/02/1996 - None	IRBF
01/01/1993 - None	REFI

Inspection Notes:

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										
	1	2	12	ea.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/29/2008 - None	ZZBK
01/24/2005 - None	ZNDZ
12/26/2000 - _	OLJA

Inspection Notes:

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 234 - R/Conc Cap										
	1	1	28	m.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/29/2008 - None	ZZBK
01/24/2005 - None	ZNDZ
12/26/2000 - None	OLJA
10/02/1996 - None	IRBF
01/01/1993 - None	REFI

Inspection Notes:

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 302 - Compressn Joint Seal										
	1	2	28	m.		0	100	0		
						%	%	%	%	%

Previous Inspection Notes :

12/29/2008 - None	ZZBK
01/24/2005 - same as previously reported.	ZNDZ
12/26/2000 - Seal material tearing and leaking at both joints, snow plow damage to south joint on the lt lane. (see photo)	OLJA
10/02/1996 - None	IRBF
01/01/1993 - None	REFI

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020032+03991
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 313 - Fixed Bearing

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	1	24	ea.		100	0	0		
						%	%	%	%	%

Previous Inspection Notes :

12/29/2008 - None ZZBK
01/24/2005 - None ZNDZ
12/26/2000 - None OLJA
10/02/1996 - None IRBF
01/01/1993 - None REFI

Inspection Notes:

Element 321 - R/Conc Approach Slab

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	2	1	ea.		0	100	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/29/2008 - None ZZBK
01/24/2005 - same as previously reported. ZNDZ
12/26/2000 - Both appr. slabs has deep longitutional cracks. South slab is heaving up in winter time 2" from freezing weather. OLJA
10/02/1996 - None IRBF
01/01/1993 - None REFI

Inspection Notes:

Element 334 - Metal Rail Coated

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	3	75	m.		100	0	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

12/29/2008 - None ZZBK
01/24/2005 - None ZNDZ
12/26/2000 - None OLJA
10/02/1996 - None IRBF
01/01/1993 - None REFI

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020032+03991
Continue

General Inspection Notes

12/29/2008 - None	ZZBK
01/24/2005 - None	ZNDZ
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$u5963 at 3/10/97 11:34:38 Sufficiency Rating Calculation Accepted by ops$u9004 at 2/19/97 14:59:06	IRBF
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	REFI
01/01/1991 - Updated with tape 1992	NB92
02/01/1989 - Updated with tape 1991	NB91
01/01/1987 - Updated with tape 1988	NB88
01/01/1985 - Updated with tape 1986	NB86
01/01/1983 - Updated with tape 1984	NB84
12/01/1980 - Updated with tape 1983	NB83
12/01/1978 - Updated with tape 1980	NB80

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020032+03991

Location : 1M N SAVAGE Structure Name: none

General Location Data

District Code, Number, Location : **04 Dist 4 GLENDIVE**
County Code, Location : **083 RICHLAND**
Kind fo Hwy Code, Description : **3 3 State Hwy**
Str Owner Code, Description : **1 State Highway Agency**
Intersecting Feature : **DUNLAP CREEK**
Structure on the State Highway System : X
Structure on the National Highway System : X
Str Meet or Exceed NBIS Bridge Length : X
Latitude : **47°27'41"**
Longitude : **104°20'34"**

Division Code, Location : **42 WOLF POINT**
City Code, Location : **00000 RURAL AREA**
Signed Route Number : **00016**
Maintained by Code, Description : **1 State Highway Agency**
Kilometer Post, Mile Post : **52.13 km 32.39**

Construction Data

Construction Project Number : **F RF-245(26)**
Construction Station Number : **190+60.00**
Construction Drawing Number : **10470**
Construction Year : **1974**
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 :	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**
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 : **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 : **0.00 m**
(50B) Curb Width : **0.00 m**
Skew Angle : °

Structure Vertical and Horizontal Clearance Data Inventory Route :

Over / Under Direction Name	Inventory Route	South, West or Bi-directional Travel			North or East Travel		
		Direction	Vertical	Horizontal	Direction	Vertical	Horizontal
Route On Structure	P00020	Both	99.99 m	13.26 m	N/A		

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020032+03991
Continue

Inspection Data

Sufficiency Rating : **87.8**
Health Index : **98.16**
Structure Status :**Not Deficient**

Inspection Due Date : 29 December 2012
(91) Inspection Fequency (months) : **48**

NBI Inspection Data

(90) Date of Last Inspection : 29 December 2008
(90) Inspection Date :
Last Inspected By : Greg Int-Hout - 2050
Inspected By :

(58) Deck Rating :	7		(68) Deck Geometry :	6		(36C) Approach Rail Rating :	1		(62) Culvert Rating :	N	
(59) Superstructure Rating :	8		(67) Structure Rating :	7		(36A) Bridge Rail Rating :	1		(61) Channel Rating :	8	
(60) Substructure Rating :	7		(69) Under Clearance :	N		(36B) Transition Rating :	1		(71) Waterway Adequacy :	8	
(72) App Rdwy Align :	8		(41) Posting Status :	A		(36D) End Rail Rating :	1		(113) Scour Critical :	5	

Unrepaired Spalls : 0 m sq
Deck Surfacing Depth : 0.00 in

Inspection Hours

Crew Hours for inspection :	1	
Helper Hours :	-1	
Special Crew Hours :	-1	
Special Equipment Hours :	-1	

Snooper Required : N

Snooper Hours for inspection :	-1	
Flagger Hours :	-1	

Inspection Work Candidates		Status	Priority	Effected Structure Unit	Scope of Work	Action	Covered Condition States
Candidate ID	Date Requested						

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	526	sq.m.	X	100	0	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

12/29/2008 - None. (37.19 X 14.14 = 525.867) ZZBK
01/24/2005 - Same as previously reported. ZNDZ
12/26/2000 - Light mapcracking to deck. OLJA
10/02/1996 - None IRBF
01/01/1993 - None REFI

Inspection Notes:

Element 109 - P/S Conc Open Girder										
	1	3	224	m.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/29/2008 - None ZZBK
01/24/2005 - None ZNDZ
12/26/2000 - None OLJA
10/02/1996 - None IRBF
01/01/1993 - None REFI

Inspection Notes:

Element 202 - Paint Stl Column										
	1	2	12	ea.		80	20	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

12/29/2008 - Lose of paint at water line, minor rust. ZZBK
01/24/2005 - same as previously reported. ZNDZ
12/26/2000 - Paint scalling from all piling. OLJA
10/02/1996 - None IRBF
01/01/1993 - None REFI

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020032+03991

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 215 - R/Conc Abutment

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	3	33	m.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/29/2008 - Minor spalls. ZZBK
01/24/2005 - None ZNDZ
12/26/2000 - None OLJA
10/02/1996 - None IRBF
01/01/1993 - None REFI

Inspection Notes:

Element 220 - R/C Sub Pile Cap/Ftg

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	2	12	ea.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/29/2008 - None ZZBK
01/24/2005 - None ZNDZ
12/26/2000 - _ OLJA

Inspection Notes:

Element 234 - R/Conc Cap

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	1	28	m.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/29/2008 - None ZZBK
01/24/2005 - None ZNDZ
12/26/2000 - None OLJA
10/02/1996 - None IRBF
01/01/1993 - None REFI

Inspection Notes:

Element 302 - Compressn Joint Seal

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	2	28	m.		0	100	0		
						%	%	%	%	%

Previous Inspection Notes :

12/29/2008 - None ZZBK
01/24/2005 - same as previously reported. ZNDZ
12/26/2000 - Seal material tearing and leaking at both joints, snow plow damage to south joint on the lt lane. (see photo) OLJA
10/02/1996 - None IRBF
01/01/1993 - None REFI

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020032+03991

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 313 - Fixed Bearing

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	1	24	ea.		100	0	0		
						%	%	%	%	%

Previous Inspection Notes :

Date - Note	Inspector
12/29/2008 - None	ZZBK
01/24/2005 - None	ZNDZ
12/26/2000 - None	OLJA
10/02/1996 - None	IRBF
01/01/1993 - None	REFI

Inspection Notes:

Element 321 - R/Conc Approach Slab

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	2	1	ea.		0	100	0	0	
						%	%	%	%	%

Previous Inspection Notes :

Date - Note	Inspector
12/29/2008 - None	ZZBK
01/24/2005 - same as previously reported.	ZNDZ
12/26/2000 - Both appr. slabs has deep longitutional cracks. South slab is heaving up in winter time 2" from freezing weather.	OLJA
10/02/1996 - None	IRBF
01/01/1993 - None	REFI

Inspection Notes:

Element 334 - Metal Rail Coated

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	3	75	m.		100	0	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

Date - Note	Inspector
12/29/2008 - None	ZZBK
01/24/2005 - None	ZNDZ
12/26/2000 - None	OLJA
10/02/1996 - None	IRBF
01/01/1993 - None	REFI

Inspection Notes:

General Inspection Notes

12/29/2008 - None	ZZBK
01/24/2005 - None	ZNDZ
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$u5963 at 3/10/97 11:34:38 Sufficiency Rating Calculation Accepted by ops$u9004 at 2/19/97 14:59:06	IRBF
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	REFI
01/01/1991 - Updated with tape 1992	NB92
02/01/1989 - Updated with tape 1991	NB91
01/01/1987 - Updated with tape 1988	NB88
01/01/1985 - Updated with tape 1986	NB86
01/01/1983 - Updated with tape 1984	NB84
12/01/1980 - Updated with tape 1983	NB83
12/01/1978 - Updated with tape 1980	NB80

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020032+06521

Location : 1M N SAVAGE Structure Name: none

General Location Data

District Code, Number, Location : **04 Dist 4 GLENDIVE**
County Code, Location : **083 RICHLAND**
Kind fo Hwy Code, Description : **3 3 State Hwy**
Str Owner Code, Description : **1 State Highway Agency**
Intersecting Feature : **USBR MAIN CANAL**

Division Code, Location : **42 WOLF POINT**
City Code, Location : **00000 RURAL AREA**
Signed Route Number : **00016**
Maintained by Code, Description : **1 State Highway Agency**
Kilometer Post, Mile Post : **52.55 km 32.65**

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

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

Construction Data

Construction Project Number : **F RF-245(26)**
Construction Station Number : **204+09.00**
Construction Drawing Number : **10475**
Construction Year : **1974**
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 :	61.6 mton	A LFD Assigned
Posting :		5 At/Above Legal Loads

Rating Data :	Operating	Inventory	Posting
Truck 1 Type 3 :	67		
Truck 2 Type 3-S3 :	87		
Truck 3 Type 3-3 :	98		

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 : **14.63 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 : **1**
Material Type Code, Description : **5 Prestressed concrete**
Span Design Code, Description : **2 Stringer/Multi-beam or Girder**

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 : **1 Monolithic concrete (concurrently placed with struct**
Deck Protection Type : **0 None**
Deck Membrain Type : **0 None**

(52) Out-to-Out Width : **16.58 m**
(50A) Curb Width : **0.00 m**
(50B) Curb Width : **0.00 m**
Skew Angle : **12°**

Structure Vertical and Horizontal Clearance Data Inventory Route :

Over / Under Direction Name	Inventory Route	South, West or Bi-directional Travel			North or East Travel		
		Direction	Vertical	Horizontal	Direction	Vertical	Horizontal
Route On Structure	P00020	Both	99.99 m	15.70 m	N/A		

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020032+06521
Continue

Inspection Data

Sufficiency Rating : **85.8**
Health Index : **99.36**
Structure Status :**Not Deficient**

Inspection Due Date : 29 December 2012
(91) Inspection Fequency (months) : **48**

NBI Inspection Data

(90) Date of Last Inspection : 29 December 2008
Last Inspected By : Greg Int-Hout - 2050
(90) Inspection Date :
Inspected By :

(58) Deck Rating : 7
(59) Superstructure Rating : 8
(60) Substructure Rating : 7
(72) App Rdwy Align : 8

(68) Deck Geometry : 9
(67) Structure Rating : 7
(69) Under Clearance : N
(41) Posting Status : A

(36C) Approach Rail Rating : 0
(36A) Bridge Rail Rating : 1
(36B) Transition Rating : 0
(36D) End Rail Rating : 0

(62) Culvert Rating : N
(61) Channel Rating : 8
(71) Waterway Adequacy : 8
(113) Scour Critical : 8

Unrepaired Spalls : 0 m sq
Deck Surfacing Depth : 0.00 in

Inspection Hours

Crew Hours for inspection : 1
Helper Hours : -1
Special Crew Hours : -1
Special Equipment Hours : -1

Snooper Required : N
Snooper Hours for inspection : -1
Flagger Hours : -1

Inspection Work Candidates		Status	Priority	Effected Structure Unit	Scope of Work	Action	Covered Condition States
Candidate ID	Date Requested						

INITIAL ASSESSMENT FORM FOR STRUCTURE :

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	0
						%	%	%	%	%

Previous Inspection Notes :

12/29/2008 - None ZZBS
01/24/2005 - Same as previously reported. ZUDZ
12/26/2000 - Light surface cracking to deck. OLJV
10/02/1996 - None ZZXG
01/01/1993 - None REFI

Inspection Notes:

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 109 - P/S Conc Open Girder										
	1	3	183	m.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/29/2008 - None ZZBS
01/24/2005 - None ZUDZ
12/26/2000 - None OLJV
10/02/1996 - None ZZXG
01/01/1993 - None REFI

Inspection Notes:

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	2	38	m.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/29/2008 - None ZZBS
01/24/2005 - None ZUDZ
12/26/2000 - None OLJV
10/02/1996 - None ZZXG
01/01/1993 - None REFI

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020032+06521

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 313 - Fixed Bearing

Smart Flag	Scale Factor	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	0	0		
						%	%	%	%	%

Previous Inspection Notes :

12/29/2008 - None ZZBS
01/24/2005 - None ZUDZ
12/26/2000 - None OLJV
10/02/1996 - None ZZXG
01/01/1993 - None REFI

Inspection Notes:

Element 321 - R/Conc Approach Slab

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	2	1	ea.		0	100	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/29/2008 - Spall at guard angle. ZZBS
01/24/2005 - Same as previously reported. ZUDZ
12/26/2000 - Light mapcracking to surface. OLJV
10/02/1996 - None ZZXG
01/01/1993 - None REFI

Inspection Notes:

Element 334 - Metal Rail Coated

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	2	46	m.		80	20	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

12/29/2008 - None. (22.86 X 2 = 45.72) ZZBS
01/24/2005 - Same as previously reported. ZUDZ
12/26/2000 - Light rusted areas on rail. OLJV
10/02/1996 - None ZZXG
01/01/1993 - None REFI

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020032+06521

Continue

General Inspection Notes

12/29/2008 - None	ZZBS
01/24/2005 - None	ZUDZ
12/26/2000 - None	OLJV
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$u5963 at 3/10/97 11:34:38 Sufficiency Rating Calculation Accepted by ops$u9004 at 2/19/97 14:59:07	ZZXC
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	NB92
02/01/1989 - Updated with tape 1991	NB91
01/01/1987 - Updated with tape 1988	NB88
01/01/1985 - Updated with tape 1986	NB86
01/01/1983 - Updated with tape 1984	NB84
12/01/1980 - Updated with tape 1983	NB83
12/01/1978 - Updated with tape 1980	NB80

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

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

Kilometer Post, Mile Post : 60.37 km 37.51

Structure on the State Highway System : X

Latitude : 47°31'43"

Structure on the National Highway System : X

Longitude : 104°18'30"

Str Meet or Exceed NBIS Bridge Length : X

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 : 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 : 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 : 0.00 m

(50B) Curb Width : 0.00 m

Skew Angle : 38°

Structure Vertical and Horizontal Clearance Data Inventory Route :

Over / Under Direction Name	Inventory Route	South, West or Bi-directional Travel			North or East Travel		
		Direction	Vertical	Horizontal	Direction	Vertical	Horizontal
Route On Structure	P00020	Both	99.99 m	12.01 m	N/A		

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020037+05151
Continue

Inspection Data

Sufficiency Rating : **86.6**
Health Index : **98.83**
Structure Status :**Not Deficient**

Inspection Due Date : 05 January 2013
(91) Inspection Fequency (months) : **24**

NBI Inspection Data

(90) Date of Last Inspection : 05 January 2011
(90) Inspection Date :
Last Inspected By : Troy Hafele - 2056
Inspected By :

(58) Deck Rating : 7
(59) Superstructure Rating : 7
(60) Substructure Rating : 7
(72) App Rdwy Align : 8

(68) Deck Geometry : 5
(67) Structure Rating : 7
(69) Under Clearance : N
(41) Posting Status : A

(36C) Approach Rail Rating : 1
(36A) Bridge Rail Rating : 1
(36B) Transition Rating : 0
(36D) End Rail Rating : 1

(62) Culvert Rating : N
(61) Channel Rating : 7
(71) Waterway Adequacy : 8
(113) Scour Critical : 8

Unrepaired Spalls : 0 m sq
Deck Surfacing Depth : 0.00 in

Inspection Hours

Crew Hours for inspection : 1.5
Helper Hours : -1
Special Crew Hours : -1
Special Equipment Hours : -1

Snooper Required : N
Snooper Hours for inspection : -1
Flagger Hours : -1

Inspection Work Candidates		Status	Priority	Effected Structure Unit	Scope of Work	Action	Covered Condition States
Candidate ID	Date Requested						

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020037+05151
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	370	sq.m.	X	100	0	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

01/05/2011 - deck cracking at Abut 1(photo), see element 358 deck cracking. TH KZKZ
12/29/2008 - None ZZBZ
11/06/2006 - None. (28.65 X 12.92 = 370.158) ZECP
05/19/2003 - None CNKZ
12/26/2000 - Deep diangonal cracking on deck near both abutments. Effloecence at bottom of deck near both abutments. OLKO
10/02/1996 - None NVQT
01/01/1993 - None REFI

Inspection Notes:

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 109 - P/S Conc Open Girder , 5 I beams										
	1	1	143	m.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

01/05/2011 - None KZKZ
12/29/2008 - None ZZBZ
11/06/2006 - None ZECP
05/19/2003 - None CNKZ
12/26/2000 - LT outside beam has large spall with rebar exposed.(8' NE of Abut 1. TH 1-10-11) OLKO
10/02/1996 - None NVQT
01/01/1993 - None REFI

Inspection Notes:

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 2										
	1	2	42	m.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

01/05/2011 - Abut 2(photo). TH KZKZ
12/29/2008 - None ZZBZ
11/06/2006 - None ZECP
05/19/2003 - None CNKZ
12/26/2000 - Light diagonal cracking with water staining comming thru cracks. OLKO
10/02/1996 - None NVQT
01/01/1993 - None REFI

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020037+05151

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 313 - Fixed Bearing Abut 1=5, 2=5										
	1	1	10	ea.		95	5	0		
						%	%	%	%	%

Previous Inspection Notes :

01/05/2011 - added element, bearings at Abut 1 and 2 have 1 bolt visible and are included in quantity. Some bearings have freckled rust, changed from 100,0 to 95,5 percent. TH KZKZ
11/06/2006 - None ZECP
05/19/2003 - None CNKZ
12/26/2000 - RT outside bearing device covered in dirt at abut. 1. OLKO
10/02/1996 - None NVQT
01/01/1993 - None REFI

Inspection Notes:

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 331 - Conc Bridge Railing										
	1	3	57	m.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

01/05/2011 - some end pieces at bridge ends are square(not tapered). TH KZKZ
12/29/2008 - None ZZBZ
11/06/2006 - None. (28.65 X 2 = 57.30) ZECP
05/19/2003 - None CNKZ
12/26/2000 - None OLKO
10/02/1996 - None NVQT
01/01/1993 - None REFI

Inspection Notes:

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 358 - Deck Cracking SmFlag										
X	1	2	1	ea.	X	0	100	0	0	
						%	%	%	%	%

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 KZKZ

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020037+05151
Continue

General Inspection Notes

01/05/2011 - 9' underclearance to bottom of channel. TH	KZKZ
12/29/2008 - None	ZZBZ
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.	ZECP
05/19/2003 - None	CNKZ
12/26/2000 - None	OLKO
10/02/1996 - OPS$U5963 inspection comments - Structure P00020037+05151 - Date 10/2/96 - Previous comments > Sufficiency Rating Calculation Accepted by ops$u5963 at 3/10/97 11:34:38 Sufficiency Rating Calculation Accepted by ops$u9004 at 2/19/97 14:59:07	NVQT
01/01/1993 - Sufficiency Rating Calculation Accepted by ops$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	NB92
02/01/1989 - Updated with tape 1991	NB91
01/01/1987 - Updated with tape 1988	NB88
01/01/1985 - Updated with tape 1986	NB86

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020041+03501

Location : 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 : **CRANE CREEK**
Kilometer Post, Mile Post : **66.51 km 41.33**
Structure on the State Highway System : **X**
Latitude : **47°34'26"**
Structure on the National Highway System : **X**
Longitude : **104°15'47"**
Str Meet or Exceed NBIS Bridge Length : **X**

Construction Data

Construction Project Number :
Construction Station Number : **0+00.00**
Construction Drawing Number : **none**
Construction Year : **1986**
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 :		**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 :
Approach Roadway Width : **12.20 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)**

Approach Span

Number of Spans : **0**
Material Type Code, Description :
Span Design Code, Description :

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**

(52) Out-to-Out Width : **0.00 m**
(50A) Curb Width : **0.00 m**
(50B) Curb Width : **0.00 m**
Skew Angle : °

Structure Vertical and Horizontal Clearance Data Inventory Route :

Over / Under Direction Name	Inventory Route	South, West or Bi-directional Travel			North or East Travel		
		Direction	Vertical	Horizontal	Direction	Vertical	Horizontal
Route On Structure	P00020	Both	99.99 m	7.62 m	N/A		

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020041+03501

Continue

Inspection Data

Inspection Due Date : 22 December 2012

(91) Inspection Fequency (months) : **24**

Sufficiency Rating : ***75.1**

Health Index : **93.33**

Structure Status :**Not Deficient**

NBI Inspection Data

(90) Date of Last Inspection : 22 December 2010

Last Inspected By : Troy Hafele - 2056

(90) Inspection Date :

Inspected By :

(58) Deck Rating :	N	(68) Deck Geometry :	_	(36C) Approach Rail Rating :	N	(62) Culvert Rating :	5
(59) Superstructure Rating :	N	(67) Structure Rating :	5	(36A) Bridge Rail Rating :	N	(61) Channel Rating :	6
(60) Substructure Rating :	N	(69) Under Clearance :	N	(36B) Transition Rating :	N	(71) Waterway Adequacy :	8
(72) App Rdwy Align :	6	(41) Posting Status :	A	(36D) End Rail Rating :	N	(113) Scour Critical :	8

Unrepaired Spalls : 0 m sq

Deck Surfacing Depth : 0.00 in

Inspection Hours

Crew Hours for inspection :	1	Snooper Required :	N
Helper Hours :	-1	Snooper Hours for inspection :	-1
Special Crew Hours :	-1	Flagger Hours :	-1
Special Equipment Hours :	-1		

Inspection Work Candidates		Status	Priority	Effected Structure Unit	Scope of Work	Action	Covered Condition States
Candidate ID	Date Requested						

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020041+03501
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 240 - Steel Culvert , SSPP double 13 ft 3 inch x										
	1	2	92	m.		80	20	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/22/2010 - None DEEZ
12/29/2008 - None ZMBZ
11/06/2006 - None ZACZ
02/14/2005 - None RPDZ
05/19/2003 - None CZKZ
12/26/2000 - Same as last insp. OLKS
12/04/1998 - Light rust at bottms of culverts. Flared end section at outlet end of south pipe is bent inward. GAIY
10/02/1996 - _ CVKA

Inspection Notes:

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	1	ea.	X	0	100	0		
						%	%	%	%	%

Previous Inspection Notes :

12/22/2010 - None DEEZ
12/29/2008 - None ZMBZ
11/06/2006 - None ZACZ
02/14/2005 - None RPDZ
05/19/2003 - None CZKZ
12/26/2000 - The scour is still present. OLKS
12/04/1998 - Inlet and outlet has scour occurring. GAIY

