

**Table 13**  
**Streetlight Evaluation**  
**All Interchanges**

Interchange	Scenario	Area Type	Existing Interchange Lighting Type <sup>(1)</sup>	Ramp Volumes		Crossroad Volumes		Existing Night-to-Day Accident Ratio <sup>(2)</sup>	Deficiencies
				Total Entering & Exiting Volume (veh/day)	Volumes Meet MDT CIL Volume Criteria?	Average Daily Volume (veh/day)	Volumes Meet MDT CIL Volume Criteria?		
Exit 443 Shiloh	Existing 2003	Urban	CIL	8,853	No	5,637	No	*	None
	Short Term 2008	Urban		11,430	Yes	7,540	No		Meets ramp volume criteria for CIL; I-90 mainline through lanes are not continuously lit (per CIL guidelines)
	Long Term 2023	Urban		24,680	Yes	18,080	Yes		Meets ramp and crossroad volume criteria for CIL; I-90 mainline through lanes are not continuously lit (per CIL guidelines)
Exit 447 South Billings Road	Existing 2003	Urban	PIL	11,294	Yes	10,087	Yes	0.37	Meets ramp and crossroad volume criteria for CIL consideration
	Short Term 2008	Urban		12,870	Yes	11,800	Yes		Meets ramp and crossroad volume criteria for CIL consideration
	Long Term 2023	Urban		19,400	Yes	18,920	Yes		Meets ramp and crossroad volume criteria for CIL consideration
Exit 450 27th Street	Existing 2003	Urban	PIL	10,948	Yes	8,709	No	0.36	Meets criteria for CIL consideration
	Short Term 2008	Urban		11,060	Yes	8,950	No		Meets ramp volume criteria for CIL consideration
	Long Term 2023	Urban		13,260	Yes	9,730	No		Meets ramp volume criteria for CIL consideration
Exit 452 US 87 Lockwood	Existing 2003	Urban	PIL	15,328	Yes	16,034	Yes	0.22	Meets ramp and crossroad volume criteria for CIL consideration
	Short Term 2008	Urban		16,120	Yes	17,250	Yes		Meets ramp and crossroad volume criteria for CIL consideration
	Long Term 2023	Urban		14,290	Yes	21,460	Yes		Meets ramp and crossroad volume criteria for CIL consideration
Exit 455 Johnson Lane	Existing 2003	Urban	PIL	8,853	No	5,637	No	0.30	Insufficient lighting at WB ramp terminal intersections
	Short Term 2008	Urban		10,870	Yes	7,060	No		Meets ramp volume criteria for CIL consideration
	Long Term 2023	Urban		20,170	Yes	13,840	Yes		Meets ramp and crossroad volume criteria for CIL consideration

<sup>(1)</sup> Per MDT Highway Lighting Design Guidelines; CIL = Complete Interchange Lighting; PIL = Partial Interchange Lighting

<sup>(2)</sup> Only accidents within the interchange area (ramps, terminals, and crossroads between terminals) were factored in this value.

\* Night-to-day accident ratio not calculated due to low number of total interchange accidents

**Table 14**  
**Interchange Deficiencies**  
**Shiloh Interchange - Exit 443**

Deficiency	Location	Time Frame	Category
SB left turn truck movement	Zoo Dr / Shiloh Rd	Existing	Geometric
Opposing left turn truck overlap	Zoo Dr / Future Entrance	Existing	
Opposing left turn truck overlap	Zoo Dr / Gabel Rd	Existing	
Opposing left turn truck overlap	Zoo Dr / S Frontage Rd	Short Term (1)	
No Posted Speed Limit	Zoo Dr	Existing	Traffic Control
Lack of Advance I-90 Guide Signs	Zoo Dr	Existing	
Lack of Road Closed signing behind Type 3 barrier	Zoo Dr south of S Frontage Rd	Existing	
Lack of Road Closed signing behind Type 3 barrier	Future entrance legs	Existing	
Shiloh Road advance street name sign	NB & SB S Frontage Rd at Zoo Dr	Existing	
Inappropriate stop bar for channelized right turn	NB Shiloh Rd at Zoo Dr	Existing	
Inappropriate stop bar for channelized right turn	WB Zoo Dr at Gabel Rd	Existing	
Inappropriate stop bar for channelized right turn	NB & SB S Frontage Rd at Zoo Dr	Existing	
New traffic signal	Zoo Dr / Shiloh Rd	Long Term	Traffic Control (Signal)
New traffic signal	Zoo Dr / future entrance	Long Term	
New traffic signal	Zoo Dr / Gabel Rd	Short Term	
New traffic signal	Zoo Dr / I-90 WB ramps	Long Term	
New traffic signal	Zoo Dr / I-90 EB ramps	Long Term	
New traffic signal	Zoo Dr / S Frontage Rd	Long Term	
Coordinated signal system	Zoo Dr	Long Term	
Potential inadequate capacity	Zoo Dr / Shiloh Rd	Short Term	Intersection Capacity
Potential future entrance impact on free right turn	Shiloh Rd north of Zoo Dr	Short Term	
Potential impacts of future west leg	Zoo Dr west of Shiloh Rd	Short Term (3)	
Inadequate capacity	Zoo Dr / Gabel Rd	Long Term	
Inadequate capacity	Zoo Dr / I-90 WB ramps	Long Term	
Potential inadequate capacity	Zoo Dr / I-90 EB ramps	Long Term	
Potential inadequate capacity without traffic signal	Zoo Dr / S Frontage Rd	Long Term	
Potential inadequate capacity with traffic signal	Zoo Dr / S Frontage Rd	Long Term	Ramp Capacity
Potential platoon deficiency due to new traffic signal	Zoo Dr / I-90 WB ramps	Long Term	
Potential platoon deficiency due to signalized double left turn	Zoo Dr / I-90 WB ramps	Long Term	
Potential need for right turn overlap phase or "free" right turn	Zoo Dr / I-90 WB ramps	Long Term	
Potential platoon deficiency due to new traffic signal	Zoo Dr / I-90 EB ramps	Long Term	
Potential platoon deficiency due to signalized double left turn	Zoo Dr / I-90 EB ramps	Long Term	
Potential need for right turn overlap phase	Zoo Dr / I-90 EB ramps	Long Term	
Southbound right angle accidents - potential visibility problem	Zoo Dr / S Frontage Rd	Existing	Safety
Lack of sidewalks & crosswalks except east side of I-90 bridge	Zoo Dr	Short Term (4)	Pedestrian
None identified			Bicycle
I-90 mainline highway lighting does not meet CIL standards	I-90 at Zoo Dr	Long Term	Lighting

- [1] After south leg of Zoo Drive is open
- [2] With significant development on Zoo Drive south leg
- [3] With development west of Zoo Drive / Shiloh Road
- [4] With adjacent development to generate pedestrian traffic

**POTENTIAL SHORT-TERM CRITICAL FAILURE** = May require major interchange reconfiguration or improvement in the short-term