Inspection Notes:

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

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.	GAIY
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

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020046+06831

Location : 5M SW 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 : **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 : **FOX CREEK**

Kilometer Post, Mile Post : **75.12 km 46.68**

Structure on the State Highway System : X

Latitude : **47°38'28"**

Structure on the National Highway System : X

Longitude : **104°12'34"**

Str Meet or Exceed NBIS Bridge Length : X

Construction Data

Construction Project Number : **F RF-245(24)**

Construction Station Number : **275+08.00**

Construction Drawing Number : **10366**

Construction Year : **1974**

Reconstruction Year :

Traffic Data

Current ADT : **3,150** 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 :	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 : **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 : **3**

Material Type Code, Description : **5 Prestressed concrete**

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

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 : **1 Monolithic concrete (concurrently placed with struct**

Deck Protection Type : **0 None**

Deck Membrain Type : **0 None**

(52) Out-to-Out Width : **14.14 m**

(50A) Curb Width : **0.08 m**

(50B) Curb Width : **0.08 m**

Skew Angle : °

Structure Vertical and Horizontal Clearance Data Inventory Route :

Over / Under Direction Name	Inventory Route	South, West or Bi-directional Travel			North or East Travel		
		Direction	Vertical	Horizontal	Direction	Vertical	Horizontal
Route On Structure	P00020	Both	99.99 m	13.29 m	N/A		

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020046+06831

Continue

Inspection Data

Sufficiency Rating : **83**
Health Index : **99.04**
Structure Status :**Not Deficient**

Inspection Due Date : 22 December 2012
(91) Inspection Fequency (months) : **24**

NBI Inspection Data

(90) Date of Last Inspection :	22 December 2010	Last Inspected By :	Troy Hafele - 2056
(90) Inspection Date :		Inspected By :	

(58) Deck Rating :	5		(68) Deck Geometry :	6		(36C) Approach Rail Rating :	1		(62) Culvert Rating :	N	
(59) Superstructure Rating :	8		(67) Structure Rating :	7		(36A) Bridge Rail Rating :	1		(61) Channel Rating :	7	
(60) Substructure Rating :	7		(69) Under Clearance :	N		(36B) Transition Rating :	1		(71) Waterway Adequacy :	8	
(72) App Rdwy Align :	8		(41) Posting Status :	A		(36D) End Rail Rating :	1		(113) Scour Critical :	5	

Unrepaired Spalls : 0 m sq

Deck Surfacing Depth : 7.80 in

Inspection Hours

Crew Hours for inspection :	1.5		Snooper Required :	N	
Helper Hours :	-1		Snooper Hours for inspection :	-1	
Special Crew Hours :	-1		Flagger Hours :	-1	
Special Equipment Hours :	-1				

Inspection Work Candidates		Status	Priority	Effected Structure Unit	Scope of Work	Action	Covered Condition States
Candidate ID	Date Requested						

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020046+06831
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

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	2	789	sq.m.	X	100	0	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

12/22/2010 - None DZHZ
11/06/2006 - None. (55.78 X 14.14 = 788.729) ZZCZ
05/19/2003 - None CZKZ
12/26/2000 - Moderate to heavy transverse cracking thru-out deck. OLKX
10/01/1996 - None UXRK
11/01/1992 - None REFI

Inspection Notes:

Element 109 - P/S Conc Open Girder , 6 I beams

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	2	335	m.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/22/2010 - Span 2(photo). TH DZHZ
11/06/2006 - None ZZCZ
05/19/2003 - None CZKZ
12/26/2000 - None OLKX
10/01/1996 - None UXRK
11/01/1992 - None REFI

Inspection Notes:

Element 205 - R/Conc Column , Bent 2=3, Bent 3=3

Smart Flag	Scale Factor	Env	Quantity	Units	Insp Each	Pct Stat 1	Pct Stat 2	Pct Stat 3	Pct Stat 4	Pct Stat 5
	1	3	6	ea.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/22/2010 - Bent 2 and 3(photos). TH DZHZ
11/06/2006 - None ZZCZ
05/19/2003 - None CZKZ
12/26/2000 - None OLKX
10/01/1996 - None UXRK
11/01/1992 - None REFI

Inspection Notes:

********** 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	2	34	m.		95	5	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/22/2010 - None DZHZ
11/06/2006 - None ZZCZ
05/19/2003 - None CZKZ
12/26/2000 - Backwalls spalling around bearing devices at abut.1 and 4. OLKX
10/01/1996 - None UXRK
11/01/1992 - None REFI

Inspection Notes:

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 234 - R/Conc Cap , Bent 2 and 3										
	1	1	28	m.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/22/2010 - None DZHZ
11/06/2006 - None. (14.14 X 2 = 28.28) ZZCZ
05/19/2003 - None CZKZ
12/26/2000 - None OLKX
10/01/1996 - None UXRK
11/01/1992 - None REFI

Inspection Notes:

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 302 - Compressn Joint Seal , Abut 1 and 4										
	1	2	28	m.		80	20	0		
						%	%	%	%	%

Previous Inspection Notes :

12/22/2010 - None DZHZ
11/06/2006 - None ZZCZ
05/19/2003 - None CZKZ
12/26/2000 - Both joints are leaking in areas. OLKX

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020046+06831

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 313 - Fixed Bearing , Bent 2=12, Bent 3=12

	1	1	24	ea.		90	10	0		
						%	%	%	%	%

Previous Inspection Notes :

12/22/2010 - Bearings at Abut 1 and 4 are buried in the backwalls and are not included in quantity. Changed quantity from 36 to 24. TH DZHZ
11/06/2006 - Outside shoes at abutments have rust. ZZCZ
05/19/2003 - None CZKZ
12/26/2000 - None OLKX
10/01/1996 - None UXRK
11/01/1992 - None REFI

Inspection Notes:

Element 321 - R/Conc Approach Slab

	1	3	1	ea.		0	0	100	0	
						%	%	%	%	%

Previous Inspection Notes :

12/22/2010 - Quantity of 1 includes both slabs. TH DZHZ
11/06/2006 - Changed to condition state 3 for asphalt overlay - Nate. ZZCZ
05/19/2003 - None CZKZ
12/26/2000 - Covered with asphalt. OLKX
10/01/1996 - None UXRK
11/01/1992 - None REFI

Inspection Notes:

Element 334 - Metal Rail Coated , painted 5 inch box beam and I beam posts with 16w x 12h concrete curb

	1	2	112	m.		90	10	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

12/22/2010 - rail has some scrape marks with surface rust and posts have some freckled rust, changed from 100,0 to 90,10 percent. TH DZHZ
11/06/2006 - None. (55.78 X 2 = 111.56) ZZCZ
05/19/2003 - None CZKZ
12/26/2000 - None OLKX
10/01/1996 - None UXRK
11/01/1992 - None REFI

Inspection Notes:

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

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 358 - Deck Cracking SmFlag										
X	1	2	1	ea.	X	0	0	100	0	
						%	%	%	%	%

Previous Inspection Notes :

12/22/2010 - None DZHZ

11/06/2006 - moderate to heavey cracking through out deck. ZZCZ

Inspection Notes:

General Inspection Notes

12/22/2010 - 13' underclearance to water. TH DZHZ

11/06/2006 - None ZZCZ

05/19/2003 - None CZKZ

12/26/2000 - None OLKX

10/01/1996 - Sufficiency Rating Calculation Accepted by ops$u5963 at 11/17/97 13:10:31 UXRK
OPS$U5963 inspection comments -
Structure P00020046+06831 -
Date 10/1/96 -
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 14:59:10

11/01/1992 - Sufficiency Rating Calculation Accepted by ops$u5963 at 3/10/97 11:34:38 REFI
Sufficiency Rating Calculation Accepted by ops$u9004 at 2/19/97 14:59:10

01/01/1991 - Updated with tape 1993 NB93

10/01/1988 - Updated with tape 1991 NB91

01/01/1987 - Updated with tape 1988 NB88

01/01/1985 - Updated with tape 1986 NB86

01/01/1983 - Updated with tape 1984 NB84

12/01/1980 - Updated with tape 1983 NB83

12/01/1978 - Updated with tape 1980 NB80

Form: bms001d
Printing Date : Tuesday, January 10 2012

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020051+06421

Location : SIDNEY Structure Name: none

General Location Data

District Code, Number, Location : **04 Dist 4 GLENDIVE**

County Code, Location : **083 RICHLAND**

Kind fo Hwy Code, Description : **3 3 State Hwy**

Str Owner Code, Description : **1 State Highway Agency**

Intersecting Feature : **LONE TREE CREEK**

Structure on the State Highway System : X

Structure on the National Highway System : X

Str Meet or Exceed NBIS Bridge Length : X

Latitude : **47°42'20"**

Longitude : **104°09'50"**

Division Code, Location : **42 WOLF POINT**

City Code, Location : **67900 SIDNEY**

Signed Route Number : **00016**

Maintained by Code, Description : **1 State Highway Agency**

Kilometer Post, Mile Post : **83.11 km 51.64**

Construction Data

Construction Project Number : **F RF-245(24)**

Construction Station Number : **537+04.00**

Construction Drawing Number : **10663**

Construction Year : **1974**

Reconstruction Year :

Traffic Data

Current ADT : **10,290** 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	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		

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 : **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**

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 : **28.96 m**

(50A) Curb Width : **1.52 m**

(50B) Curb Width : **1.52 m**

Skew Angle : °

Structure Vertical and Horizontal Clearance Data Inventory Route :

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

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020051+06421
Continue

Inspection Data

Sufficiency Rating : **89.8**
Health Index : **99.42**
Structure Status :**Not Deficient**

Inspection Due Date : 22 December 2012
(91) Inspection Fequency (months) : **24**

NBI Inspection Data

(90) Date of Last Inspection : 22 December 2010

Last Inspected By : Troy Hafele - 2056

(90) Inspection Date :

Inspected By :

(58) Deck Rating :	7	(68) Deck Geometry :	9	(36C) Approach Rail Rating :	N	(62) Culvert Rating :	N
(59) Superstructure Rating :	7	(67) Structure Rating :	7	(36A) Bridge Rail Rating :	0	(61) Channel Rating :	7
(60) Substructure Rating :	7	(69) Under Clearance :	N	(36B) Transition Rating :	N	(71) Waterway Adequacy :	8
(72) App Rdwy Align :	8	(41) Posting Status :	A	(36D) End Rail Rating :	0	(113) Scour Critical :	5

Unrepaired Spalls : 0 m sq

Deck Surfacing Depth : 0.00 in

Inspection Hours

Crew Hours for inspection :	1.5	Snooper Required :	N
Helper Hours :	-1	Snooper Hours for inspection :	-1
Special Crew Hours :	-1	Flagger Hours :	-1
Special Equipment Hours :	-1		

Inspection Work Candidates							
Candidate ID	**Date Requested**	**Status**	**Priority**	**Effected Structure Unit**	**Scope of Work**	**Action**	**Covered Condition States**

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020051+06421
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 38 - Bare Concrete Slab										
	1	3	794	sq.m.	X	100	0	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

12/22/2010 - None	DZIZ
12/29/2008 - Snow covered.	ZRBZ
11/06/2006 - None. (27.43 X 28.96 = 794.373)	ZZCZ
02/14/2005 - None	RGDZ
05/19/2003 - None	CZKZ
12/26/2000 - None	OLLZ
12/04/1998 - None	GAJN
10/01/1996 - None	DLXG
10/01/1994 - None	REFI

Inspection Notes:

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 205 - R/Conc Column , Bents 2, 3 and 4 have 6 each										
	1	2	18	ea.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/22/2010 - Bent 3 and 4(photos). TH	DZIZ
12/29/2008 - None	ZRBZ
11/06/2006 - None	ZZCZ
02/14/2005 - None	RGDZ
05/19/2003 - None	CZKZ
12/26/2000 - None	OLLZ
12/04/1998 - None	GAJN
10/01/1996 - None	DLXG
10/01/1994 - None	REFI

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020051+06421
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 215 - R/Conc Abutment , located at Abut 1 and 5										
	1	2	86	m.		90	10	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/22/2010 - None	DZIZ
12/29/2008 - None	ZRBZ
11/06/2006 - None	ZZCZ
02/14/2005 - None	RGDZ
05/19/2003 - None	CZKZ
12/26/2000 - Backwalls has deep vertical cracks approx.2mm wide with water stains.	OLLZ
12/04/1998 - Backwalls have light vertical cracks at about 12 foot centers in both abut.	GAJN
10/01/1996 - None	DLXG
10/01/1994 - None	REFI

Inspection Notes:

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 234 - R/Conc Cap , Bents 2, 3 and 4										
	1	1	85.97	m.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/22/2010 - Bents 3 and 4(photo). TH	DZIZ
12/29/2008 - None	ZRBZ

Inspection Notes:

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 321 - R/Conc Approach Slab										
	1	3	1	ea.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/22/2010 - Quantity of 1 includes both slabs. TH	DZIZ
12/29/2008 - Snow covered.	ZRBZ
11/06/2006 - None	ZZCZ
02/14/2005 - None	RGDZ
05/19/2003 - None	CZKZ
12/26/2000 - None	OLLZ
12/04/1998 - None	GAJN
10/01/1996 - None	DLXG
10/01/1994 - None	REFI

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020051+06421
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 334 - Metal Rail Coated , painted 4 inch triple box beam rail with 6 inch I beam posts										
	1	2	55	m.		90	10	0	0	0
						%	%	%	%	%

Previous Inspection Notes :

12/22/2010 - rail has some primer showing and posts have some freckled rust, changed from 100,0 to 90,10 percent. TH DZIZ
12/29/2008 - None ZRBZ
11/06/2006 - None. (27.43 X 2 = 54.86) ZZCZ
02/14/2005 - None RGDZ
05/19/2003 - None CZKZ
12/26/2000 - None OLLZ
12/04/1998 - None GAJN
10/01/1996 - None DLXG
10/01/1994 - None REFI

Inspection Notes:

General Inspection Notes

12/22/2010 - 7' underclearance to bottom of channel. Sidewalks on both left and right sides. TH DZIZ
12/29/2008 - None ZRBZ
11/06/2006 - None ZZCZ
02/14/2005 - None RGDZ
05/19/2003 - None CZKZ
12/26/2000 - None OLLZ
12/04/1998 - None GAJN
10/01/1996 - Sufficiency Rating Calculation Accepted by ops$a0241 at 8/15/97 14:39:00 DLXG
OPS$A0241 inspection comments -
Structure P00020051+06421 -
Date 10/1/96 -
Previous comments > Sufficiency Rating Calculation Accepted by ops$u5963 at 3/11/97 10:45:18
Sufficiency Rating Calculation Accepted by ops$u9004 at 2/19/97 14:59:10

10/01/1994 - Sufficiency Rating Calculation Accepted by ops$u5963 at 3/11/97 10:45:18 REFI
Sufficiency Rating Calculation Accepted by ops$u9004 at 2/19/97 14:59:10

01/01/1993 - Updated with tape 1994 NB94
01/01/1991 - Updated with tape 1993 NB93
02/01/1989 - Updated with tape 1991 NB91
01/01/1987 - Updated with tape 1988 NB88
01/01/1985 - Updated with tape 1986 NB86
01/01/1983 - Updated with tape 1984 NB84
12/01/1980 - Updated with tape 1983 NB83
12/01/1978 - Updated with tape 1980 NB80

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020059+05101

Location : 3M SW FAIRVIEW Structure Name: none

General Location Data

District Code, Number, Location : 04 Dist 4 GLENDIVE

County Code, Location : 083 RICHLAND

Kind fo Hwy Code, Description : 3 3 State Hwy

Str Owner Code, Description : 1 State Highway Agency

Intersecting Feature : FIRST HAY CREEK

Structure on the State Highway System : [X]

Structure on the National Highway System : [ ]

Str Meet or Exceed NBIS Bridge Length : [X]

Latitude : 47°48'30"

Longitude : 104°05'26"

Division Code, Location :42 WOLF POINT

City Code, Location :00000 RURAL AREA

Signed Route Number :00200

Maintained by Code, Description :1 State Highway Agency

Kilometer Post, Mile Post : 95.77 km 59.51

Construction Data

Construction Project Number : RTFBRF20-2(7)52

Construction Station Number : 367+22.00

Construction Drawing Number : 13594

Construction Year : 1986

Reconstruction Year :

Traffic Data

Current ADT : 3,410 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	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 : 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

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 : 1 Monolithic concrete (concurrently placed with struct

Deck Protection Type : 1 Epoxy Coated Reinforcing

Deck Membrain Type : 0 None

(52) Out-to-Out Width : 12.83 m

(50A) Curb Width : 0.00 m

(50B) Curb Width : 0.00 m

Skew Angle : 40°

Structure Vertical and Horizontal Clearance Data Inventory Route :

Over / Under Direction Name	Inventory Route	South, West or Bi-directional Travel			North or East Travel		
		Direction	Vertical	Horizontal	Direction	Vertical	Horizontal
Route On Structure	P00020	Both	99.99 m	11.98 m	N/A		

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020059+05101

Continue

Inspection Data

Sufficiency Rating : **94.9**
Health Index : **97.78**
Structure Status :**Not Deficient**

Inspection Due Date : 27 December 2012
(91) Inspection Fequency (months) : **24**

NBI Inspection Data

(90) Date of Last Inspection : 27 December 2010
Last Inspected By : Troy Hafele - 2056
(90) Inspection Date :
Inspected By :

(58) Deck Rating :	7	(68) Deck Geometry :	5	(36C) Approach Rail Rating :	1	(62) Culvert Rating :	N
(59) Superstructure Rating :	7	(67) Structure Rating :	7	(36A) Bridge Rail Rating :	1	(61) Channel Rating :	7
(60) Substructure Rating :	7	(69) Under Clearance :	N	(36B) Transition Rating :	0	(71) Waterway Adequacy :	6
(72) App Rdwy Align :	8	(41) Posting Status :	A	(36D) End Rail Rating :	0	(113) Scour Critical :	5

Unrepaired Spalls : 5 m sq
Deck Surfacing Depth : 15.00 in

Inspection Hours

Crew Hours for inspection :	1.5	Snooper Required :	N
Helper Hours :	-1	Snooper Hours for inspection :	-1
Special Crew Hours :	-1	Flagger Hours :	-1
Special Equipment Hours :	-1		

Inspection Work Candidates		Status	Priority	Effected Structure Unit	Scope of Work	Action	Covered Condition States
Candidate ID	Date Requested						

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020059+05101

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 38 - Bare Concrete Slab										
	1	2	428	sq.m.	X	100	0	0	0	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 DZFJ
12/29/2008 - None ZZCA
11/06/2006 - None. (33.38 X 12.83 = 428.265) ZZCZ
02/14/2005 - None RZDZ
05/19/2003 - None CZKZ
12/26/2000 - Damaged areas from milling machine over abut.5. OLAC
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) GAJS
10/01/1996 - None ZUSN
10/01/1994 - None REFI

Inspection Notes:

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 202 - Paint Stl Column , Bents 2, 3 and 4, 16 inch diameter, 4 per bent										
	1	2	12	ea.		80	5	15	0	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 DZFJ
12/29/2008 - None ZZCA
11/06/2006 - None ZZCZ
02/14/2005 - None RZDZ
05/19/2003 - None CZKZ
12/26/2000 - Same comments as last insp. OLAC
12/04/1998 - None GAJS
10/01/1996 - Paint failing at bottoms of piling. ZUSN
10/01/1994 - None REFI

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020059+05101
Continue

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

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										
	1	2	34	m.		95	5	0	0	
						%	%	%	%	%
Element 234 - R/Conc Cap , Bents 2, 3 and 4										
	1	1	49.05	m.		100	0	0	0	
						%	%	%	%	%
Element 331 - Conc Bridge Railing , barrier rail										
	1	2	67	m.		95	5	0	0	
						%	%	%	%	%

Element 215 - R/Conc Abutment 1 and 5

Previous Inspection Notes :

12/27/2010 - see element 361 for repaired scour. TH DZFJ

12/29/2008 - None ZZCA

11/06/2006 - None ZZCZ

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. RZDZ

05/19/2003 - None CZKZ

12/26/2000 - Same condition as last insp. OLAC

12/04/1998 - None GAJS

10/01/1996 - Small vertical cracks in both abutments. Endfills sluffed under extended curbs. ZUSN

10/01/1994 - None REFI

Inspection Notes:

Element 234 - R/Conc Cap , Bents 2, 3 and 4

Previous Inspection Notes :

12/27/2010 - None DZFJ

12/29/2008 - None ZZCA

Inspection Notes:

Element 331 - Conc Bridge Railing , barrier rail

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 DZFJ

12/29/2008 - None ZZCA

11/06/2006 - None. (33.38 X 2 = 66.76) ZZCZ

02/14/2005 - None RZDZ

05/19/2003 - None CZKZ

12/26/2000 - None OLAC

12/04/1998 - None GAJS

10/01/1996 - None ZUSN

10/01/1994 - None REFI

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020059+05101
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 361 - Scour Smart Flag										
X	1	1	1	ea.	X	100	0	0		
						%	%	%	%	%

Previous Inspection Notes :

12/27/2010 - Abut 1 right/downstream half and Abut 5 has riprap(photos). TH	DZFJ
12/29/2008 - Since this is in condition state 1, the substructure rating has been changed back to a 7 - Nate.	ZZCA
11/06/2006 - SW upstream bank and halfway under the structure at abut 1 was repaired with gabion baskets after the scour damage.	ZZCZ
02/14/2005 - None	RZDZ
05/19/2003 - None	CZKZ
12/26/2000 - Same comments as last insp.	OLAC
12/04/1998 - None	GAJS
10/01/1996 - Channel scoured out in summer of 1997. Washed out endfills.	ZUSN

Inspection Notes:

General Inspection Notes

12/27/2010 - 13' underclearance to water. TH	DZFJ
12/29/2008 - None	ZZCA
11/06/2006 - None	ZZCZ
02/14/2005 - None	RZDZ
05/19/2003 - None	CZKZ
12/26/2000 - None	OLAC
12/04/1998 - None	GAJS
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	ZUSN
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	REFI
01/01/1993 - Updated with tape 1994	NB94
01/01/1991 - Updated with tape 1993	NB93
02/01/1989 - Updated with tape 1991	NB91
01/01/1987 - Updated with tape 1988	NB88

Form: bms001d
Printing Date : Tuesday, January 10 2012

Montana Department of Transportation

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020060+00061

Location : 2M SW FAIRVIEW Structure Name: none

General Location Data

District Code, Number, Location : **04** **Dist 4** **GLENDIVE**
County Code, Location : **083** **RICHLAND**
Kind fo Hwy Code, Description : **3** **3 State Hwy**
Str Owner Code, Description : **1** **State Highway Agency**
Intersecting Feature : **SECOND HAY CREEK**
Structure on the State Highway System : X
Structure on the National Highway System : ☐
Str Meet or Exceed NBIS Bridge Length : X
Latitude : **47°48'52"**
Longitude : **104°05'08"**

Division Code, Location :**42** **WOLF POINT**
City Code, Location :**00000** **RURAL AREA**
Signed Route Number :**00200**
Maintained by Code, Description :**1** **State Highway Agency**
Kilometer Post, Mile Post : **96.61 km** **60.03**

Construction Data

Construction Project Number : **RTFBRF20-2(7)52**
Construction Station Number : **393+13.00**
Construction Drawing Number : **none**
Construction Year : **1986**
Reconstruction Year :

Traffic Data

Current ADT : **3,410** 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**	**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 : **0.00 m**
Minimum Lateral Under Clearance Left : **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 : **0.00 m**
(50B) Curb Width : **0.00 m**
Skew Angle : **38°**

Structure Vertical and Horizontal Clearance Data Inventory Route :

Over / Under Direction Name	Inventory Route	South, West or Bi-directional Travel			North or East Travel		
		Direction	Vertical	Horizontal	Direction	Vertical	Horizontal
Route On Structure	P00020	Both	99.99 m	15.82 m	N/A		

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020060+00061
Continue

Inspection Data

Sufficiency Rating : **97**
Health Index : **100**
Structure Status :**Not Deficient**

Inspection Due Date : 27 December 2012
(91) Inspection Fequency (months) : **24**

NBI Inspection Data

(90) Date of Last Inspection : 27 December 2010
Last Inspected By : Troy Hafele - 2056
(90) Inspection Date :
Inspected By :

(58) Deck Rating :	N	(68) Deck Geometry :	9	(36C) Approach Rail Rating :	N	(62) Culvert Rating :	7
(59) Superstructure Rating :	N	(67) Structure Rating :	7	(36A) Bridge Rail Rating :	N	(61) Channel Rating :	7
(60) Substructure Rating :	N	(69) Under Clearance :	N	(36B) Transition Rating :	N	(71) Waterway Adequacy :	8
(72) App Rdwy Align :	8	(41) Posting Status :	A	(36D) End Rail Rating :	N	(113) Scour Critical :	8

Unrepaired Spalls : 0 m sq
Deck Surfacing Depth : 0.00 in

Inspection Hours

Crew Hours for inspection :	1	Snooper Required :	N
Helper Hours :	-1	Snooper Hours for inspection :	-1
Special Crew Hours :	-1	Flagger Hours :	-1
Special Equipment Hours :	-1		

Inspection Work Candidates		Status	Priority	Effected Structure Unit	Scope of Work	Action	Covered Condition States
Candidate ID	Date Requested						

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 240 - Steel Culvert , SSPPA 23 ft 2 in S x										
	1	3	16	m.		100	0	0	0	
						%	%	%	%	%

Previous Inspection Notes :

12/27/2010 - Both ends have concrete headwalls with concrete slope protection along culvert bevel. TH — DZEZ
12/29/2008 - Minor rust on invert. — ZZCI
11/06/2006 - None — ZZCZ
02/14/2005 - None — RBCZ
05/19/2003 - None — CZKZ
12/26/2000 - None — OLAH
12/04/1998 - Embankment washing around retaining walls. Water sits in bottom of culverts year around. — GAJV
10/01/1996 - None — JUUZ

Inspection Notes:

INITIAL ASSESSMENT FORM FOR STRUCTURE :

P00020060+00061
Continue

General Inspection Notes

12/27/2010 - None	DZEZ
12/29/2008 - None	ZZCI
11/06/2006 - None	ZZCZ
02/14/2005 - None	RBCZ
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$u5963 at 3/10/97 14:31:26 Sufficiency Rating Calculation Accepted by ops$u9004 at 2/19/97 14:59:12	JUUZ
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	NB94
01/01/1991 - Updated with tape 1993	NB93
02/01/1989 - Updated with tape 1991	NB91
01/01/1987 - Updated with tape 1988	NB88

Appendix 3

Right-of-Way Information

MT 16 / MT 200 Corridor

West				East			
RP		R/W offset from Centerline (ft)	Distance (mi)	RP		R/W offset from Centerline (ft)	Distance (mi)
Begin	End			Begin	End		
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			
RP		R/W offset from Centerline (ft)	Distance (mi)	RP		R/W offset from Centerline (ft)	Distance (mi)
Begin	End			Begin	End		
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	0.1	28.0	28.4	Varies (~105')	0.4
33.0	34.0	80	1.0	28.4	28.6	102	0.2
34.0	34.2	60	0.1	28.5	29.0	Varies (~100')	0.4
34.2	34.6	80	0.4	31.5	31.6	80	0.1
34.6	34.6	70	0.1	31.6	31.6	50	0.0
34.6	34.7	80	0.1	31.6	31.7	55	0.1
34.7	35.0	90	0.3	31.7	31.8	60	0.1
35.0	36.0	80	1.0	31.8	31.9	80	0.0
36.0	36.1	70	0.1	31.9	31.9	68	0.1
36.1	37.0	80	0.9	31.9	32.0	94	0.0
37.0	37.1	60	0.1	32.0	32.0	81	0.0
37.1	37.5	80	0.4	32.0	32.0	87	0.0
37.5	37.9	90	0.4	32.0	32.2	93	0.1
37.9	39.2	80	1.3	32.2	32.2	80	0.1

West				East			
RP		R/W offset from Centerline (ft)	Distance (mi)	RP		R/W offset from Centerline (ft)	Distance (mi)
Begin	End			Begin	End		
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	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
42.5	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	41.4	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
46.4	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	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
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			
RP		R/W offset from Centerline (ft)	Distance (mi)	RP		R/W offset from Centerline (ft)	Distance (mi)
Begin	End			Begin	End		
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

Curve PI[1] (RP)	Curve Type	Curve Length (ft)	Radius (ft)	Deflection Angle[2]	Superelevation Rate[3] Existing / Required	Design/Posted Speed (mph)	Min. Sight Obstruction (ft)	Meet Min. Sight Distance (SSD) (730 ft)	Curve Type Correct[4]	Correct Spiral Curve Dimensions	Meet Min. Radius (1810 ft)	Required Superelevation Rate	Meet Min. 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**

Curve PI[(1)] (RP)	Curve Type	Curve Length (ft)	Radius (ft)	Deflection Angle[(2)]	Superelevation Rate[(3)] Existing / Required	Design/Posted Speed (mph)	Min. Sight Obstruction (ft)	Meet Min. Sight Distance (SSD) (730 ft)	Curve Type Correct[(4)]	Correct Spiral Curve Dimensions	Meet Min. Radius (1810 ft)	Required Superelevation Rate	Meet Min. 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.

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

(2) 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.

(4) 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)

Reference Post	Privat Driveways [1]				Commercial Access [2]				Road Access [3]				Farm Field Access [4]	
	West		East		West		East		West		East		West	East
	Unpaved	Paved	Unpaved	Paved	Unpaved	Paved	Unpaved	Paved	Unpaved	Paved	Unpaved	Paved	Unpaved	Unpaved
0.73	1						1							
0.76							1							
0.79	1			1										
0.80			1											
0.82							1							
0.83					1									
0.84							1							
0.89							1							
0.92	1													
0.97							1							
1.00			1											
1.03	1													
1.06	1													
1.09			1											
1.16							1			1				
1.22											1			
1.26					1									
1.28									1					
1.31							1							
1.38					1		1							
1.50							1							
1.62					1									
1.73							1							
1.81			1											
1.96													1	
2.37	1													
2.64			1										1	
2.71			1											
2.75			1											
1.00			1											
2.80			1											
2.85	1													
2.97			1											
3.14							1							
3.39	1													
3.53			1											
3.56			1											
3.59	1													
3.72												1		
3.86														1
4.07					1									1
4.44			1											
4.50	1													
4.53	1										1			
4.78														1
5.05			1											
5.16	1		1											
5.21	1													
5.50			1											
5.61									1					
5.71			1											
1.00	1													
5.89	1		1											
6.13	1		1											
6.46													1	
6.65			1											
6.80			1											
7.08	1													
7.70			1											
7.95	1													
8.12			1											
8.20	1		1											
8.57			1											
8.68									1					
1.00			1						1					
9.35			1											
9.69			1											
10.14			1											
10.27			1											

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

Reference Post	Privat Driveways [1]				Commercial Access [2]				Road Access [3]				Farm Field Access [4]	
	West		East		West		East		West		East		West	East
	Unpaved	Paved	Unpaved	Paved	Unpaved	Paved	Unpaved	Paved	Unpaved	Paved	Unpaved	Paved	Unpaved	Unpaved
10.32													1	
10.61									1					
10.84													1	
10.86			1											
12.18													1	
12.47	1		1											
13.06					1									
13.16	1													
14.47														1
15.34			1											
17.03										1		1		
17.37	1													
17.59	1													
18.22											1			
18.88			1											
19.24														1
19.52														1
19.63			1											
19.71													1	
19.94													1	
20.70			1										1	
20.85													1	1
21.76													1	1
22.13														1
22.51											1		1	
22.57			1											
23.22	1		1											
23.63											1			
23.95			1						1		1			
24.53	1													
24.80											1			
25.43	1													
25.56											1			
25.90									1		1			
26.15													1	1
26.55													1	
27.00													1	1
27.06														1
28.26	1		1											
28.55									1		1			
28.88											1			
28.96									1					
29.23											1			
29.57			1											
29.93	1													1
30.16													1	1
30.69													1	1
30.89	1		1											
30.93									1					
31.00			1											
31.04													1	
31.11													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 Points = 156

Total Length in Miles = 30.9

Access Point Density (Access Points per Mile) = 5.0

[1] 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.

[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)

Reference Post	Privat Driveways [1]				Commercial Access [2]				Road Access [3]				Farm Field Access [4]	
	West		East		West		East		West		East		West	East
	Unpaved	Paved	Unpaved	Paved	Unpaved	Paved	Unpaved	Paved	Unpaved	Paved	Unpaved	Paved	Unpaved	Unpaved
31.61			1											
31.65								1						
31.67												1		
31.92												1		
31.94									1					
31.98											1			
32.03	1											1		
32.10	1													
32.15										1		1		
32.23											1			
32.58											1			
32.63	1		1											
32.68	1		1											
32.81									1		1			
32.83									1		1			
33.08													1	1
33.35													1	
33.43														1
33.65													1	
33.75													1	1
33.83			1											
33.86	1													
33.92			1											
34.03	1													
34.07	1													
34.08									1		1			
34.09			1											
34.25														1
34.47									1					
34.64														1
34.66													1	1
34.79														1
35.11													1	1
35.25									1		1			
35.47													1	
35.65													1	1
35.71														1
35.79													1	
36.00	1													1
36.17													1	1
36.40									1		1			
36.47														1
36.97	1													1
37.04	1													
37.23													1	1
37.47									1					
37.48									1					
37.53									1			1		
37.75			1											
37.91	1		1											
38.05													1	1
38.37													1	1
38.53	1													
38.57	1													
38.62											1			
38.70													1	1
38.96														1
39.06			1										1	
39.17													1	1
39.20											1			
39.45			1											
39.50													1	
1.00													1	
39.87	1													
38.90			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)

Reference Post	Privat Driveways [1]				Commercial Access [2]				Road Access [3]				Farm Field Access [4]	
	West		East		West		East		West		East		West	East
	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] 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.

[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)

Reference Post	Privat Driveways [1]				Commercial Access [2]				Road Access [3]				Farm Field Access [4]	
	West		East		West		East		West		East		West	East
	Unpaved	Paved	Unpaved	Paved	Unpaved	Paved	Unpaved	Paved	Unpaved	Paved	Unpaved	Paved	Unpaved	Unpaved
41.52	1										1			
41.53			1											
41.62	1													1
41.72											1			
41.82	1		1											
41.82													1	
42.06														1
42.34									1		1			
42.55														1
42.58													1	
42.75													1	1
42.98													1	1
43.00			1						1					
43.06			1											
43.13			1											
43.52														1
43.61									1		1			
43.69			1										1	
43.80	1													
43.85													1	1
44.12													1	1
44.23			1											
44.32														1
44.46	1													
44.50									1		1			
44.74	1													
44.78									1		1			
44.88													1	1
44.92	1													
45.00	1													
45.07	1													
45.10														1
45.26	1													
45.34													1	
45.55													1	
45.88									1		1			
46.15													1	
46.30	1													
46.32	1													
46.37													1	
46.44									1		1			
46.50	1													
46.57									1					
46.77	1													
46.85	1													
46.90	1													
46.94											1			
46.97	1													
47.12													1	
47.16	1													
47.18											1			
47.20	1													
47.26									1					
47.28											1			
47.49	1													
47.62														1
47.70	1													
47.77	1		1											
48.00											1			
48.06									1					
48.08			1											
48.12			1											
48.15													1	
48.24	1													
48.26	1													
48.27			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)

Reference Post	Privat Driveways [1]				Commercial Access [2]				Road Access [3]				Farm Field Access [4]	
	West		East		West		East		West		East		West	East
	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 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] 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.

[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)

Reference Post	Privat Driveways [1]				Commercial Access [2]				Road Access [3]				Farm Field Access [4]	
	West		East		West		East		West		East		West	East
	Unpaved	Paved	Unpaved	Paved	Unpaved	Paved	Unpaved	Paved	Unpaved	Paved	Unpaved	Paved	Unpaved	Unpaved
52.60										1		1		
52.61								2						
52.63						1								
52.65	1		1											
52.67	1		1											
52.68	1		1											
52.69										1		1		
52.70	1													
53.09	1													
53.12						1								
53.22		1										1		
53.35			1										1	
53.66									1		1			
53.68	1													
53.75														1
53.83			1											
53.90			1											
53.92			1											
53.94	1													
53.97	1													
54.00			1										1	
54.01			1											
54.08			1											
54.13											1			
54.17			1											
54.20	1													1
54.26		1												
54.27	1													
54.31														1
54.32	1													
54.33	1													
54.37	1													
54.40	1													
54.45	1													
54.51	1													
54.65	1													
54.73									1		1			
54.90			1											
54.97													1	
55.02	1		1											
55.10														1
55.16	1													
55.17			1											
55.20	1		1											
55.27	1													
55.30			1											
55.34			1											
55.47													1	
55.50	1													
55.58			1										1	
55.61			1											
55.67			1											
55.72													1	
55.73			1											
55.77			1											
55.85									1		1			
56.14													1	1
56.39													1	1
56.50													1	
56.62													1	
56.64			1											
56.77													1	
56.89									1		1			
56.96														1
57.00													1	
57.16													1	
57.18														1
57.44													1	1
57.49														1

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

Reference Post	Privat Driveways [1]				Commercial Access [2]				Road Access [3]				Farm Field Access [4]	
	West		East		West		East		West		East		West	East
	Unpaved	Paved	Unpaved	Paved	Unpaved	Paved	Unpaved	Paved	Unpaved	Paved	Unpaved	Paved	Unpaved	Unpaved
57.75													1	
57.79	1													
57.86	1													
57.95			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			
59.30													1	
59.31	1													
59.39													1	
59.44			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													
60.43													1	1
60.59	1													
60.70										1	1			
60.96			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	1													
62.09													1	1
62.18	1													
62.19			1											
62.24	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 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.

[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.

[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

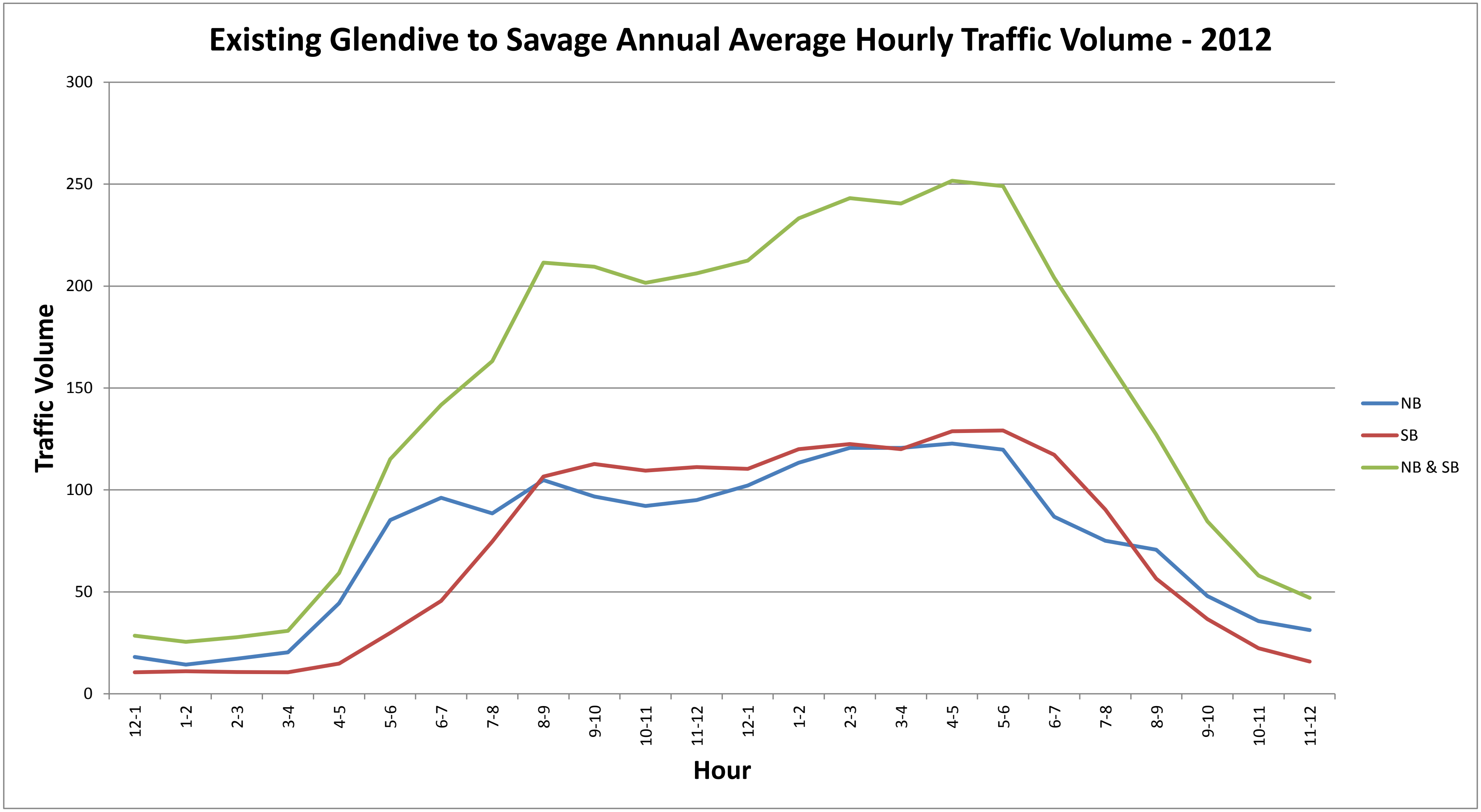
<table>
<tr><th>Portion of Corridor</th><th>1990-2011 Count Locations</th><th>2012 Count Locations</th></tr>
<tr><td rowspan="9">Glendive to Sidney</td><td>MT 16, north of I-94</td><td rowspan="3">MT 16, RP 16.0, south of County Road 549</td></tr>
<tr><td>MT 16, north of Highland Park</td></tr>
<tr><td>MT 16, south of County Road 254</td></tr>
<tr><td>MT 16, RP 4.0, north of County Road 254</td><td rowspan="3">MT 16, RP 37.0, south of County Road 112</td></tr>
<tr><td>MT 16, RP 12.0, 0.5 miles southwest of Morgan Creek bridge</td></tr>
<tr><td>MT 16, RP 23.5, northeast of Dawson County Line</td></tr>
<tr><td>MT 16, RP 32.0, south of 4th Avenue, Savage, MT</td><td rowspan="3">MT 16, RP 47.0, south of County Road120</td></tr>
<tr><td>MT 16, RP 42.0, 0.5 miles northeast of Crane, MT</td></tr>
<tr><td>MT 16, RP 49.5, south of MT 200</td></tr>
<tr><td rowspan="5">Sidney to Fairview</td><td>Central Avenue, north of Holly Street</td><td rowspan="5">MT 16, RP 57.0, South of County Road 130</td></tr>
<tr><td>MT 200, RP 53.5, 1 mile north of Holly Street</td></tr>
<tr><td>MT 200, RP 56, 7.5 mile southwest of County Road 201</td></tr>
<tr><td>MT 200, RP 62.0, 1.5 mile southwest of County Road 201</td></tr>
<tr><td>MT 200 between Western Avenue & South Central Avenue, south of Fairview</td></tr>
</table>

Source: MDT, 2012.

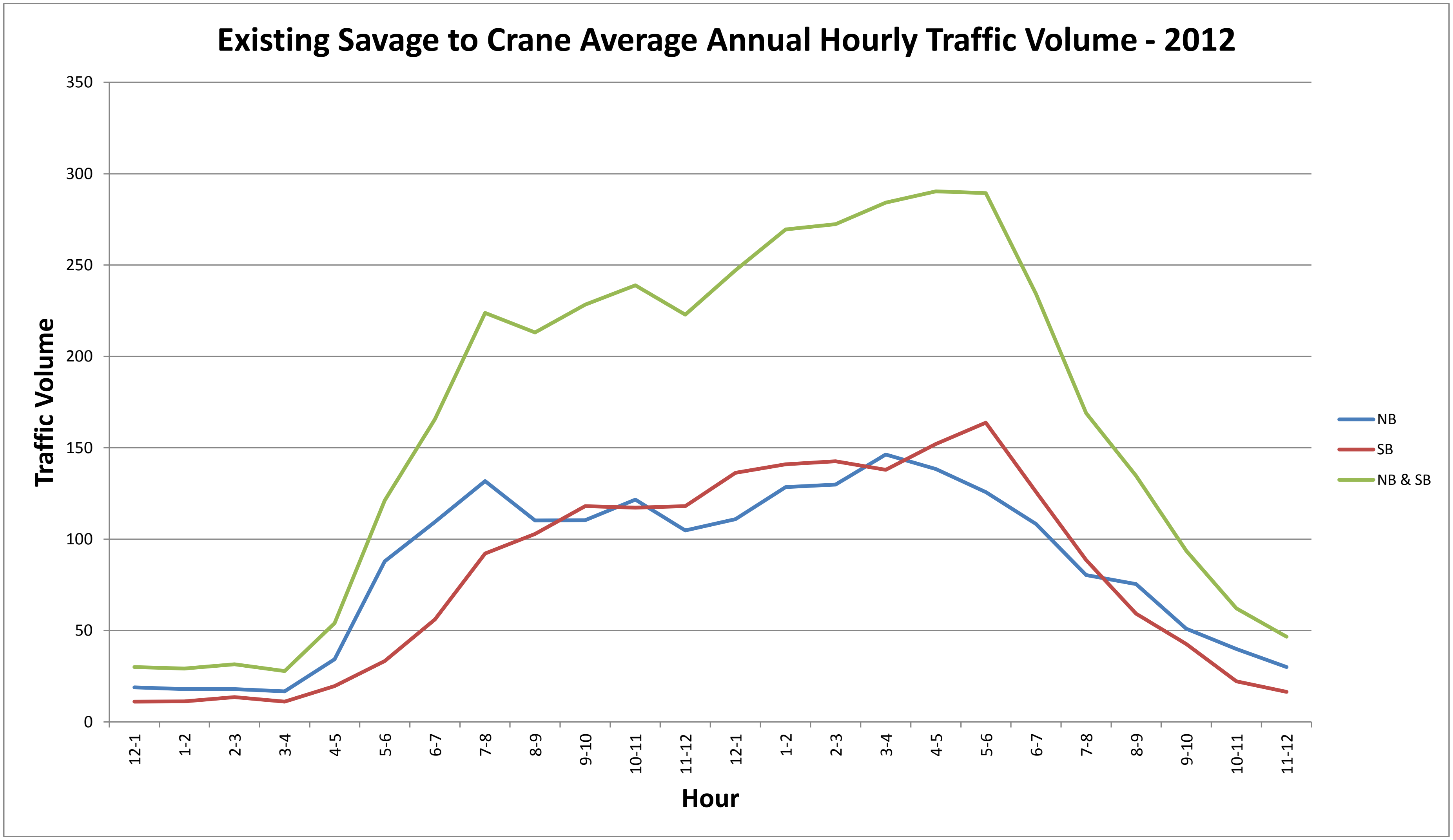
Table 2 Weighted AADT Volumes (1990 – 2012)

Year	Weighted AADT			
	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%

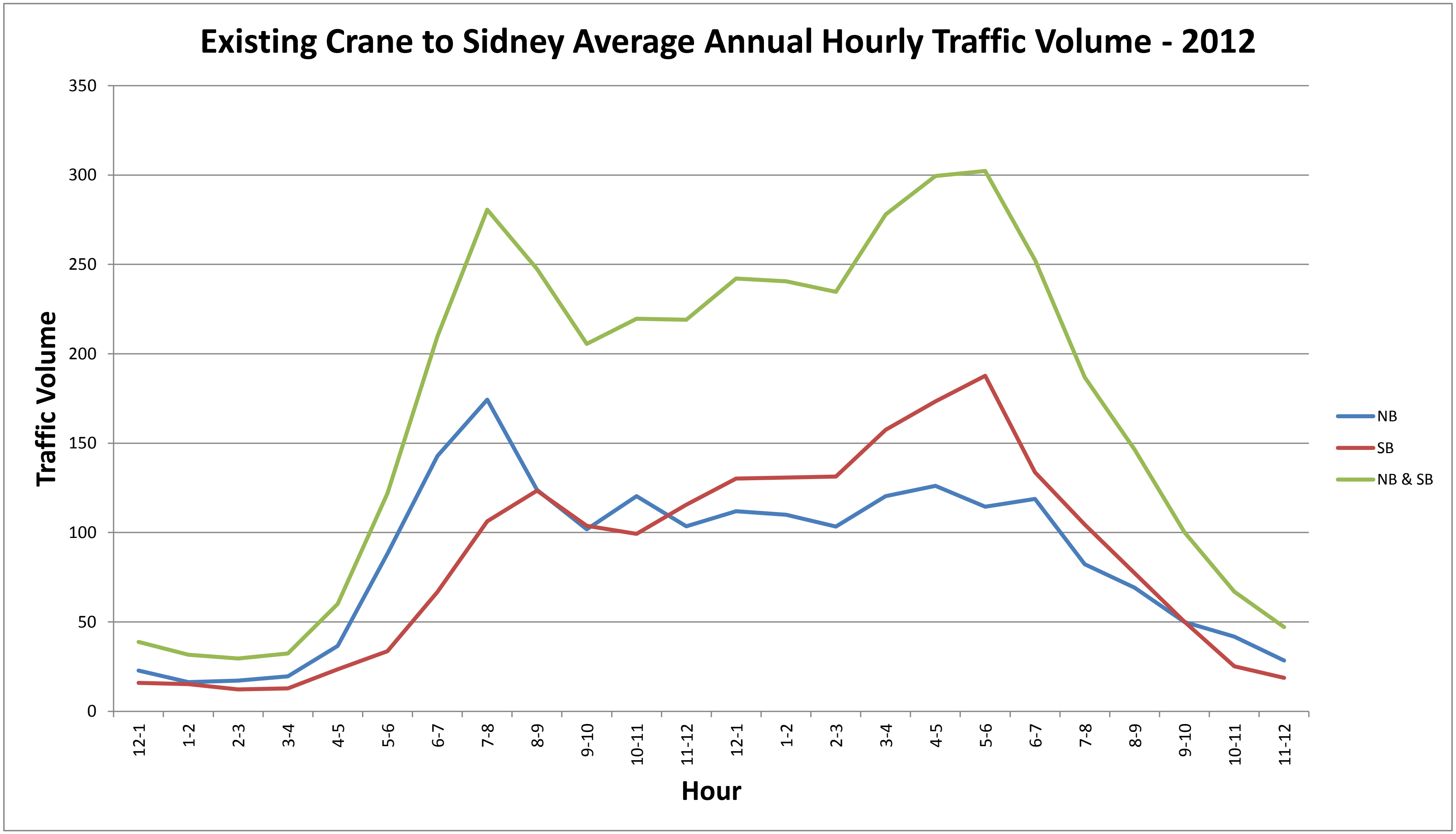
Source: MDT, 2012.

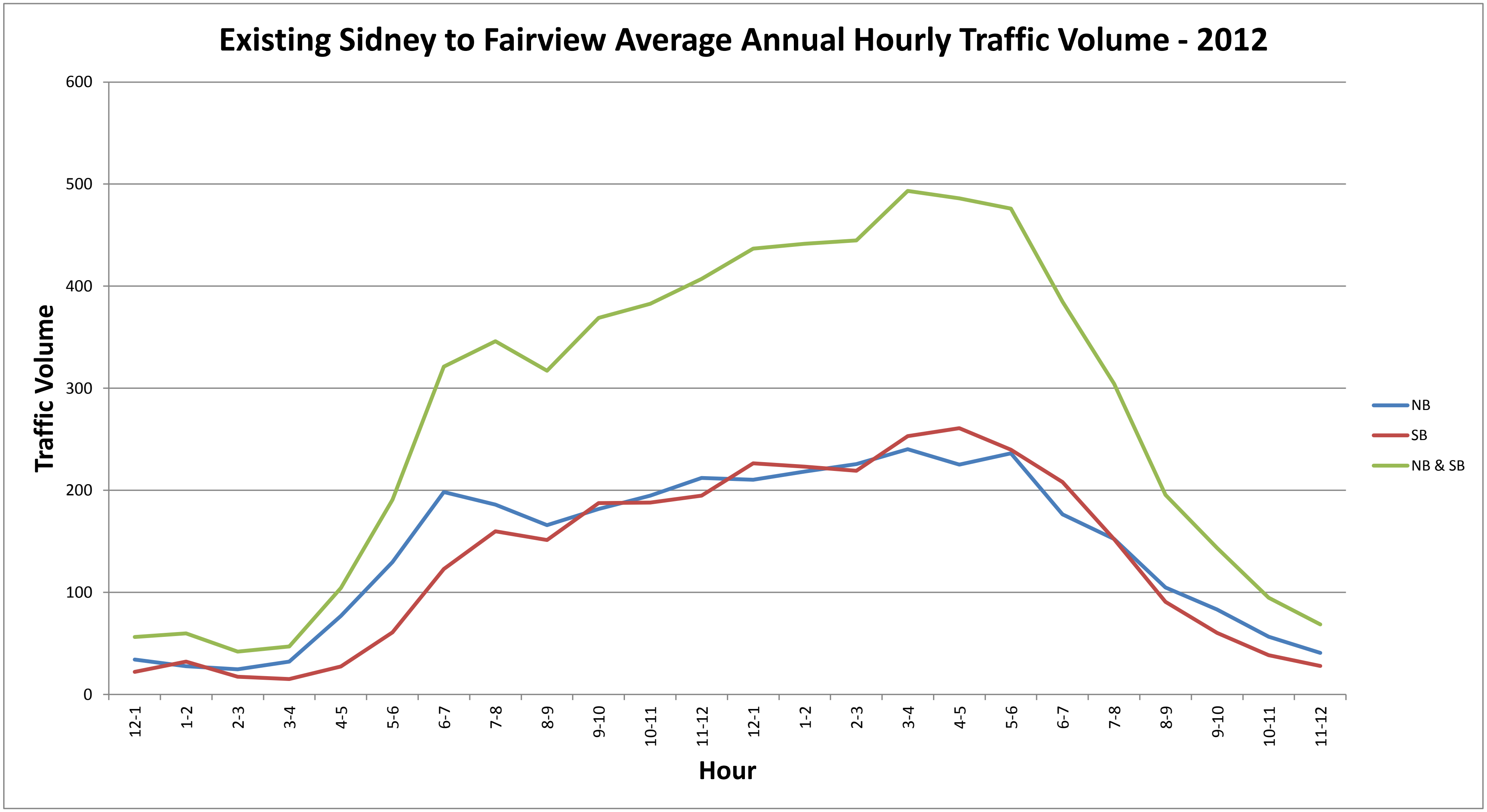


Existing Glendive to Savage Annual Average Hourly Traffic Volume - 2012
Traffic Volume
300
250
200
150
100
50
0
12-1
1-2
2-3
3-4
4-5
5-6
6-7
7-8
8-9
9-10
10-11
11-12
12-1
1-2
2-3
3-4
4-5
5-6
6-7
7-8
8-9
9-10
10-11
11-12
Hour
NB
SB
NB & SB



Existing Savage to Crane Average Annual Hourly Traffic Volume - 2012
Traffic Volume
350
300
250
200
150
100
50
0
12-1
1-2
2-3
3-4
4-5
5-6
6-7
7-8
8-9
9-10
10-11
11-12
12-1
1-2
2-3
3-4
4-5
5-6
6-7
7-8
8-9
9-10
10-11
11-12
Hour
NB
SB
NB & SB


Existing Crane to Sidney Average Annual Hourly Traffic Volume - 2012
Traffic Volume
350
300
250
200
150
100
50
0
12-1
1-2
2-3
3-4
4-5
5-6
6-7
7-8
8-9
9-10
10-11
11-12
12-1
1-2
2-3
3-4
4-5
5-6
6-7
7-8
8-9
9-10
10-11
11-12
Hour
NB
SB
NB & SB



Existing Sidney to Fairview Average Annual Hourly Traffic Volume - 2012
Traffic Volume
600
500
400
300
200
100
0
12-1
1-2
2-3
3-4
4-5
5-6
6-7
7-8
8-9
9-10
10-11
11-12
12-1
1-2
2-3
3-4
4-5
5-6
6-7
7-8
8-9
9-10
10-11
11-12
Hour
NB
SB
NB & SB

Table 3 Growth Rate Comparison (1990 – 2012)

Time Period	Background Growth Rates		Time Period	Rapid Growth Rates	
	Glendive to Sidney	Sidney to Fairview		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%

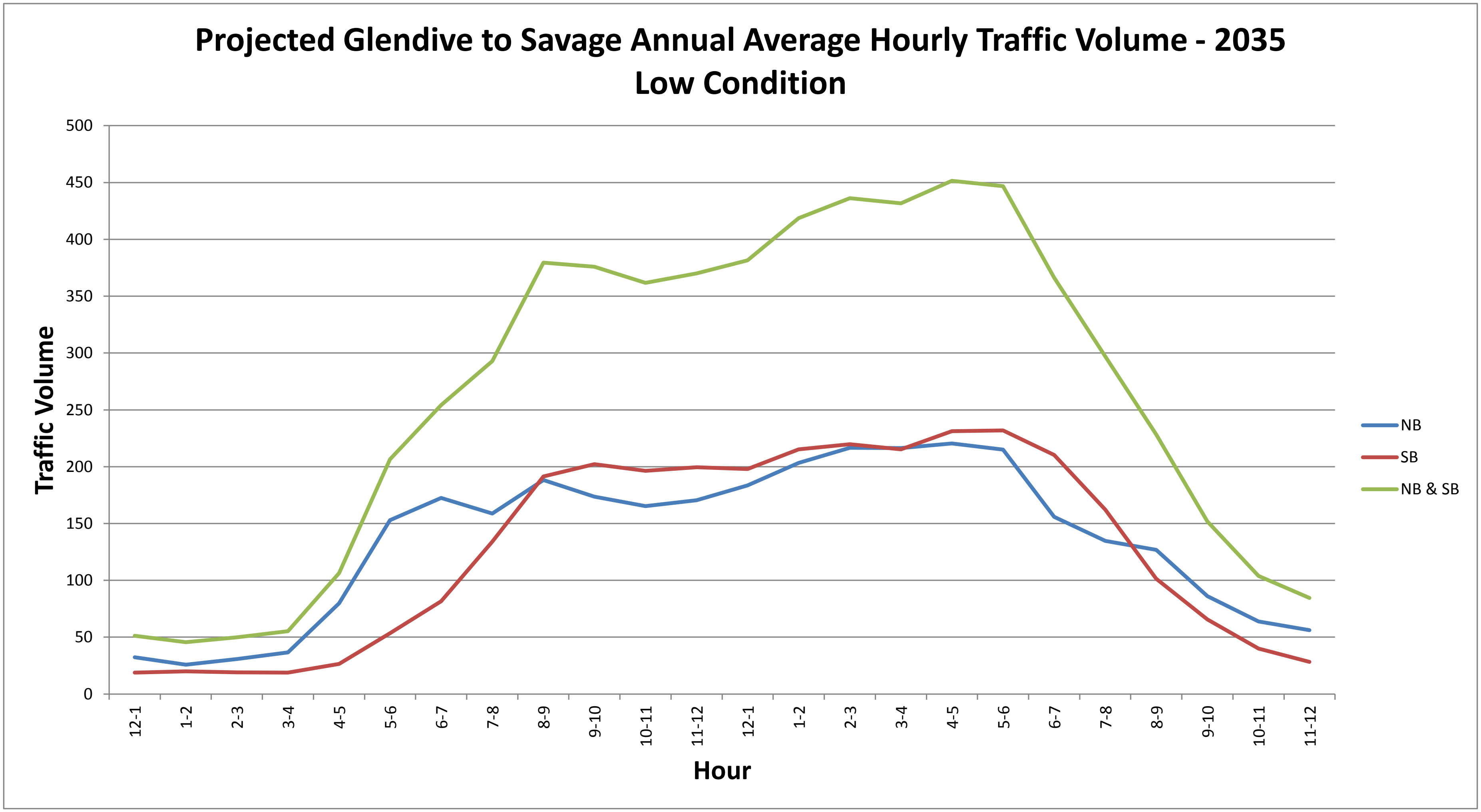
Source: DOWL HKM, 2012.

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

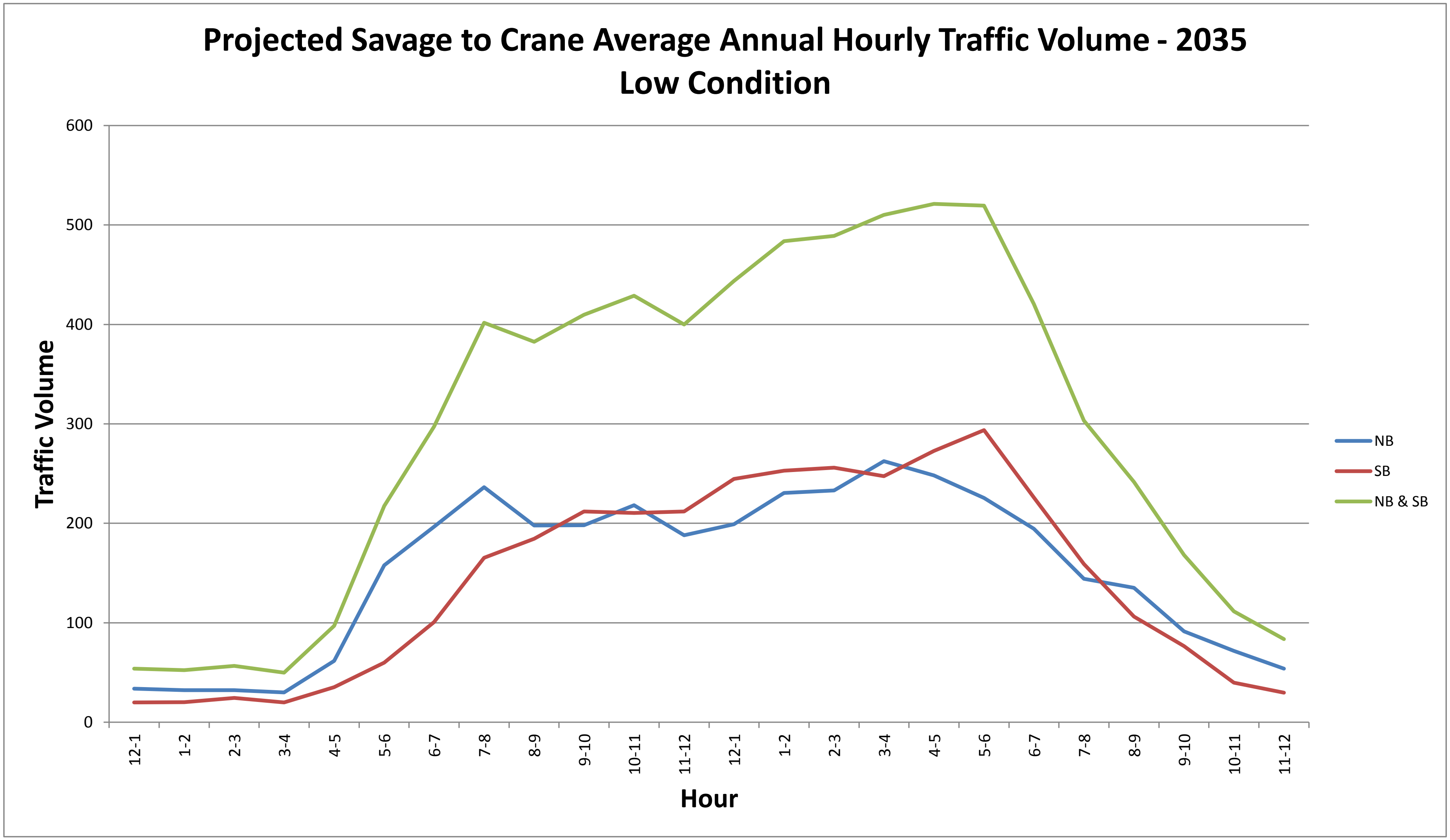
Table 4 Projected AADT Volumes (2013 – 2035)

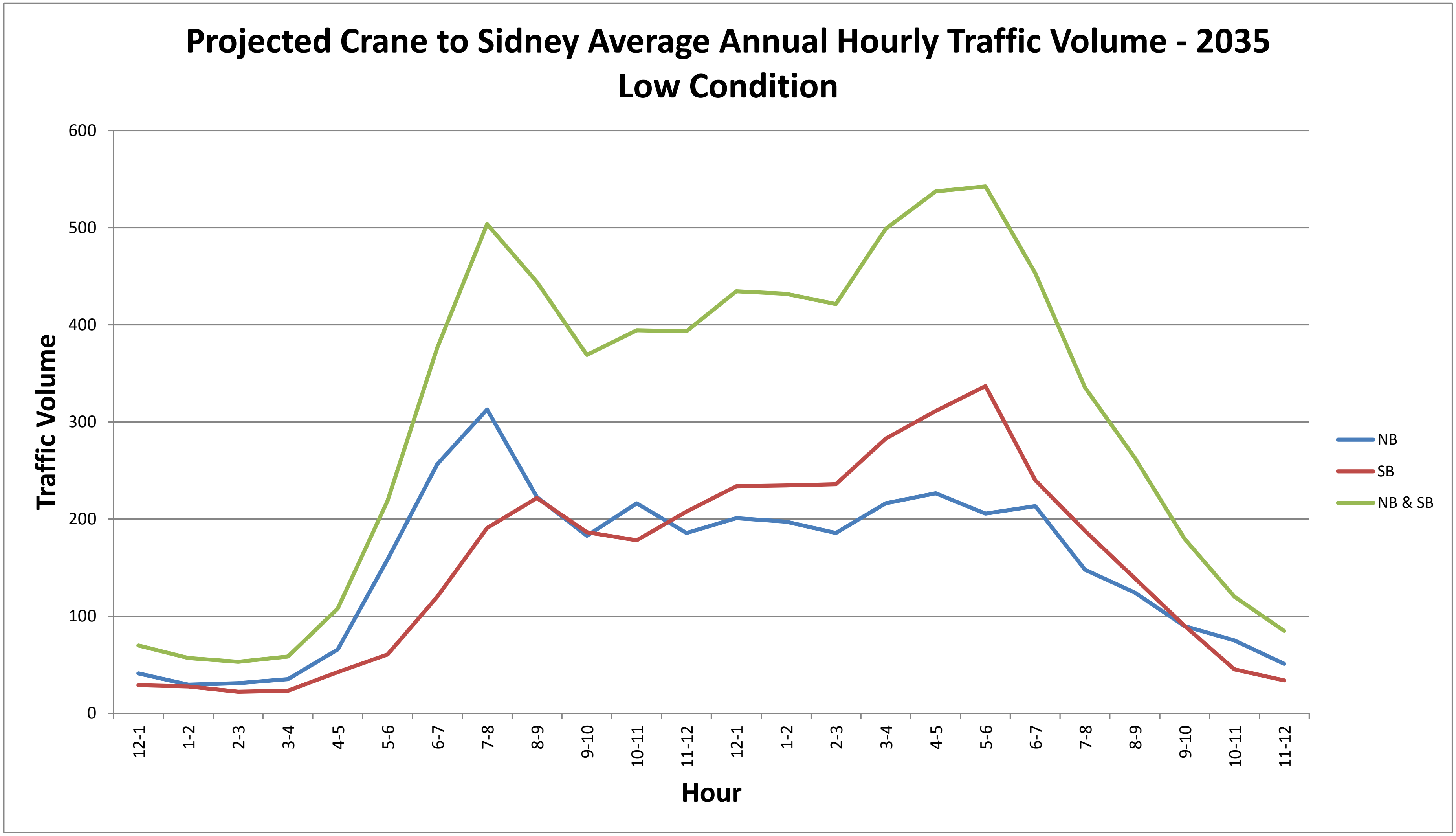
Year	MT 16 Glendive to Sidney RP 0.6 to RP 50.4				MT 200 Sidney to Fairview RP 52.6 to RP 62.5			
	Low Estimate		High Estimate		Low Estimate		High Estimate	
	Growth Rate	AADT	Growth Rate	AADT	Growth Rate	AADT	Growth Rate	AADT
2013		3,658		3,658		7,627		7,627
2014	16.0%	3,954		3,954	13.7%	8,542		8,542
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		4,455	0.7%	5,104		9,974	1.7%	12,192
2027		4,500		5,155		10,104		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

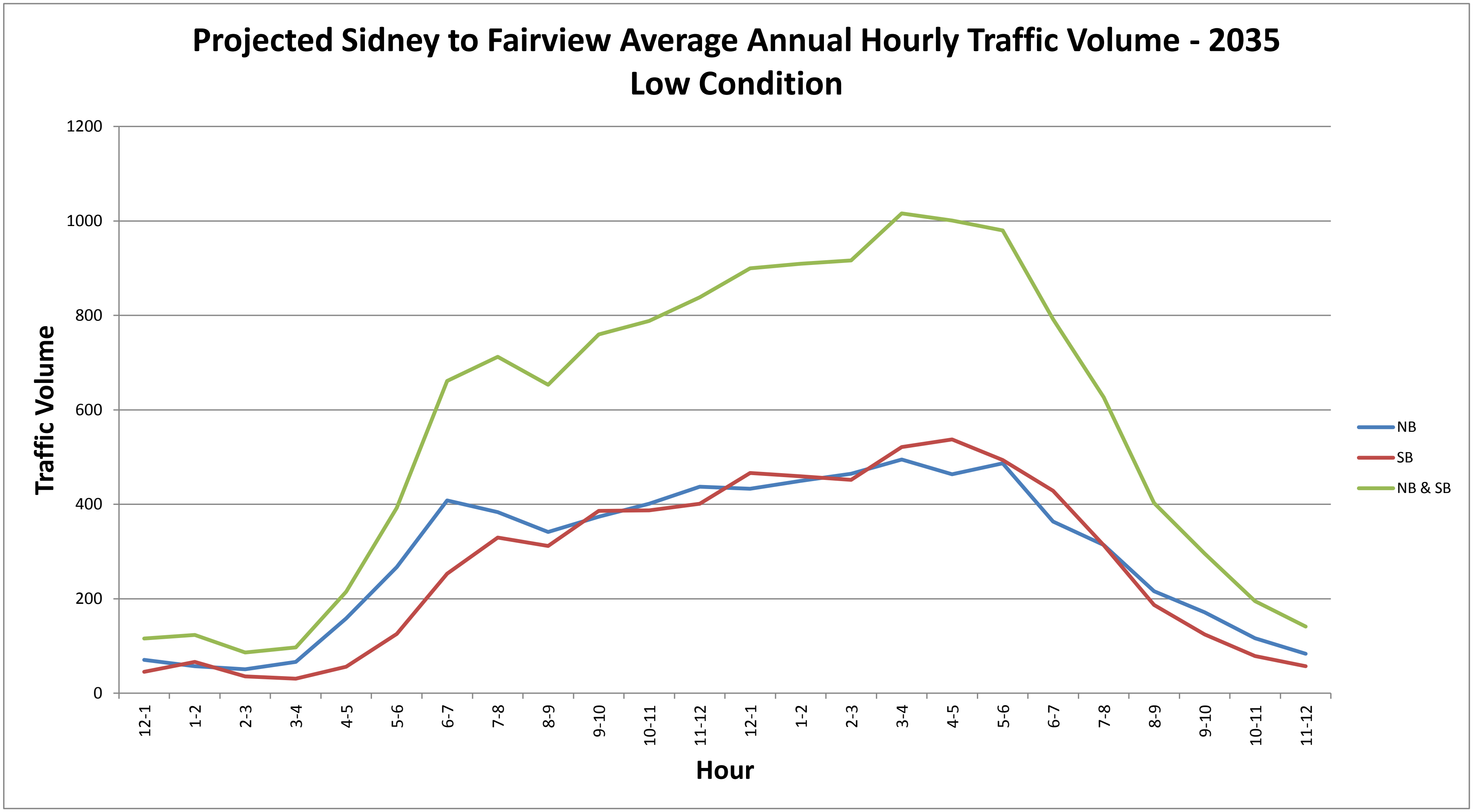
Source: DOWL HKM, 2012.



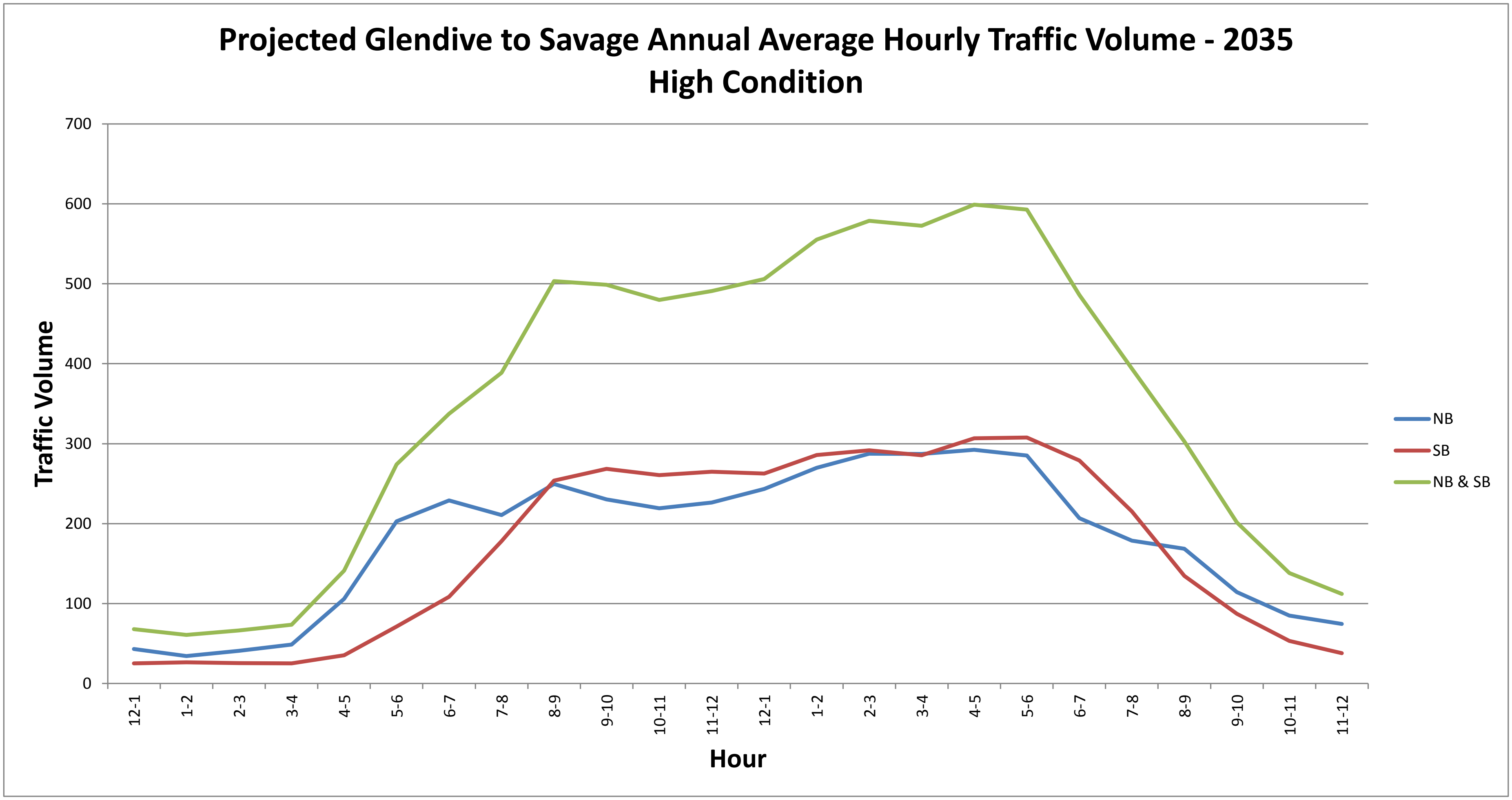
Projected Glendive to Savage Annual Average Hourly Traffic Volume - 2035
Low Condition
Traffic Volume
500
450
400
350
300
250
200
150
100
50
0
12-1
1-2
2-3
3-4
4-5
5-6
6-7
7-8
8-9
9-10
10-11
11-12
12-1
1-2
2-3
3-4
4-5
5-6
6-7
7-8
8-9
9-10
10-11
11-12
Hour
NB
SB
NB & SB


Projected Savage to Crane Average Annual Hourly Traffic Volume - 2035
Low Condition
Traffic Volume
600
500
400
300
200
100
0
12-1
1-2
2-3
3-4
4-5
5-6
6-7
7-8
8-9
9-10
10-11
11-12
12-1
1-2
2-3
3-4
4-5
5-6
6-7
7-8
8-9
9-10
10-11
11-12
Hour
NB
SB
NB & SB

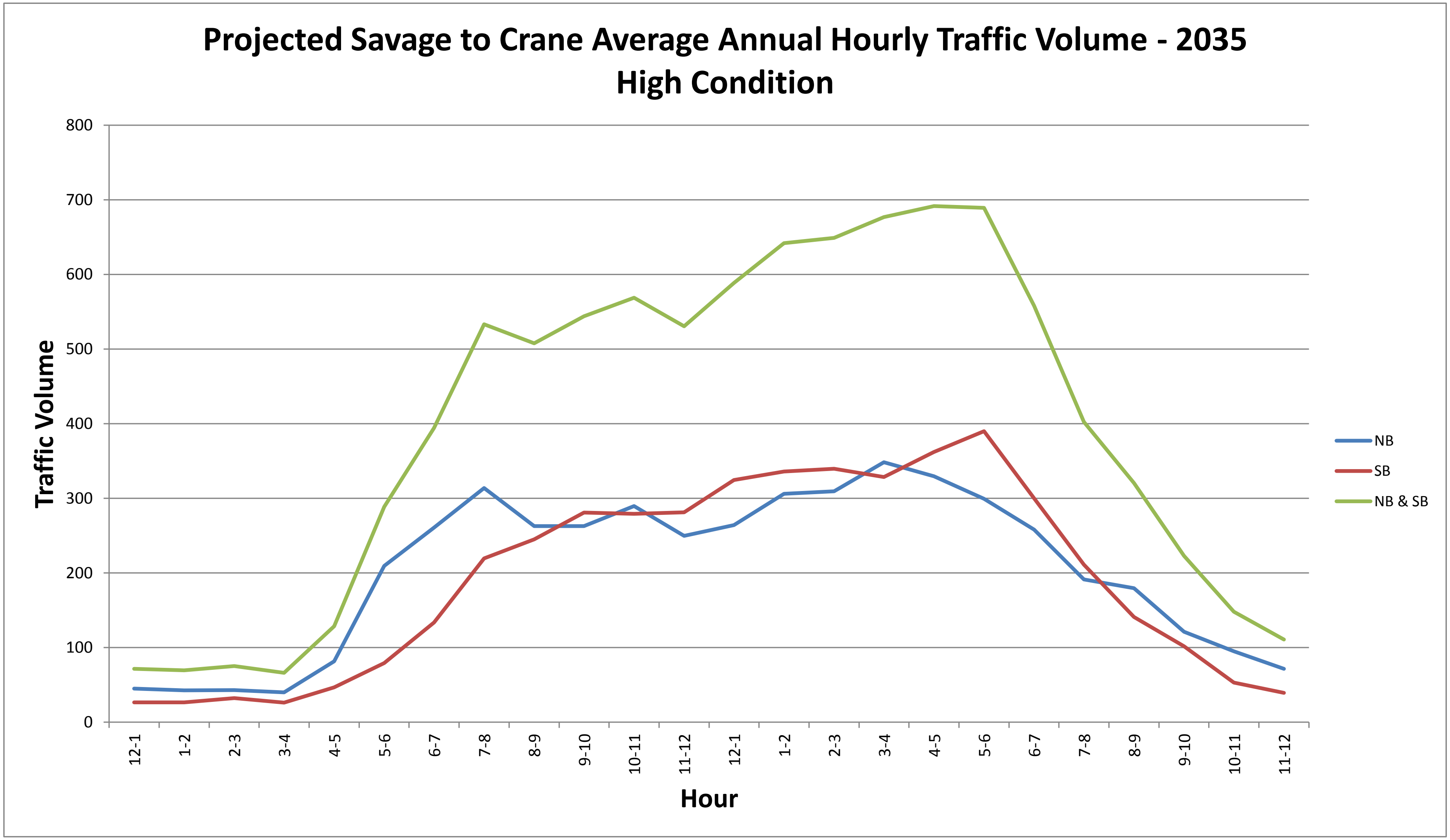

Projected Crane to Sidney Average Annual Hourly Traffic Volume - 2035
Low Condition
Traffic Volume
600
500
400
300
200
100
0
12-1
1-2
2-3
3-4
4-5
5-6
6-7
7-8
8-9
9-10
10-11
11-12
12-1
1-2
2-3
3-4
4-5
5-6
6-7
7-8
8-9
9-10
10-11
11-12
Hour
NB
SB
NB & SB



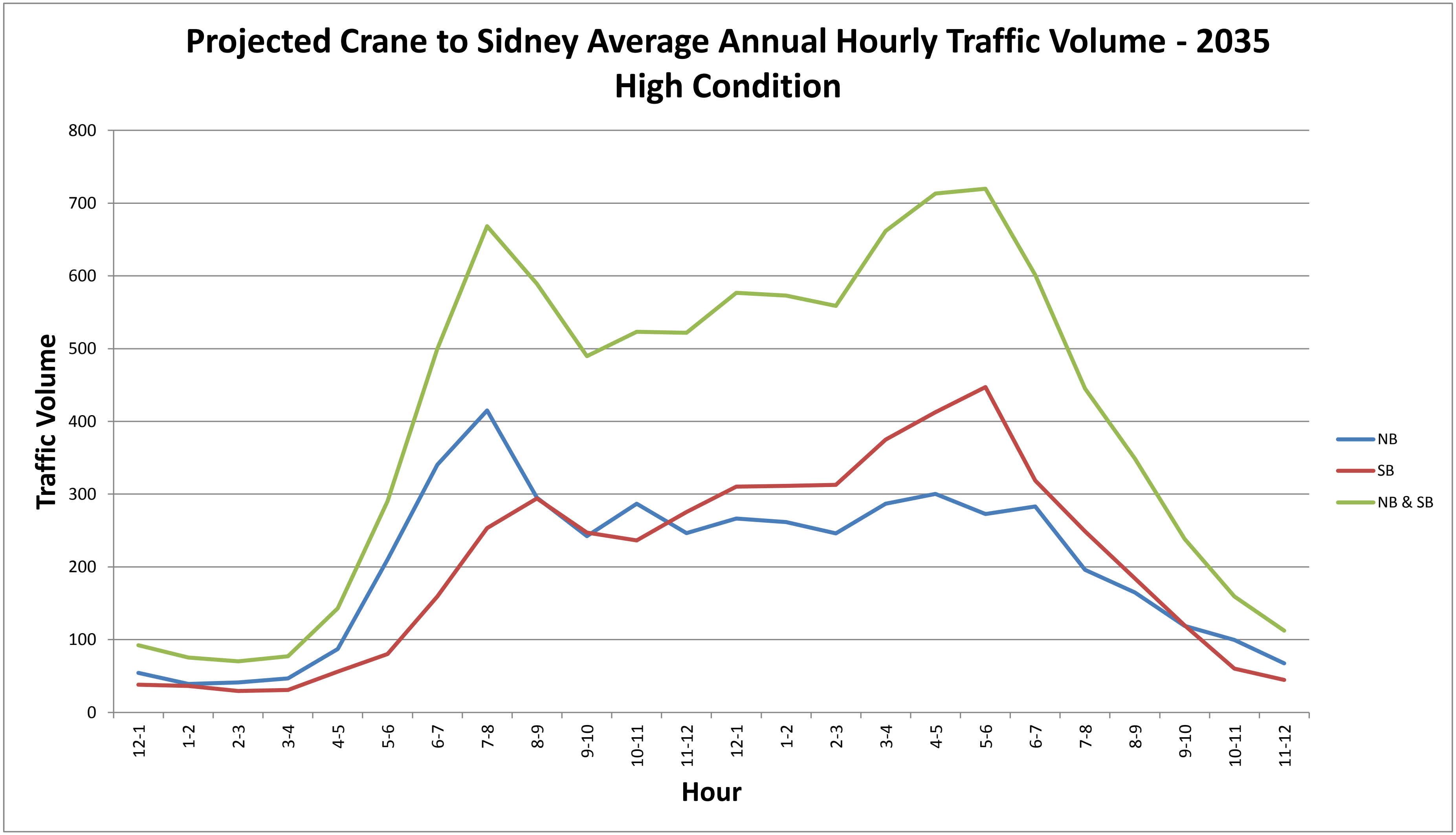
Projected Sidney to Fairview Average Annual Hourly Traffic Volume - 2035
Low Condition
Traffic Volume
Hour
0
200
400
600
800
1000
1200
12-1
1-2
2-3
3-4
4-5
5-6
6-7
7-8
8-9
9-10
10-11
11-12
12-1
1-2
2-3
3-4
4-5
5-6
6-7
7-8
8-9
9-10
10-11
11-12
NB
SB
NB & SB

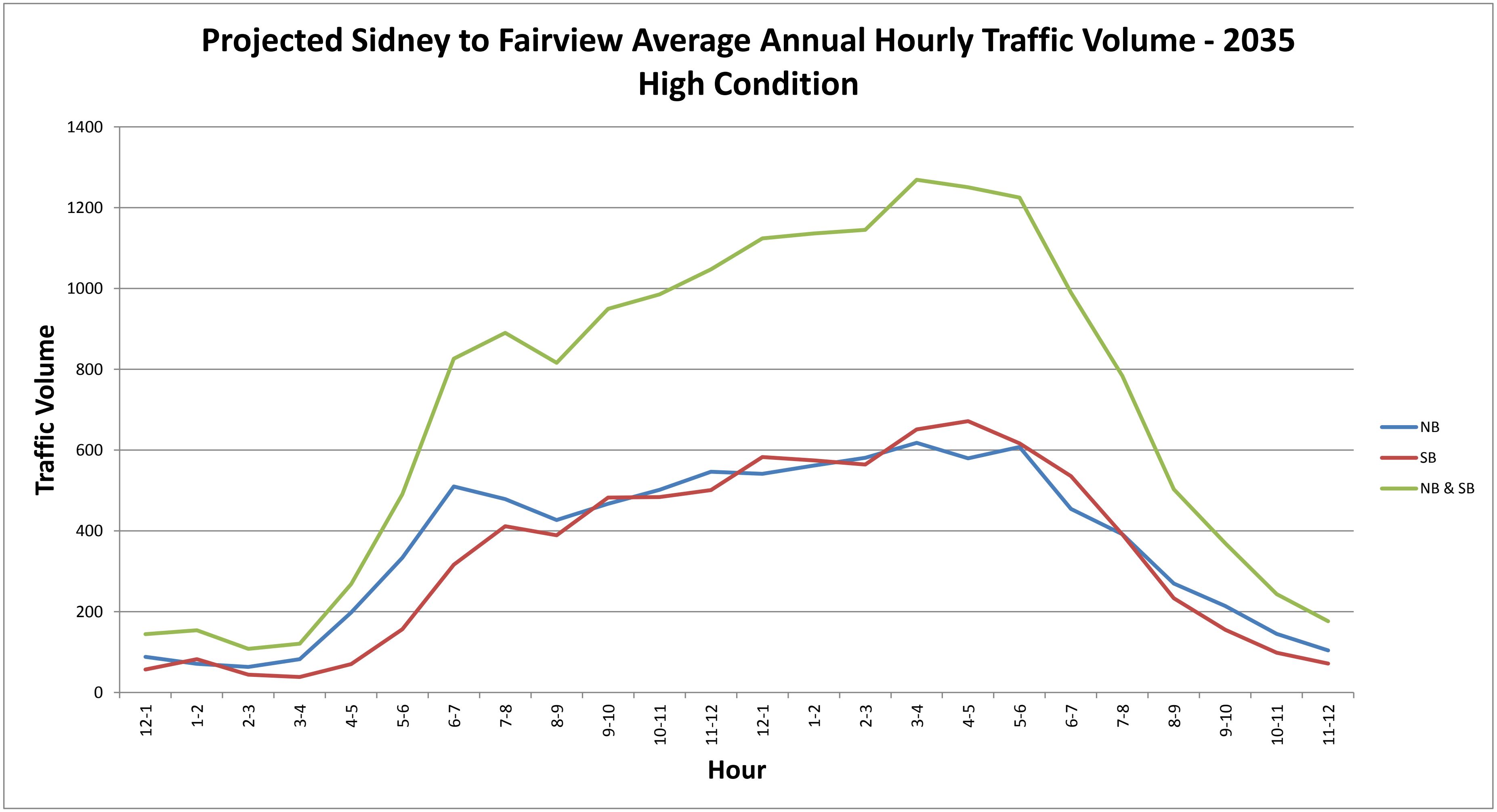


Projected Glendive to Savage Annual Average Hourly Traffic Volume - 2035
High Condition
Traffic Volume
Hour
0
100
200
300
400
500
600
700
12-1
1-2
2-3
3-4
4-5
5-6
6-7
7-8
8-9
9-10
10-11
11-12
12-1
1-2
2-3
3-4
4-5
5-6
6-7
7-8
8-9
9-10
10-11
11-12
NB
SB
NB & SB



Projected Savage to Crane Average Annual Hourly Traffic Volume - 2035
High Condition
Traffic Volume
800
700
600
500
400
300
200
100
0
12-1
1-2
2-3
3-4
4-5
5-6
6-7
7-8
8-9
9-10
10-11
11-12
12-1
1-2
2-3
3-4
4-5
5-6
6-7
7-8
8-9
9-10
10-11
11-12
Hour
NB
SB
NB & SB


Projected Crane to Sidney Average Annual Hourly Traffic Volume - 2035
High Condition
Traffic Volume
800
700
600
500
400
300
200
100
0
12-1
1-2
2-3
3-4
4-5
5-6
6-7
7-8
8-9
9-10
10-11
11-12
12-1
1-2
2-3
3-4
4-5
5-6
6-7
7-8
8-9
9-10
10-11
11-12
Hour
NB
SB
NB & SB



Projected Sidney to Fairview Average Annual Hourly Traffic Volume - 2035
High Condition
Traffic Volume
1400
1200
1000
800
600
400
200
0
12-1
1-2
2-3
3-4
4-5
5-6
6-7
7-8
8-9
9-10
10-11
11-12
12-1
1-2
2-3
3-4
4-5
5-6
6-7
7-8
8-9
9-10
10-11
11-12
Hour
NB
SB
NB & SB

Appendix 7

Operational Analysis Worksheets

Appendix 7

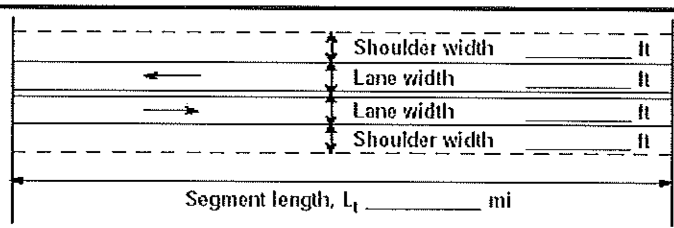
Existing Two-Lane Highway 2012

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

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*	Jurisdiction	*Dawson/Richland County*
Analysis Time Period	*Peak Hour*	Analysis Year	*2012*

Project Description: *MT 16 / MT 200 Glendive to Fairview Corridor Planning Study*

Input Data



☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Analysis direction vol., V_d	*135*veh/h
Opposing direction vol., V_o	*139*veh/h
Shoulder width ft	*8.0*
Lane Width ft	*12.0*
Segment Length mi	*19.4*
Peak-hour factor, PHF	*0.81*
No-passing zone	*27%*
% Trucks and Buses , P_T	*27 %*
% Recreational vehicles, P_R	*4%*
Access points *mi*	*5*/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.6*	*1.6*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.861*	*0.861*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*194*	*199*

Free-Flow Speed from Field Measurement		Estimated Free-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,[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)	*1.3 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Free-flow speed, FFS ($FSS=BFFS-f_{LS}-f_A$)	*63.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.5 mi/h*	Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*58.2 mi/h*
		Percent free flow speed, PFFS	*91.3 %*

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, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.974*	*0.974*
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) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*171*	*176*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*18.8*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*42.2*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*39.6*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*B*
Volume to capacity ratio, *v/c*	*0.13*

Capacity, $C_{d,ATS}$ (Equation 15-12) pc/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

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.

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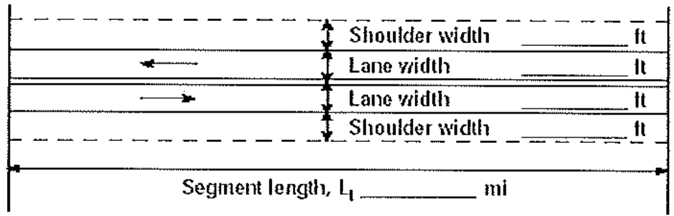
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	David Stoner	Highway / Direction of Travel	MT 16
Agency or Company	DOWL HKM	From/To	RP 0.6 to RP 12.4 SB
Date Performed	4/17/2012	Jurisdiction	Dawson/Richland County
Analysis Time Period	Peak Hour	Analysis Year	2012

Project Description: *MT 16 / MT 200 Glendive to Fairview Corridor Planning Study*

Input Data



Analysis direction vol., V_d 139veh/h

Opposing direction vol., V_o 135veh/h

Shoulder width ft 8.0

Lane Width ft 12.0

Segment Length mi 11.8

☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Peak-hour factor, PHF 0.78

No-passing zone 20%

% Trucks and Buses , P_T 29 %

% Recreational vehicles, P_R 4%

Access points *mi* 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	1.6
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)	1.00	1.00
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	209	203

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	65.0 mi/h
Total demand flow rate, both directions, v		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	0.0 mi/h
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	1.8 mi/h
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	2.1 mi/h	Free-flow speed, FFS $(FSS=BFFS-f_{LS}-f_A)$	63.3 mi/h
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	58.0 mi/h
		Percent free flow speed, PFFS	91.6 %

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_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, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	39.5	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	B
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)	*91.6*
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.
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.

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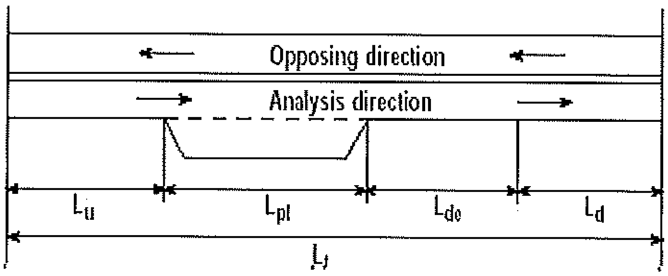
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET WITH PASSING LANE WORKSHEET

General Information		Site Information	
Analyst	*David Stoner*	Highway of Travel	*MT 16*
Agency or Company	*DOWL HKM*	From/To	*RP 20.0 to Savage NB*
Date Performed	*4/17/2012*	Jurisdiction	*Dawson/Richland County*
Analysis Time Period	*Peak Hour*	Analysis Year	*2012*

Project Description: *MT 16 / MT 200 Glendive to Fairview Corridor Planning Study*

Input Data

☑ Class I highway ☐ Class II highway ☐ Class III highway



Shoulder width (ft)	*8.0*
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)	*37.3*
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)	*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_{pl}+ L_{de})	*7.90*
Adj. factor for the effect of passing lane on average speed, f_{pl} (Exhibit 15-28)	*1.08*
Average travel speed including passing lane[2], $ATS_{pl} = (ATS_d * L_t) / (L_u+L_d+(L_{pl}/f_{pl})+ (2L_{de}/(1+f_{pl,ATS})))$	*59.7*
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)	*13.00*
Length of two-lane highway downstream of effective length of the passing lane for percent-time-following, $L_d = L_t-(L_u+ L_{pl}+ L_{de})$	*-3.40*
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], $PTSF_{pl}$(%) $PTSF_{pl}= PTSF_d[L_u+L_d+f_{pl,PTSF}L_{pl}+((1+f_{pl,PTSF})/2)L_{de}]/L_t$	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	
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 Worksheet.	

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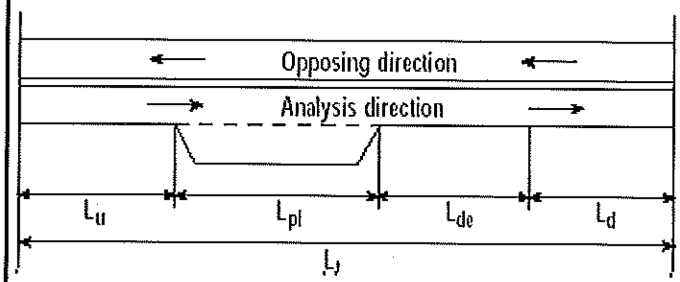
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET WITH PASSING LANE WORKSHEET

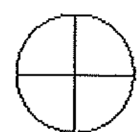
General Information		Site Information	
Analyst	*David Stoner*	Highway of Travel	*MT 16*
Agency or Company	*DOWL HKM*	From/To	*RP 12.4 to RP 22.0 SB*
Date Performed	*4/17/2012*	Jurisdiction	*Dawson/Richland County*
Analysis Time Period	*Peak Hour*	Analysis Year	*2012*

Project Description: *MT 16 / MT 200 Glendive to Fairview Corridor Planning Study*

Input Data

☑ Class I highway ☐ Class II highway ☐ Class III highway





Show North 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, 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)	*59.1*
Percent time-spent-following, $PTSF_d$ (from Directional Two-Lane Highway Segment Worksheet)	*37.1*
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)	*1.70*
Length of two-lane highway downstream of effective length of the passing lane for avg travel speed, L_d $L_d = L_t - (L_u + L_{pl} + L_{de})$	*6.00*
Adj. factor for the effect of passing lane on average speed, f_{pl} (Exhibit 15-28)	*1.09*
Average travel speed including passing lane[2], $ATS_{pl} = (ATS_d * L_t) / (L_u + L_d + (L_{pl}/f_{pl}) + (2L_{de}/(1+f_{pl,ATS})))$	*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 lane for percent-time-following, $L_d = L_t - (L_u + L_{pl} + L_{de})$	*-5.30*
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], $PTSF_{pl}$(%) $PTSF_{pl}= PTSF_d[L_u+L_d+f_{pl,PTSF}L_{pl}+((1+f_{pl,PTSF})/2)L_{de}]/L_t$	25.2
Level of Service and Other Performance Measures[4]	
Level of service including passing lane LOS_{pl} (Exhibit 15-3)	A
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

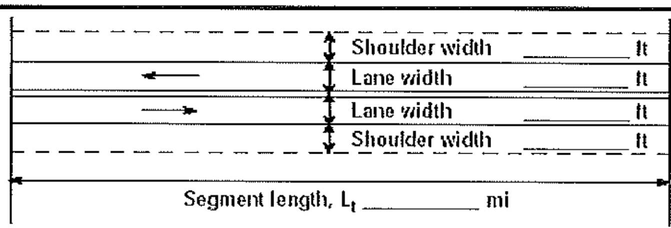
1. If LOS_d=F, passing lane analysis cannot be performed.
2. If L_d <0, use alternative Equation 15-18.
3. If L_d<0, use alternative Equation 15-16.
4. v/c, VMT_{15} and VMT_{60} are calculated on Directional Two-Lane Highway Segment Worksheet.

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

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*	Jurisdiction	*Dawson/Richland County*
Analysis Time Period	*Peak Hour*	Analysis Year	*2012*

Project Description: *MT 16 / MT 200 Glendive to Fairview Corridor Planning Study*

Input Data



☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Analysis direction vol., V_d	*139*veh/h
Opposing direction vol., V_o	*135*veh/h
Shoulder width ft	*8.0*
Lane Width ft	*12.0*
Segment Length mi	*9.5*
Peak-hour factor, PHF	*0.78*
No-passing zone	*22%*
% Trucks and Buses , P_T	*29 %*
% Recreational vehicles, P_R	*4%*
Access points *mi*	*5/mi*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.6*	*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)	*1.00*	*1.00*
Demand flow rate[2], v_i(pc/h) $v_i=V_i/(PHF^* f_{g,ATS} * f_{HV,ATS})$	*209*	*203*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*65.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*1.3 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.2 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*63.8 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*58.3 mi/h*
		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_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)	*39.7*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*40.1*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*B*
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.
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.

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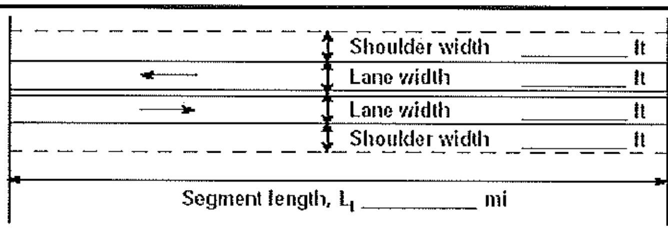
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

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	4/17/2012	Jurisdiction	Dawson/Richland County
Analysis Time Period	Peak Hour	Analysis Year	2012

Project Description: MT 16 / MT 200 Glendive to Fairview Corridor Planning Study

Input Data



Analysis direction vol., V_d	141veh/h
Opposing direction vol., V_o	171veh/h
Shoulder width ft	8.0
Lane Width ft	12.0
Segment Length mi	10.0

☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi	Up/down
Peak-hour factor, PHF	0.87
No-passing zone	31%
% Trucks and Buses , P_T	23 %
% Recreational vehicles, P_R	4%
Access points *mi*	11/mi

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 Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	69.0 mi/h
Total demand flow rate, both directions, v		Adj. for lane and shoulder width,[4] f_{LS} (Exhibit 15-7)	0.0 mi/h
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	2.8 mi/h
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	2.7 mi/h	Free-flow speed, FFS $(FSS=BFFS-f_{LS}-f_A)$	66.3 mi/h
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	60.4 mi/h
		Percent free flow speed, PFFS	91.1 %

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_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	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, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	37.9	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	B
Volume to capacity ratio, v/c	0.12

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_t (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.
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.

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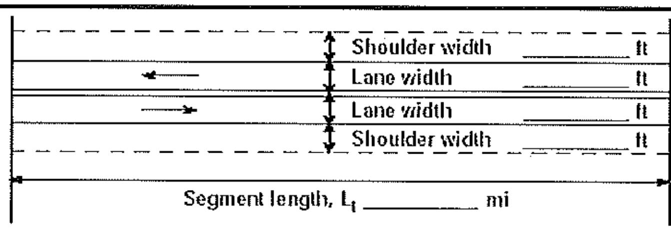
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

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*	Jurisdiction	*Dawson/Richland County*
Analysis Time Period	*Peak Hour*	Analysis Year	*2012*

Project Description: *MT 16 / MT 200 Glendive to Fairview Corridor Planning Study*

Input Data



☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Analysis direction vol., V_d	*171*veh/h
Opposing direction vol., V_o	*141*veh/h
Shoulder width ft	*8.0*
Lane Width ft	*12.0*
Segment Length mi	*10.0*
Grade Length mi Up/down	
Peak-hour factor, PHF	*0.84*
No-passing zone	*19%*
% Trucks and Buses , P_T	*25* %
% Recreational vehicles, P_R	*4%*
Access points *mi*	*11*/mi

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_i (pc/h) $v_i=V_i/(PHF^{*} f_{g,ATS} {}^{*} f_{HV,ATS})$	*229*	*193*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*66.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS} (Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*2.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.0 mi/h*	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*63.3 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*58.0 mi/h*
		Percent free flow speed, PFFS	*91.6 %*

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, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.976*	*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*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}{}^{*}(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*42.5*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*B*
Volume to capacity ratio, *v/c*	*0.15*

Capacity, $C_{d,ATS}$ (Equation 15-12) pc/h	*1479*
Capacity, $C_{d,PTSF}$ (Equation 15-13) pc/h	*1659*
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.
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.

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DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

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	2012

Project Description: MT 16 / MT 200 Glendive to Fairview Corridor Planning Study

Input Data

Shoulder width ____ ft
Lane width ____ ft
Lane width ____ ft
Shoulder width ____ ft
Segment length, L_t ____ mi

Show North Arrow

Analysis direction vol., V_d	151veh/h
Opposing direction vol., V_o	232veh/h
Shoulder width ft	8.0
Lane Width ft	12.0
Segment Length mi	8.9

☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length	mi	Up/down
Peak-hour factor, PHF		0.80
No-passing zone		24%
% Trucks and Buses , P_T		19 %
% Recreational vehicles, P_R		4%
Access points *mi*		12/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	1.5	1.4
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.913	0.929
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	1.00	1.00
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF^* f_{g,ATS} * f_{HV,ATS})$	207	312

Free-Flow Speed from Field Measurement		Estimated Free-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,[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)	3.0 mi/h
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Free-flow speed, FFS $(FSS=BFFS-f_{LS}-f_A)$	62.0 mi/h
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	1.9 mi/h	Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	56.1 mi/h
		Percent free flow speed, PFFS	90.5 %

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, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.981	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_i(pc/h) $v_i=V_i/(PHF^*f_{HV,PTSF}^* f_{g,PTSF})$	192	296
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	23.2	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	37.7	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	38.0	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	B
Volume to capacity ratio, *v/c*	0.13

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_t (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.
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.

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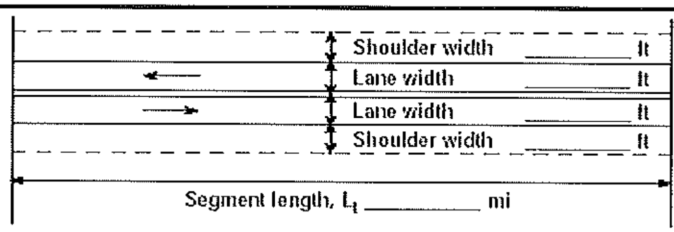
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*David Stoner*	Highway / Direction of Travel	*MT 16*
Agency or Company	*DOWL HKM*	From/To	*Crane to Sidney SB*
Date Performed	*4/17/2012*	Jurisdiction	*Dawson/Richland County*
Analysis Time Period	*Peak Hour*	Analysis Year	*2012*

Project Description: *MT 16 / MT 200 Glendive to Fairview Corridor Planning Study*

Input Data



☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Analysis direction vol., V_d	*232veh/h*
Opposing direction vol., V_o	*151veh/h*
Shoulder width ft	*8.0*
Lane Width ft	*12.0*
Segment Length mi	*8.9*
Grade Length mi	Up/down
Peak-hour factor, PHF	*0.87*
No-passing zone	*22%*
% Trucks and Buses, P_T	*19 %*
% Recreational vehicles, P_R	*4%*
Access points *mi*	*12/mi*

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	*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 (Exhibit 15-8)	*3.0 mi/h*
Free-flow speed, FFS=S_{FM}+0.00776(*v*/ $f_{HV,ATS}$)		Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	*66.0 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*2.2 mi/h*	Average travel speed, ATS_d=FFS-0.00776($v_{d,ATS}$ + $v_{o,ATS}$) - $f_{np,ATS}$	*60.0 mi/h*
		Percent free flow speed, PFFS	*91.0 %*

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))	*0.981*	*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_i(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, $PTSF_d$(%)=$BPTSF_d$+$f_{np,PTSF}$ *($v_{d,PTSF}$ / $v_{d,PTSF}$ + $v_{o,PTSF}$)	*50.2*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.19*

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

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.

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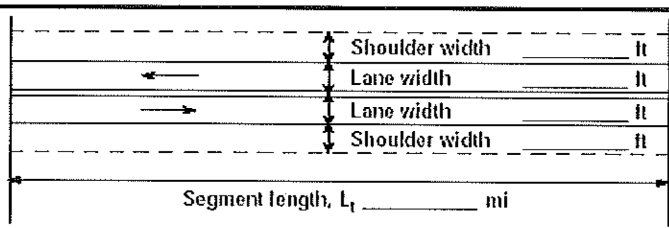
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		*Site Information*	
Analyst	*David Stoner*	Highway / Direction of Travel	*MT 200*
Agency or Company	*DOWL HKM*	From/To	*Sidney to Fairview EB*
Date Performed	*4/17/2012*	Jurisdiction	*Dawson/Richland County*
Analysis Time Period	*Peak Hour*	Analysis Year	*2012*

Project Description: *MT 16 / MT 200 Glendive to Fairview Corridor Planning Study*

Input Data



☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Analysis direction vol., V_d	257veh/h
Opposing direction vol., V_o	254veh/h
Shoulder width ft	8.0
Lane Width ft	12.0
Segment Length mi	9.9
Grade Length mi Up/down	
Peak-hour factor, PHF	0.83
No-passing zone	17%
% Trucks and Buses , P_T	17 %
% Recreational vehicles, P_R	4%
Access points *mi*	16/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	1.4	1.4
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.936	0.936
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	327

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	69.0 mi/h
Total demand flow rate, both directions, v		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	0.0 mi/h
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	4.0 mi/h
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	1.8 mi/h	Free-flow speed, FFS $(FSS=BFFS-f_{LS}-f_A)$	65.0 mi/h
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	58.1 mi/h
		Percent free flow speed, PFFS	89.3 %

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, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.983	0.983
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) $v_i=V_i/(PHF^*f_{HV,PTSF}^* f_{g,PTSF})$	315	311
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	33.8	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	34.3	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF} *(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	51.1	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	C
Volume to capacity ratio, v/c	0.21

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	

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.

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DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	David Stoner	Highway / Direction of Travel	MT 200
Agency or Company	DOWL HKM	From/To	Sidney to Fairview WB
Date Performed	4/17/2012	Jurisdiction	Dawson/Richland County
Analysis Time Period	Peak Hour	Analysis Year	2012

Project Description: *MT 16 / MT 200 Glendive to Fairview Corridor Planning Study*

Input Data

Shoulder width ______ ft
Lane width ______ ft
Lane width ______ ft
Shoulder width ______ ft
Segment length, L_t ______ mi

Show North Arrow

☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Analysis direction vol., V_d	254veh/h
Opposing direction vol., V_o	257veh/h
Shoulder width ft	8.0
Lane Width ft	12.0
Segment Length mi	9.9
Grade Length mi Up/down	
Peak-hour factor, PHF	0.86
No-passing zone	15%
% Trucks and Buses , P_T	25 %
% Recreational vehicles, P_R	4%
Access points *mi*	16/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	1.4	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], $f_{g,ATS}$ (Exhibit 15-9)	1.00	1.00
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	325	329

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	66.0 mi/h
Total demand flow rate, both directions, v		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	0.0 mi/h
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	4.0 mi/h
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	1.7 mi/h	Free-flow speed, FFS $(FSS=BFFS-f_{LS}-f_A)$	62.0 mi/h
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	55.3 mi/h
		Percent free flow speed, PFFS	89.1 %

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, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.976	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) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	303	306
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	33.2	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	32.4	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	49.3	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	B
Volume to capacity ratio, *v/c*	0.21

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)	*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.
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.

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Appendix 7

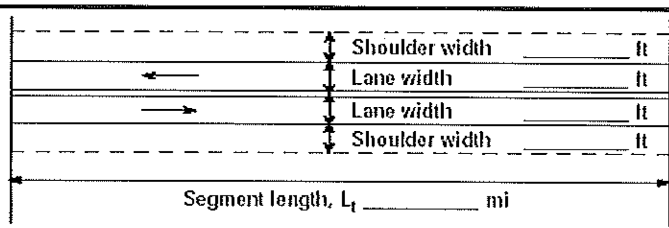
Projected Two-Lane Highway 2035 – Low Condition

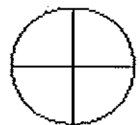
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

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	Jurisdiction	Dawson/Richland County
Analysis Time Period	Peak Hour	Analysis Year	2035 Low

Project Description: *MT 16 / MT 200 Glendive to Fairview Corridor Planning Study*

Input Data




Show North Arrow

Analysis direction vol., V_d	242veh/h
Opposing direction vol., V_o	249veh/h
Shoulder width ft	8.0
Lane Width ft	12.0
Segment Length mi	19.4

☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi	Up/down
Peak-hour factor, PHF	0.81
No-passing zone	27%
% Trucks and Buses , P_T	27 %
% Recreational vehicles, P_R	4%
Access points *mi*	5/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	1.4	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 Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	65.0 mi/h
Total demand flow rate, both directions, v		Adj. for lane and shoulder width,[4] f_{LS} (Exhibit 15-7)	0.0 mi/h
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	1.3 mi/h
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	2.0 mi/h	Free-flow speed, FFS $(FSS=BFFS-f_{LS}-f_A)$	63.8 mi/h
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	56.5 mi/h
		Percent free flow speed, PFFS	88.7 %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	1.1	1.1
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.974	0.974
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) $v_i=V_i/(PHF^*f_{HV,PTSF}*f_{g,PTSF})$	307	316
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	34.5	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	40.7	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	54.6	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	C
Volume to capacity ratio, v/c	0.22

Capacity, $C_{d,ATS}$ (Equation 15-12) pc/h	*1535*
Capacity, $C_{d,PTSF}$ (Equation 15-13) pc/h	*1655*
Percent Free-Flow Speed $PFFS_d$(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	*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.
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.

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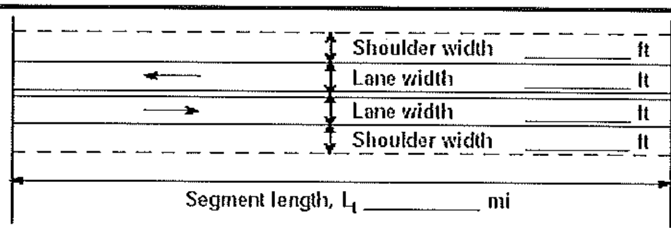
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*David Stoner*	Highway / Direction of Travel	*MT 16*
Agency or Company	*DOWL HKM*	From/To	*RP 0.6 to RP 12.4 SB*
Date Performed	*4/17/2012*	Jurisdiction	*Dawson/Richland County*
Analysis Time Period	*Peak Hour*	Analysis Year	*2035 Low*

Project Description: *MT 16 / MT 200 Glendive to Fairview Corridor Planning Study*

Input Data



☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Analysis direction vol., V_d	*249veh/h*
Opposing direction vol., V_o	*242veh/h*
Shoulder width ft	*8.0*
Lane Width ft	*12.0*
Segment Length mi	*11.8*
Grade Length mi	Up/down
Peak-hour factor, PHF	*0.78*
No-passing zone	*20%*
% Trucks and Buses , P_T	*29 %*
% Recreational vehicles, P_R	*4%*
Access points *mi*	*7/mi*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	*1.4*	*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_i (pc/h) $v_i=V_i/(\text{PHF}*f_{g,ATS}*f_{HV,ATS})$	*356*	*346*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*65.0 mi/h*
Total demand flow rate, both directions, v		Adj. for lane and shoulder width,[4] f_{LS} (Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*1.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.7 mi/h*	Free-flow speed, FFS $(FSS=BFFS-f_{LS}-f_A)$	*63.3 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*56.1 mi/h*
		Percent free flow speed, PFFS	*88.7 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*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) $v_i=V_i/(\text{PHF}*f_{HV,PTSF}*f_{g,PTSF})$	*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)	*37.0*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*54.9*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*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

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.

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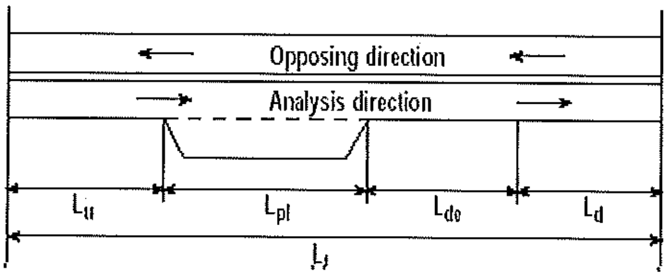
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET WITH PASSING LANE WORKSHEET

General Information		**Site Information**	
Analyst	*David Stoner*	Highway of Travel	*MT 16*
Agency or Company	*DOWL HKM*	From/To	*RP 20.0 to Savage NB*
Date Performed	*4/17/2012*	Jurisdiction	*Dawson/Richland County*
Analysis Time Period	*Peak Hour*	Analysis Year	*2035 Low*

Project Description: *MT 16 / MT 200 Glendive to Fairview Corridor Planning Study*

Input Data

☑ Class I highway ☐ Class II highway ☐ Class III highway



Shoulder width (ft)	*8.0*
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)	*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)	*C*
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 $L_d=L_t-(L_u+L_{pl}+L_{de})$	*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], $ATS_{pl} = (ATS_d * L_t) / (L_u+L_d+(L_{pl}/f_{pl})+ (2L_{de}/(1+f_{pl,ATS})))$	*58.1*
Percent free flow speed including passing lane, $PFFS_{pl} = (ATS_{pl}/ FFS)$	*91.1*
Percent Time-Spent-Following	
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 lane for percent-time-following, $L_d = L_t-(L_u+ L_{pl}+ L_{de})$	*-1.76*
Adj. factor for the effect of passing lane on percent time-spent-following, $f_{pl,PTSF}$(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)	*B*
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 Worksheet.

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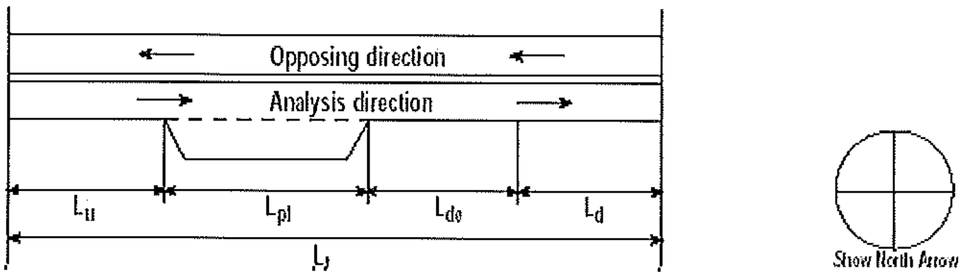
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET WITH PASSING LANE WORKSHEET

General Information		Site Information	
Analyst	*David Stoner*	Highway of Travel	*MT 16*
Agency or Company	*DOWL HKM*	From/To	*RP 12.4 to RP 22.0 SB*
Date Performed	*4/17/2012*	Jurisdiction	*Dawson/Richland County*
Analysis Time Period	*Peak Hour*	Analysis Year	*2035 Low*

Project Description: *MT 16 / MT 200 Glendive to Fairview Corridor Planning Study*

Input Data

☑ Class I highway ☐ Class II highway ☐ Class III highway



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 , L_{pl}	*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 Segment Worksheet)	*52.7*
Level of service[1], LOS_d (from Directional Two-Lane Highway Segment Worksheet)	*C*
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 $L_d=L_t-(L_u+L_{pl}+L_{de})$	*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], $ATS_{pl} = (ATS_d * L_t) / (L_u+L_d+(L_{pl}/f_{pl})+ (2L_{de}/(1+f_{pl,ATS})))$	*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, $L_d = L_t-(L_u+ L_{pl}+ L_{de})$	*-2.92*
Adj. factor for the effect of passing lane on percent time-spent-following, $f_{pl,PTSF}$(Exhibit 15-26)	*0.60*

Percent time-spent-following including passing lane[3], $PTSF_{pl}$(%) $PTSF_{pl}= PTSF_d[L_u+L_d+f_{pl,PTSF}L_{pl}+((1+f_{pl,PTSF})/2)L_{de}]/L_t$	*37.7*
Level of Service and Other Performance Measures[4]	
Level of service including passing lane LOS_{pl} (Exhibit 15-3)	*B*
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	
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.	

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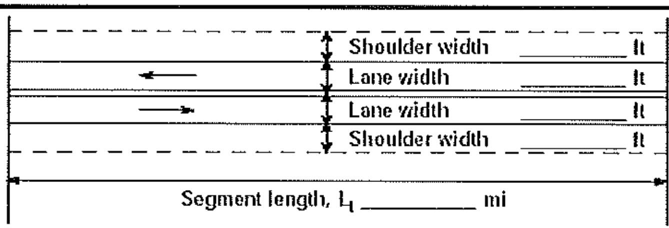
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

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	Jurisdiction	Dawson/Richland County
Analysis Time Period	Peak Hour	Analysis Year	2035 Low

Project Description: *MT 16 / MT 200 Glendive to Fairview Corridor Planning Study*

Input Data



☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Analysis direction vol., V_d	249veh/h
Opposing direction vol., V_o	242veh/h
Shoulder width ft	8.0
Lane Width ft	12.0
Segment Length mi	9.5
Grade Length mi	Up/down
Peak-hour factor, PHF	0.78
No-passing zone	22%
% Trucks and Buses , P_T	29 %
% Recreational vehicles, P_R	4%
Access points *mi*	5/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	1.4	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_i (pc/h) $v_i=V_i/(PHF^* f_{g,ATS} * f_{HV,ATS})$	356	346

Free-Flow Speed from Field Measurement		Estimated Free-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,[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)	1.3 mi/h
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Free-flow speed, FFS $(FSS=BFFS-f_{LS}-f_A)$	63.8 mi/h
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	1.8 mi/h	Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	56.5 mi/h
		Percent free flow speed, PFFS	88.7 %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	1.1	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) $v_i=V_i/(PHF^*f_{HV,PTSF}^* f_{g,PTSF})$	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)	37.9	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	55.3	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	C
Volume to capacity ratio, *v/c*	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

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.

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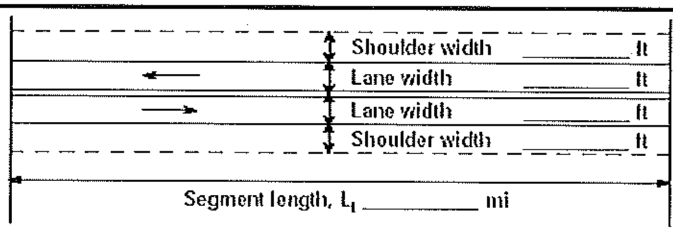
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

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	4/17/2012	Jurisdiction	Dawson/Richland County
Analysis Time Period	Peak Hour	Analysis Year	2035 - Low

Project Description: *MT 16 / MT 200 Glendive to Fairview Corridor Planning Study*

Input Data



☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Analysis direction vol., V_d	253veh/h
Opposing direction vol., V_o	307veh/h
Shoulder width ft	8.0
Lane Width ft	12.0
Segment Length mi	10.0
Grade Length mi Up/down	
Peak-hour factor, PHF	0.87
No-passing zone	31%
% Trucks and Buses , P_T	23 %
% Recreational vehicles, P_R	4%
Access points *mi*	11/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	1.4	1.3
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.916	0.935
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	1.00	1.00
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	317	377

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,[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)	2.8 mi/h
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Free-flow speed, FFS ($FSS=BFFS-f_{LS}-f_A$)	66.3 mi/h
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	2.1 mi/h	Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	58.8 mi/h
		Percent free flow speed, PFFS	88.7 %

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	1.1	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_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	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	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	C
Volume to capacity ratio, *v/c*	0.20

Capacity, $C_{d,ATS}$ (Equation 15-12) pc/h	*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

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.

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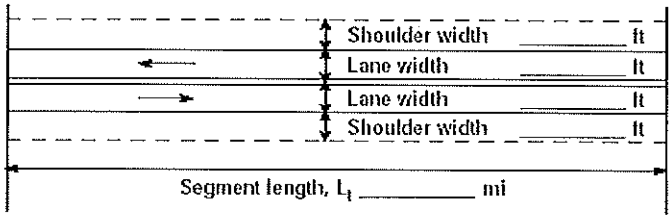
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

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*	Jurisdiction	*Dawson/Richland County*
Analysis Time Period	*Peak Hour*	Analysis Year	*2035 - Low*

Project Description: *MT 16 / MT 200 Glendive to Fairview Corridor Planning Study*

Input Data



☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Analysis direction vol., V_d	*307*veh/h
Opposing direction vol., V_o	*253*veh/h
Shoulder width ft	*8.0*
Lane Width ft	*12.0*
Segment Length mi	*10.0*
Grade Length mi	Up/down
Peak-hour factor, PHF	*0.84*
No-passing zone	*19%*
% Trucks and Buses , P_T	*25* %
% Recreational vehicles, P_R	*4%*
Access points *mi*	*11*/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*	*1.4*
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_i(pc/h) $v_i=V_i/(PHF^* f_{g,ATS} * f_{HV,ATS})$	*393*	*331*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*66.0 mi/h*
Total demand flow rate, both directions, v		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*2.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.7 mi/h*	Free-flow speed, FFS ($FSS=BFFS-f_{LS}-f_A$)	*63.3 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*55.9 mi/h*
		Percent free flow speed, PFFS	*88.4 %*

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, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.976*	*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], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*38.7*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*33.9*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF} *(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*57.3*	

Level of Service and Other Performance 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	*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.
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.

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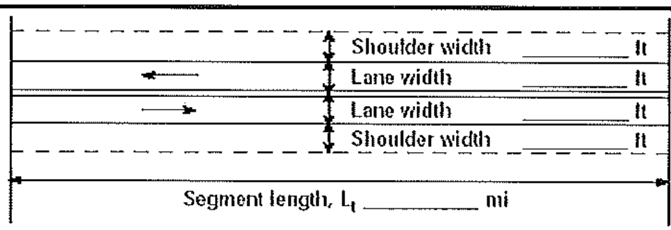
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

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 - Low*

Project Description: *MT 16 / MT 200 Glendive to Fairview Corridor Planning Study*

Input Data



☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Analysis direction vol., V_d	*271*veh/h
Opposing direction vol., V_o	*416*veh/h
Shoulder width ft	*8.0*
Lane Width ft	*12.0*
Segment Length mi	*8.9*
Grade Length mi	Up/down
Peak-hour factor, PHF	*0.80*
No-passing zone	*24%*
% Trucks and Buses , P_T	*19 %*
% Recreational vehicles, P_R	*4%*
Access points *mi*	*12*/mi

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], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*365*	*540*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*65.0 mi/h*
Total demand flow rate, both directions, v		Adj. for lane and shoulder width,[4] f_{LS} (Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*3.0 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.4 mi/h*	Free-flow speed, FFS $(FSS=BFFS-f_{LS}-f_A)$	*62.0 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*53.6 mi/h*
		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)	*1.1*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.981*	*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_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*345*	*520*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*41.1*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*27.9*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*52.2*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.22*

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.
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.

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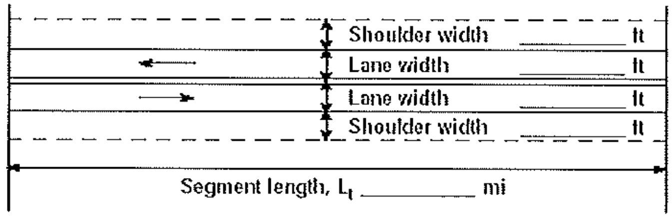
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*David Stoner*	Highway / Direction of Travel	*MT 16*
Agency or Company	*DOWL HKM*	From/To	*Crane to Sidney SB*
Date Performed	*4/17/2012*	Jurisdiction	*Dawson/Richland County*
Analysis Time Period	*Peak Hour*	Analysis Year	*2035 - Low*

Project Description: *MT 16 / MT 200 Glendive to Fairview Corridor Planning Study*

Input Data



Analysis direction vol., V_d	*416*veh/h
Opposing direction vol., V_o	*271*veh/h
Shoulder width ft	*8.0*
Lane Width ft	*12.0*
Segment Length mi	*8.9*

☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi	Up/down
Peak-hour factor, PHF	*0.87*
No-passing zone	*22%*
% Trucks and Buses , P_T	*19 %*
% Recreational vehicles, P_R	*4%*
Access points *mi*	*12/mi*

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (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, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.963*	*0.929*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF^* f_{g,ATS} * f_{HV,ATS})$	*497*	*335*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*69.0 mi/h*
Total demand flow rate, both directions, v		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*3.0 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.9 mi/h*	Free-flow speed, FFS ($FSS=BFFS-f_{LS}-f_A$)	*66.0 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*57.7 mi/h*
		Percent free flow speed, PFFS	*87.4 %*

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*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*1.000*	*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_i(pc/h) $v_i=V_i/(PHF^*f_{HV,PTSF}{}^* f_{g,PTSF})$	*478*	*317*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*47.4*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*28.7*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}{}^*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*64.7*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.31*

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)	*87.4*
Bicycle Level of Service	
Directional demand flow rate in outside lane, v_{OL} (Eq. 15-24) veh/h	*478.2*
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)	*8.51*
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.
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.

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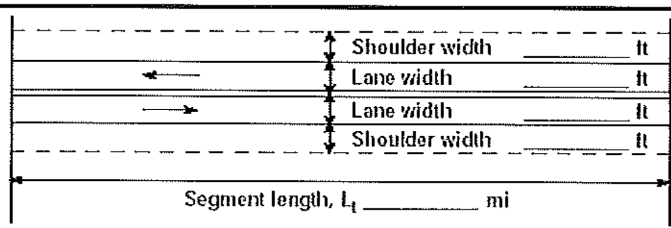
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*David Stoner*	Highway / Direction of Travel	*MT 200*
Agency or Company	*DOWL HKM*	From/To	*Sidney to Fairview EB*
Date Performed	*4/17/2012*	Jurisdiction	*Dawson/Richland County*
Analysis Time Period	*Peak Hour*	Analysis Year	*2035 - Low*

Project Description: *MT 16 / MT 200 Glendive to Fairview Corridor Planning Study*

Input Data



☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Analysis direction vol., V_d	*529veh/h*
Opposing direction vol., V_o	*523veh/h*
Shoulder width ft	*8.0*
Lane Width ft	*12.0*
Segment Length mi	*9.9*
Grade Length mi Up/down	
Peak-hour factor, PHF	*0.83*
No-passing zone	*17%*
% Trucks and Buses , P_T	*17 %*
% Recreational vehicles, P_R	*4%*
Access points *mi*	*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, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.983*	*0.983*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*648*	*641*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*69.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS} (Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*4.0 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.3 mi/h*	Free-flow speed, FFS $(FSS=BFFS-f_{LS}-f_A)$	*65.0 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*53.7 mi/h*
		Percent free flow speed, PFFS	*82.7 %*

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 (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_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*637*	*630*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*60.4*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*21.6*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*71.3*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*D*
Volume to capacity ratio, *v/c*	*0.39*

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

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.

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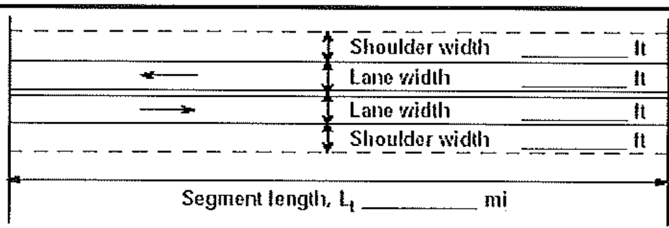
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	David Stoner	Highway / Direction of Travel	MT 200
Agency or Company	DOWL HKM	From/To	Sidney to Fairview WB
Date Performed	4/17/2012	Jurisdiction	Dawson/Richland County
Analysis Time Period	Peak Hour	Analysis Year	2035 - Low

Project Description: *MT 16 / MT 200 Glendive to Fairview Corridor Planning Study*

Input Data



☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Analysis direction vol., V_d	523veh/h
Opposing direction vol., V_o	529veh/h
Shoulder width ft	8.0
Lane Width ft	12.0
Segment Length mi	9.9
Grade Length mi Up/down	
Peak-hour factor, PHF	0.86
No-passing zone	15%
% Trucks and Buses, P_T	25 %
% Recreational vehicles, P_R	4%
Access points *mi*	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_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	623	630

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	66.0 mi/h
Total demand flow rate, both directions, v		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	0.0 mi/h
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	4.0 mi/h
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	1.1 mi/h	Free-flow speed, FFS $(FSS=BFFS-f_{LS}-f_A)$	62.0 mi/h
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	51.1 mi/h
		Percent free flow speed, PFFS	82.5 %

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_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	608	615
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	58.6	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	21.4	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	69.2	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	D
Volume to capacity ratio, *v/c*	0.38

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.
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.

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Appendix 7

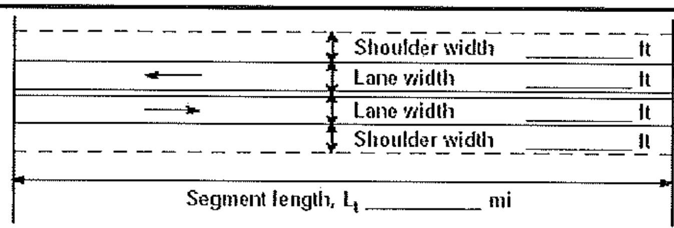
Projected Two-Lane Highway 2035 – High Condition

DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

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*	Jurisdiction	*Dawson/Richland County*
Analysis Time Period	*Peak Hour*	Analysis Year	*2035 High*

Project Description: *MT 16 / MT 200 Glendive to Fairview Corridor Planning Study*

Input Data



☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi	Up/down
Peak-hour factor, PHF	*0.81*
No-passing zone	*27%*
% Trucks and Buses , P_T	*27 %*
% Recreational vehicles, P_R	*4%*
Access points *mi*	*5/mi*

Analysis direction vol., V_d	*321veh/h*
Opposing direction vol., V_o	*331veh/h*
Shoulder width ft	*8.0*
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 Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*65.0 mi/h*
Total demand flow rate, both directions, v		Adj. for lane and shoulder width,[4] f_{LS} (Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*1.3 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.7 mi/h*	Free-flow speed, FFS $(FSS=BFFS-f_{LS}-f_A)$	*63.8 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*55.3 mi/h*
		Percent free flow speed, PFFS	*86.7 %*

Percent Time-Spent-Following

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T(Exhibit 15-18 or 15-19)	*1.1*	*1.0*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.974*	*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_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, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*60.3*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.27*

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	
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.	

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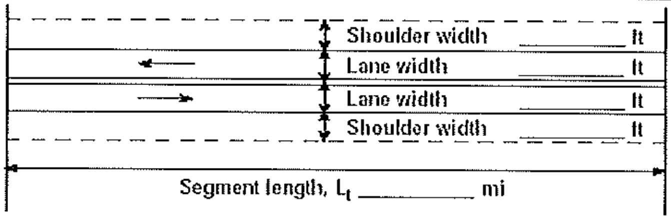
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	David Stoner	Highway / Direction of Travel	MT 16
Agency or Company	DOWL HKM	From/To	RP 0.6 to RP 12.4 SB
Date Performed	4/17/2012	Jurisdiction	Dawson/Richland County
Analysis Time Period	Peak Hour	Analysis Year	2035 High

Project Description: *MT 16 / MT 200 Glendive to Fairview Corridor Planning Study*

Input Data



Analysis direction vol., V_d	331veh/h	☑ Class I highway ☐ Class II highway ☐ Class III highway	
Opposing direction vol., V_o	321veh/h	Terrain	☑ Level ☐ Rolling
Shoulder width ft	8.0	Grade Length mi	Up/down
Lane Width ft	12.0	Peak-hour factor, PHF	0.78
Segment Length mi	11.8	No-passing zone	20%
		% Trucks and Buses , P_T	29 %
		% Recreational vehicles, P_R	4%
		Access points *mi*	7/mi

Average Travel Speed

	Analysis Direction (d)	Opposing Direction (o)
Passenger-car equivalents for trucks, E_T (Exhibit 15-11 or 15-12)	1.3	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_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	461	447

Free-Flow Speed from Field Measurement		Estimated Free-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,[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)	1.8 mi/h
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Free-flow speed, FFS $(FSS=BFFS-f_{LS}-f_A)$	63.3 mi/h
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	1.5 mi/h	Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	54.7 mi/h
		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_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	424	412
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	45.2	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	32.6	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	61.7	

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	*424.4*
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)	*15.39*
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.
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.

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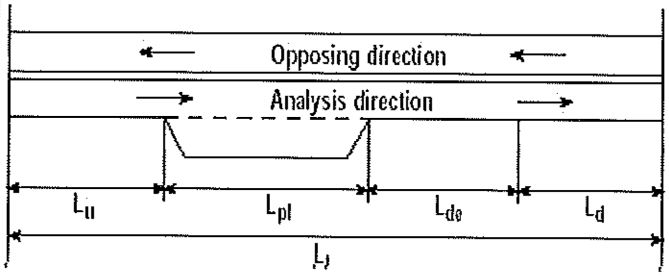
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET WITH PASSING LANE WORKSHEET

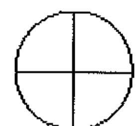
General Information		Site Information	
Analyst	*David Stoner*	Highway of Travel	*MT 16*
Agency or Company	*DOWL HKM*	From/To	*RP 20.0 to Savage NB*
Date Performed	*4/17/2012*	Jurisdiction	*Dawson/Richland County*
Analysis Time Period	*Peak Hour*	Analysis Year	*2035 High*

Project Description: *MT 16 / MT 200 Glendive to Fairview Corridor Planning Study*

Input Data

☑ Class I highway ☐ Class II highway ☐ Class III highway





Shoulder width (ft)	*8.0*
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)	*55.5*
Percent time-spent-following, $PTSF_d$ (from Directional Two-Lane Highway Segment Worksheet)	*59.2*
Level of service[1], LOS_d (from Directional Two-Lane Highway Segment Worksheet)	*C*
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 $L_d=L_t-(L_u+L_{pl}+L_{de})$	*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], $ATS_{pl} = (ATS_d * L_t) / (L_u+L_d+(L_{pl}/f_{pl})+(2L_{de}/(1+f_{pl,ATS})))$	*56.7*
Percent free flow speed including passing lane, $PFFS_{pl} = (ATS_{pl}/FFS)$	*89.0*
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)	*8.04*
Length of two-lane highway downstream of effective length of the passing lane for percent-time-following, $L_d=L_t-(L_u+L_{pl}+L_{de})$	*1.56*
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], $PTSF_{pl}$(%) $PTSF_{pl}= PTSF_d[L_u+L_d+f_{pl,PTSF}L_{pl}+((1+f_{pl,PTSF})/2)L_{de}]/L_t$	47.3
Level of Service and Other Performance Measures[4]	
Level of service including passing lane LOS_{pl} (Exhibit 15-3)	B
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 Worksheet.

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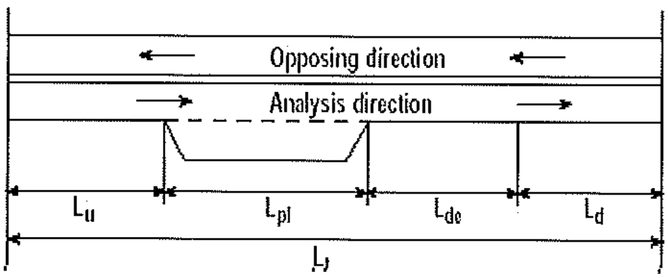
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET WITH PASSING LANE WORKSHEET

General Information		Site Information	
Analyst	David Stoner	Highway of Travel	MT 16
Agency or Company	DOWL HKM	From/To	RP 12.4 to RP 22.0 SB
Date Performed	4/17/2012	Jurisdiction	Dawson/Richland County
Analysis Time Period	Peak Hour	Analysis Year	2035 High

Project Description: MT 16 / MT 200 Glendive to Fairview Corridor Planning Study

Input Data

☑ Class I highway ☐ Class II highway ☐ Class III highway



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, 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)	C
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 $L_d = L_t - (L_u + L_{pl} + L_{de})$	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], $ATS_{pl} = (ATS_d * L_t) / (L_u + L_d + (L_{pl}/f_{pl}) + (2L_{de}/(1+f_{pl,ATS})))$	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, $L_d = L_t - (L_u + L_{pl} + L_{de})$	-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], $PTSF_{pl}$(%) $PTSF_{pl}= PTSF_d[L_u+L_d+f_{pl,PTSF}L_{pl}+((1+f_{pl,PTSF})/2)L_{de}]/L_t$	45.7
Level of Service and Other Performance Measures[4]	
Level of service including passing lane LOS_{pl} (Exhibit 15-3)	B
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_t (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 Worksheet.

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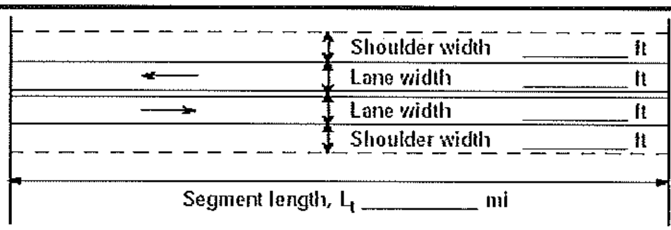
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

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	Jurisdiction	Dawson/Richland County
Analysis Time Period	Peak Hour	Analysis Year	2035 High

Project Description: *MT 16 / MT 200 Glendive to Fairview Corridor Planning Study*

Input Data



☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Analysis direction vol., V_d	321veh/h
Opposing direction vol., V_o	331veh/h
Shoulder width ft	8.0
Lane Width ft	12.0
Segment Length mi	9.5
Grade Length mi Up/down	
Peak-hour factor, PHF	0.78
No-passing zone	22%
% Trucks and Buses , P_T	29 %
% Recreational vehicles, P_R	4%
Access points *mi*	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_i(pc/h) $v_i=V_i/(PHF^* f_{g,ATS} * f_{HV,ATS})$	447	461

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	65.0 mi/h
Total demand flow rate, both directions, v		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	0.0 mi/h
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	1.3 mi/h
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	1.5 mi/h	Free-flow speed, FFS $(FSS=BFFS-f_{LS}-f_A)$	63.8 mi/h
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	55.2 mi/h
		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_i(pc/h) $v_i=V_i/(PHF^*f_{HV,PTSF}^* f_{g,PTSF})$	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, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF} *(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	60.1	

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_t (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. 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.	

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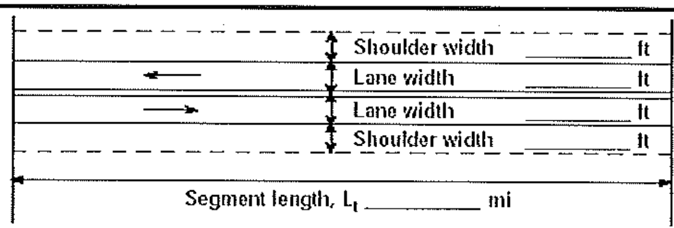
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

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	*4/17/2012*	Jurisdiction	*Dawson/Richland County*
Analysis Time Period	*Peak Hour*	Analysis Year	*2035 - High*

Project Description: *MT 16 / MT 200 Glendive to Fairview Corridor Planning Study*

Input Data



☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Analysis direction vol., V_d	*336*veh/h
Opposing direction vol., V_o	*407*veh/h
Shoulder width ft	*8.0*
Lane Width ft	*12.0*
Segment Length mi	*10.0*
Grade Length mi	Up/down
Peak-hour factor, PHF	*0.87*
No-passing zone	*31%*
% Trucks and Buses, P_T	*23 %*
% Recreational vehicles, P_R	*4%*
Access points *mi*	*11*/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*	*1.2*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.935*	*0.956*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF*f_{g,ATS}*f_{HV,ATS})$	*413*	*489*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*69.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS} (Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*2.8 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.7 mi/h*	Free-flow speed, FFS $(FSS=BFFS-f_{LS}-f_A)$	*66.3 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*57.5 mi/h*
		Percent free flow speed, PFFS	*86.8 %*

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*	*1.0*
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], $f_{g,PTSF}$ (Exhibit 15-16 or Ex 15-17)	*1.00*	*1.00*
Directional flow rate[2], v_i(pc/h) $v_i=V_i/(PHF*f_{HV,PTSF}*f_{g,PTSF})$	*395*	*468*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*44.1*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*33.0*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*59.2*	

Level of Service and Other Performance 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.
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.

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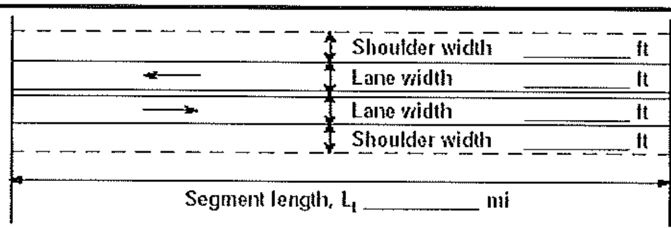
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

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*	Jurisdiction	*Dawson/Richland County*
Analysis Time Period	*Peak Hour*	Analysis Year	*2035 - High*

Project Description: *MT 16 / MT 200 Glendive to Fairview Corridor Planning Study*

Input Data



☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi	Up/down
Peak-hour factor, PHF	*0.84*
No-passing zone	*19%*
% Trucks and Buses, P_T	*25 %*
% Recreational vehicles, P_R	*4%*
Access points *mi*	*11/mi*

Analysis direction vol., V_d	*407*veh/h
Opposing direction vol., V_o	*336*veh/h
Shoulder width ft	*8.0*
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)	*1.2*	*1.3*
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*0.952*	*0.930*
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	*1.00*	*1.00*
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF^* f_{g,ATS} * f_{HV,ATS})$	*509*	*430*

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 (Exhibit 15-8)	*2.8 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Free-flow speed, FFS $(FSS=BFFS-f_{LS}-f_A)$	*63.3 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*1.5 mi/h*	Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*54.5 mi/h*
		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 15-19)	*1.0*	*1.1*
Passenger-car equivalents for RVs, E_R (Exhibit 15-18 or 15-19)	*1.0*	*1.0*
Heavy-vehicle adjustment factor, $f_{HV}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	*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_i(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, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*64.7*	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	*C*
Volume to capacity ratio, *v/c*	*0.32*

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, 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)	*12.44*
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.
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.

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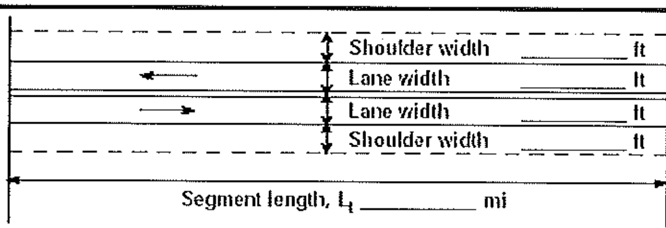
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

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 Glendive to Fairview Corridor Planning Study*

Input Data



☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Analysis direction vol., V_d	360veh/h
Opposing direction vol., V_o	552veh/h
Shoulder width ft	8.0
Lane Width ft	12.0
Segment Length mi	8.9
Grade Length mi	Up/down
Peak-hour factor, PHF	0.80
No-passing zone	24%
% Trucks and Buses , P_T	19 %
% Recreational vehicles, P_R	4%
Access points *mi*	12/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	1.1
Passenger-car equivalents for RVs, E_R (Exhibit 15-11 or 15-13)	1.0	1.0
Heavy-vehicle adjustment factor, $f_{HV,ATS}=1/(1+P_T(E_T-1)+P_R(E_R-1))$	0.946	0.981
Grade adjustment factor[1], $f_{g,ATS}$ (Exhibit 15-9)	1.00	1.00
Demand flow rate[2], v_i (pc/h) $v_i=V_i/(PHF^* f_{g,ATS} * f_{HV,ATS})$	476	703

Free-Flow Speed from Field Measurement		Estimated Free-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,[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)	3.0 mi/h
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Free-flow speed, FFS $(FSS=BFFS-f_{LS}-f_A)$	62.0 mi/h
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	1.0 mi/h	Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	51.9 mi/h
		Percent free flow speed, PFFS	83.7 %

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 (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_i(pc/h) $v_i=V_i/(PHF^*f_{HV,PTSF}^* f_{g,PTSF})$	450	690
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	50.2	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	23.5	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	59.5	

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	*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*
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)	*8.48*
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.
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.

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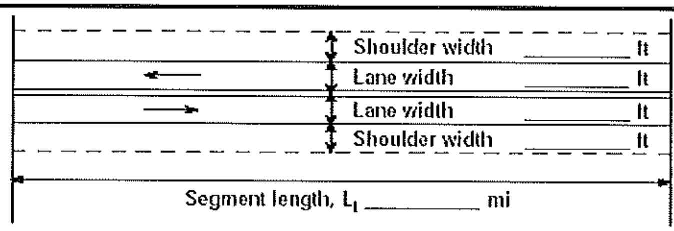
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	David Stoner	Highway / Direction of Travel	MT 16
Agency or Company	DOWL HKM	From/To	Crane to Sidney SB
Date Performed	4/17/2012	Jurisdiction	Dawson/Richland County
Analysis Time Period	Peak Hour	Analysis Year	2035 - High

Project Description: MT 16 / MT 200 Glendive to Fairview Corridor Planning Study

Input Data



☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Analysis direction vol., V_d	552veh/h
Opposing direction vol., V_o	360veh/h
Shoulder width ft	8.0
Lane Width ft	12.0
Segment Length mi	8.9
Grade Length mi Up/down	
Peak-hour factor, PHF	0.87
No-passing zone	22%
% Trucks and Buses , P_T	19 %
% Recreational vehicles, P_R	4%
Access points *mi*	12/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	1.3
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) $v_i=V_i/(PHF^* f_{g,ATS} * f_{HV,ATS})$	647	437

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	69.0 mi/h
Total demand flow rate, both directions, v		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	0.0 mi/h
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	3.0 mi/h
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	1.6 mi/h	Free-flow speed, FFS (FSS=BFFS-f_{LS}-f_A)	66.0 mi/h
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	56.0 mi/h
		Percent free flow speed, PFFS	84.8 %

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_i(pc/h) $v_i=V_i/(PHF^*f_{HV,PTSF}^*f_{g,PTSF})$	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)	24.6	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	72.8	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	D
Volume to capacity ratio, *v/c*	0.40

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.
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.

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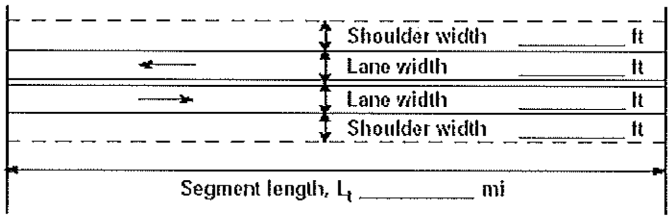
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	*David Stoner*	Highway / Direction of Travel	*MT 200*
Agency or Company	*DOWL HKM*	From/To	*Sidney to Fairview EB*
Date Performed	*4/17/2012*	Jurisdiction	*Dawson/Richland County*
Analysis Time Period	*Peak Hour*	Analysis Year	*2035 - High*

Project Description: *MT 16 / MT 200 Glendive to Fairview Corridor Planning Study*

Input Data



☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi	Up/down
Peak-hour factor, PHF	*0.83*
No-passing zone	*17%*
% Trucks and Buses, P_T	*17 %*
% Recreational vehicles, P_R	*4%*
Access points *mi*	*16/mi*

Analysis direction vol., V_d	*661veh/h*
Opposing direction vol., V_o	*654veh/h*
Shoulder width ft	*8.0*
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_i (pc/h) $v_i=V_i/(PHF^* f_{g,ATS} * f_{HV,ATS})$	*810*	*802*

Free-Flow Speed from Field Measurement		Estimated Free-Flow Speed	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	*69.0 mi/h*
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS} (Exhibit 15-7)	*0.0 mi/h*
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	*4.0 mi/h*
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	*0.7 mi/h*	Free-flow speed, FFS $(FSS=BFFS-f_{LS}-f_A)$	*65.0 mi/h*
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	*51.8 mi/h*
		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 (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_i(pc/h) $v_i=V_i/(PHF^*f_{HV,PTSF}^* f_{g,PTSF})$	*796*	*788*
Base percent time-spent-following[4], $BPTSF_d(\%)=100(1-e^{av_d^b})$	*68.8*	
Adj. for no-passing zone, $f_{np,PTSF}$ (Exhibit 15-21)	*17.1*	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF} * (v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	*77.4*	

Level of Service and Other Performance Measures

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_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*7.63*
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. 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.	

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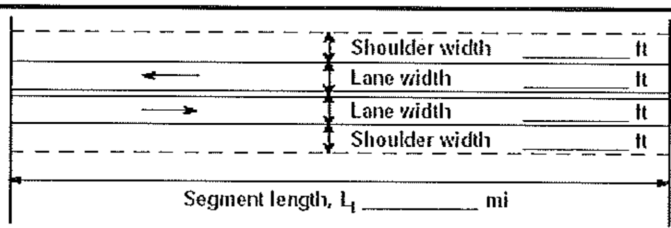
DIRECTIONAL TWO-LANE HIGHWAY SEGMENT WORKSHEET

General Information		Site Information	
Analyst	David Stoner	Highway / Direction of Travel	MT 200
Agency or Company	DOWL HKM	From/To	Sidney to Fairview WB
Date Performed	4/17/2012	Jurisdiction	Dawson/Richland County
Analysis Time Period	Peak Hour	Analysis Year	2035 - High

Project Description: *MT 16 / MT 200 Glendive to Fairview Corridor Planning Study*

Input Data



☑ Class I highway ☐ Class II highway ☐ Class III highway

Terrain ☑ Level ☐ Rolling

Grade Length mi Up/down

Analysis direction vol., V_d	654veh/h
Opposing direction vol., V_o	661veh/h
Shoulder width ft	8.0
Lane Width ft	12.0
Segment Length mi	9.9
Peak-hour factor, PHF	0.86
No-passing zone	15%
% Trucks and Buses , P_T	25 %
% Recreational vehicles, P_R	4%
Access points *mi*	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_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	
Mean speed of sample[3], S_{FM}		Base free-flow speed[4], BFFS	66.0 mi/h
Total demand flow rate, both directions, *v*		Adj. for lane and shoulder width,[4] f_{LS}(Exhibit 15-7)	0.0 mi/h
Free-flow speed, $FFS=S_{FM}+0.00776(v/f_{HV,ATS})$		Adj. for access points[4], f_A (Exhibit 15-8)	4.0 mi/h
Adj. for no-passing zones, $f_{np,ATS}$ (Exhibit 15-15)	0.7 mi/h	Free-flow speed, FFS $(FSS=BFFS-f_{LS}-f_A)$	62.0 mi/h
		Average travel speed, $ATS_d=FFS-0.00776(v_{d,ATS}+v_{o,ATS})-f_{np,ATS}$	49.2 mi/h
		Percent free flow speed, PFFS	79.3 %

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_i(pc/h) $v_i=V_i/(PHF^*f_{HV,PTSF}^* f_{g,PTSF})$	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)	17.0	
Percent time-spent-following, $PTSF_d(\%)=BPTSF_d+f_{np,PTSF}*(v_{d,PTSF}/v_{d,PTSF}+v_{o,PTSF})$	75.9	

Level of Service and Other Performance Measures

Level of service, LOS (Exhibit 15-3)	D
Volume to capacity ratio, *v/c*	0.47

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_t (Eq. 15-30)	*4.79*
Bicycle level of service score, BLOS (Eq. 15-31)	*12.67*
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.
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.

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Appendix 7

Projected Four-Lane Highway 2035 – Low Condition

Direction 1 = Northbound/Eastbound Direction

Direction 2 = Southbound/Westbound Direction

MULTILANE HIGHWAYS WORKSHEET(Direction 1)

General Information

Analyst	David Stoner
Agency or Company	DOWL HKM
Date Performed	5/1/2012
Analysis Time Period	Peak Hour

Site Information

Highway/Direction to Travel	MT 16
From/To	Glendive to Savage
Jurisdiction	Dawson/Richland County
Analysis Year	2035 - Low

Project Description MT 16 / MT 200 Glendive to Fairview Corridor Planning Study

☐ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	242	Peak-Hour Factor, PHF	0.81
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 %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.889

Speed Inputs

Lane Width, LW (ft)	12.0
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	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	60.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	168
Speed, S (mi/h)	60.0
D (pc/mi/ln)	2.8
LOS	A

Design

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	*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

Analyst	David Stoner
Agency or Company	DOWL HKM
Date Performed	5/1/2012
Analysis Time Period	Peak Hour

Site Information

Highway/Direction to Travel	MT 16
From/To	Glendive to Savage
Jurisdiction	Dawson/Richland County
Analysis Year	2035 - Low

Project Description MT 16 / MT 200 Glendive to Fairview Corridor Planning Study

☐ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	249	Peak-Hour Factor, PHF	0.78
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 %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.889

Speed Inputs

Lane Width, LW (ft)	12.0
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	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	60.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	179
Speed, S (mi/h)	60.0
D (pc/mi/ln)	3.0
LOS	A

Design

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)

[X]

General Information

Analyst	David Stoner
Agency or Company	DOWL HKM
Date Performed	5/1/2012
Analysis Time Period	Peak Hour

Site Information

Highway/Direction to Travel	MT 16
From/To	Savage to Crane
Jurisdiction	Dawson/Richland County
Analysis Year	2035 - Low

Project Description MT 16 / MT 200 Glendive to Fairview Corridor Planning Study

☐ 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		General Terrain:	Level
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.897

Speed Inputs

Lane Width, LW (ft)	12.0
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	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	60.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	162
Speed, S (mi/h)	60.0
D (pc/mi/ln)	2.7
LOS	A

Design

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	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

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MULTILANE HIGHWAYS WORKSHEET(Direction 2)

General Information

Analyst	David Stoner
Agency or Company	DOWL HKM
Date Performed	5/1/2012
Analysis Time Period	Peak Hour

Site Information

Highway/Direction to Travel	MT 16
From/To	Savage to Crane
Jurisdiction	Dawson/Richland County
Analysis Year	2035 - Low

Project Description MT 16 / MT 200 Glendive to Fairview Corridor Planning Study

☐ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	307	Peak-Hour Factor, PHF	0.84
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 %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.889

Speed Inputs

Lane Width, LW (ft)	12.0
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	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	60.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	205
Speed, S (mi/h)	60.0
D (pc/mi/ln)	3.4
LOS	A

Design

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*
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

Analyst	David Stoner
Agency or Company	DOWL HKM
Date Performed	5/1/2012
Analysis Time Period	Peak Hour

Site Information

Highway/Direction to Travel	MT 16
From/To	Crane to Sidney
Jurisdiction	Dawson/Richland County
Analysis Year	2035 - Low

Project Description MT 16 / MT 200 Glendive to Fairview Corridor Planning Study

☐ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	271	Peak-Hour Factor, PHF	0.80
AADT(veh/h)		%Trucks and Buses, P_T	19
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 %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.913

Speed Inputs

Lane Width, LW (ft)	12.0
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	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	60.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	185
Speed, S (mi/h)	60.0
D (pc/mi/ln)	3.1
LOS	A

Design

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)

[X]

General Information

Analyst	David Stoner
Agency or Company	DOWL HKM
Date Performed	5/1/2012
Analysis Time Period	Peak Hour

Site Information

Highway/Direction to Travel	MT 16
From/To	Crane to Sidney
Jurisdiction	Dawson/Richland County
Analysis Year	2035 - Low

Project Description MT 16 / MT 200 Glendive to Fairview Corridor Planning Study

☐ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	416	Peak-Hour Factor, PHF	0.87
AADT(veh/h)		%Trucks and Buses, P_T	19
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 %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.913

Speed Inputs

Lane Width, LW (ft)	12.0
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	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	60.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	261
Speed, S (mi/h)	60.0
D (pc/mi/ln)	4.3
LOS	A

Design

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	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

Analyst	David Stoner
Agency or Company	DOWL HKM
Date Performed	5/1/2012
Analysis Time Period	Peak Hour

Site Information

Highway/Direction to Travel	MT 16
From/To	Sidney to Fairview
Jurisdiction	Dawson/Richland County
Analysis Year	2035 - Low

Project Description MT 16 / MT 200 Glendive to Fairview Corridor Planning Study

☐ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	529	Peak-Hour Factor, PHF	0.83
AADT(veh/h)		%Trucks and Buses, P_T	17
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 %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.922

Speed Inputs

Lane Width, LW (ft)	12.0
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	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	60.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	345
Speed, S (mi/h)	60.0
D (pc/mi/ln)	5.8
LOS	A

Design

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	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)

General Information

Analyst	David Stoner
Agency or Company	DOWL HKM
Date Performed	5/1/2012
Analysis Time Period	Peak Hour

Site Information

Highway/Direction to Travel	MT 16
From/To	Sidney to Fairview
Jurisdiction	Dawson/Richland County
Analysis Year	2035 - Low

Project Description MT 16 / MT 200 Glendive to Fairview Corridor Planning Study

☐ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

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 %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.889

Speed Inputs

Lane Width, LW (ft)	12.0
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	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	60.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	342
Speed, S (mi/h)	60.0
D (pc/mi/ln)	5.7
LOS	A

Design

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	*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

Analyst	David Stoner
Agency or Company	DOWL HKM
Date Performed	5/1/2012
Analysis Time Period	Peak Hour

Site Information

Highway/Direction to Travel	MT 16
From/To	Glendive to Savage
Jurisdiction	Dawson/Richland County
Analysis Year	2035 - High

Project Description MT 16 / MT 200 Glendive to Fairview Corridor Planning Study

☐ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	321	Peak-Hour Factor, PHF	0.81
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 %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.889

Speed Inputs

Lane Width, LW (ft)	12.0
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	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	60.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	222
Speed, S (mi/h)	60.0
D (pc/mi/ln)	3.7
LOS	A

Design

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	*198.1*
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)	*14.06*
Bicycle level of service (Exhibit 15-4)	*F*

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MULTILANE HIGHWAYS WORKSHEET(Direction 2)

General Information

Analyst	David Stoner
Agency or Company	DOWL HKM
Date Performed	5/1/2012
Analysis Time Period	Peak Hour

Site Information

Highway/Direction to Travel	MT 16
From/To	Glendive to Savage
Jurisdiction	Dawson/Richland County
Analysis Year	2035 - High

Project Description MT 16 / MT 200 Glendive to Fairview Corridor Planning Study

☐ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	331	Peak-Hour Factor, PHF	0.78
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 %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.889

Speed Inputs

Lane Width, LW (ft)	12.0
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	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	60.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	238
Speed, S (mi/h)	60.0
D (pc/mi/ln)	4.0
LOS	A

Design

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*

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MULTILANE HIGHWAYS WORKSHEET(Direction 1)

General Information

Analyst	David Stoner
Agency or Company	DOWL HKM
Date Performed	5/1/2012
Analysis Time Period	Peak Hour

Site Information

Highway/Direction to Travel	MT 16
From/To	Savage to Crane
Jurisdiction	Dawson/Richland County
Analysis Year	2035 - High

Project Description MT 16 / MT 200 Glendive to Fairview Corridor Planning Study

☐ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	336	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		General Terrain:	Level
DDHV (veh/h)		Grade Length (mi)	0.00
Driver Type Adjustment	1.00	Up/Down %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.897

Speed Inputs

Lane Width, LW (ft)	12.0
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	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	60.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	215
Speed, S (mi/h)	60.0
D (pc/mi/ln)	3.6
LOS	A

Design

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	*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

Analyst	David Stoner
Agency or Company	DOWL HKM
Date Performed	5/1/2012
Analysis Time Period	Peak Hour

Site Information

Highway/Direction to Travel	MT 16
From/To	Savage to Crane
Jurisdiction	Dawson/Richland County
Analysis Year	2035 - High

Project Description MT 16 / MT 200 Glendive to Fairview Corridor Planning Study

☐ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	407	Peak-Hour Factor, PHF	0.84
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 %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.889

Speed Inputs

Lane Width, LW (ft)	12.0
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	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	60.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	272
Speed, S (mi/h)	60.0
D (pc/mi/ln)	4.5
LOS	A

Design

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	242.3
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)	14.16
Bicycle level of service (Exhibit 15-4)	F

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MULTILANE HIGHWAYS WORKSHEET(Direction 1)

General Information

Analyst	David Stoner
Agency or Company	DOWL HKM
Date Performed	5/1/2012
Analysis Time Period	Peak Hour

Site Information

Highway/Direction to Travel	MT 16
From/To	Crane to Sidney
Jurisdiction	Dawson/Richland County
Analysis Year	2035 - High

Project Description MT 16 / MT 200 Glendive to Fairview Corridor Planning Study

☐ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	360	Peak-Hour Factor, PHF	0.80
AADT(veh/h)		%Trucks and Buses, P_T	19
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 %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.913

Speed Inputs

Lane Width, LW (ft)	12.0
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	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	60.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	246
Speed, S (mi/h)	60.0
D (pc/mi/ln)	4.1
LOS	A

Design

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	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)

[X]

General Information

Analyst	David Stoner
Agency or Company	DOWL HKM
Date Performed	5/1/2012
Analysis Time Period	Peak Hour

Site Information

Highway/Direction to Travel	MT 16
From/To	Crane to Sidney
Jurisdiction	Dawson/Richland County
Analysis Year	2035 - High

Project Description MT 16 / MT 200 Glendive to Fairview Corridor Planning Study

☐ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	552	Peak-Hour Factor, PHF	0.87
AADT(veh/h)		%Trucks and Buses, P_T	19
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 %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.913

Speed Inputs

Lane Width, LW (ft)	12.0
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	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	60.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	347
Speed, S (mi/h)	60.0
D (pc/mi/ln)	5.8
LOS	A

Design

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	317.2
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)	10.05
Bicycle level of service (Exhibit 15-4)	F

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MULTILANE HIGHWAYS WORKSHEET(Direction 1)

[x]

General Information

Analyst	David Stoner
Agency or Company	DOWL HKM
Date Performed	5/1/2012
Analysis Time Period	Peak Hour

Site Information

Highway/Direction to Travel	MT 16
From/To	Sidney to Fairview
Jurisdiction	Dawson/Richland County
Analysis Year	2035 - High

Project Description MT 16 / MT 200 Glendive to Fairview Corridor Planning Study

☐ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	661	Peak-Hour Factor, PHF	0.83
AADT(veh/h)		%Trucks and Buses, P_T	17
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 %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.922

Speed Inputs

Lane Width, LW (ft)	12.0
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	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	60.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	432
Speed, S (mi/h)	60.0
D (pc/mi/ln)	7.2
LOS	A

Design

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	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)

General Information

Analyst	David Stoner
Agency or Company	DOWL HKM
Date Performed	5/1/2012
Analysis Time Period	Peak Hour

Site Information

Highway/Direction to Travel	MT 16
From/To	Sidney to Fairview
Jurisdiction	Dawson/Richland County
Analysis Year	2035 - High

Project Description MT 16 / MT 200 Glendive to Fairview Corridor Planning Study

☐ Oper.(LOS) ☐ Des. (N) ☐ Plan. (vp)

Flow Inputs

Volume, V (veh/h)	654	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 %	0.00
		Number of Lanes	2

Calculate Flow Adjustments

f_p	1.00	E_R	1.2
E_T	1.5	f_{HV}	0.889

Speed Inputs

Lane Width, LW (ft)	12.0
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	

Calc Speed Adj and FFS

f_{LW} (mi/h)	
f_{LC} (mi/h)	
f_A (mi/h)	
f_M (mi/h)	
FFS (mi/h)	60.0

Operations

Operational (LOS)

Flow Rate, v_p (pc/h/ln)	427
Speed, S (mi/h)	60.0
D (pc/mi/ln)	7.1
LOS	A

Design

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	*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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