**POTENTIAL LONG-TERM CRITICAL FAILURE** = May require major interchange reconfiguration or improvement in the long-term

**Table 15**  
**Interchange Deficiencies**  
**South Billings Boulevard Interchange - Exit 447**

Deficiency	Location	Time Frame	Category
Multiple truck turn movements	S Billings Blvd	Existing	Geometric
Access Management at gas station	King Ave west of S Billings Blvd	Existing	
Jct I-90 signs before previous intersection	SB S Billings Blvd north of King Ave	Existing	Traffic Control
Jct I-90 signs before previous intersection	NB S Billings Blvd south of S Frontage Rd	Existing	
Lack of I-90 advance directional sign	SB S Billings Blvd north of I-90 EB ramps	Existing	
No posted speed limit in SB direction	SB S Billings Blvd	Existing	
Lack of lane control sign for wide thru-right lane on mast arm	SB S Billings Blvd at King Ave	Existing	
Lack of lane control signs for thru and right turns on mast arm	EB King Ave at S Billings Blvd	Existing	
Lack of end of guardrail object marker	NB & SB S Billings Blvd overpass	Existing	
New traffic signal	S Billings Blvd / Midland Rd	Short Term (1)	Traffic Control (Signal)
Coordinated signal system	S Billings Blvd	Short Term	
Inadequate capacity under stop control	Southgate Dr left / thru at King Ave	Long Term	Intersection Capacity
Monitor need for traffic signal	Southgate Dr / King Ave	Long Term (2)	
Inadequate capacity	S Billings Blvd / King Ave	Long Term	
Potential inadequate capacity	S Billings Blvd / I-90 WB ramps	Long Term	
Inadequate capacity	S Billings Blvd / I-90 EB ramps	Long Term	
Inadequate capacity	S Billings Blvd / S Frontage - Midland	Long Term	
Potential platoon deficiency due to signalized double left turn	S Billings Blvd / I-90 WB ramps	Long Term	Ramp Capacity
None identified			Safety
Pedestrian push button accessibility	SW corner of S Billings Blvd / King Ave	Existing	Pedestrian
Guardrail restricts on-street path	NB S Billings Blvd on I-90 bridge	Existing	
Lack of sidewalks except on I-90 bridge	S Billings Blvd	Existing	
None identified			Bicycle
Crossroad and ramp lighting does not meet CIL standards	S Billings Blvd	Short Term	Lighting
I-90 mainline highway lighting does not meet CIL standards	I-90 at S Billings Blvd	Short Term	

[1] After west leg is open and Billings Operations Center is open

[2] Stop control may be inadequate with significant development along Southgate Drive on north & south sides

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**Table 16**  
**Interchange Deficiencies**  
**27th Street Interchange - Exit 450**

Deficiency	Location	Time Frame	Category
Skewed intersection	27th St / State Ave	Existing	Geometric
Truck turn movements	27th St / State Ave	Existing	
Truck turn movements	27th St / I-90 WB ramps	Existing	
Truck turn movements	27th St / I-90 EB ramps	Existing	
Intersection sight distance	I-90 EB off-ramp at 27th St	Existing	
Intersection sight distance	I-90 WB off-ramp at 27th St	Existing	
Access Management	State Ave west of 27th St	Existing	
Lack of Advance I-90 Guide Signs between ramps	27th Street / I-90 WB ramps	Existing	Traffic Control
Lack of Advance I-90 Guide Signs between ramps	27th Street / I-90 EB ramps	Existing	
No posted speed limit in NB (or WB) direction	27th Street	Existing	
Lack of lane control signs on mast arm	EB State Ave at 27th St	Existing	
Lack of end of guardrail object marker	SB 27th St north of I-90 WB	Existing	
Lack of signs or markings for lane drop	SB 27th St south of I-90 EB ramps	Existing	
Potential new traffic signal (mostly right turns)	27th St / I-90 WB ramps	Long Term (1)	Traffic Control (Signal)
New traffic signal	27th St / I-90 EB ramps	Long Term	
Coordinated signal system	27th St	Long Term	
Potential inadequate capacity & signal timing updates	27th St / State Ave	Long Term	Intersection Capacity
Consider adding short left turn lane	I-90 WB off-ramp at 27th St	Long Term	
Consider separating lefts from thru with signal installation	NB 27th St at I-90 WB ramps	Long Term	
Inadequate capacity with stop control	I-90 EB off-ramp at 27th St	Short Term (2)	
Consider adding short right turn lane with signal installation	I-90 EB off-ramp at 27th St	Long Term	
Consider separating lefts from thru with signal installation	SB 27th St at I-90 EB ramps	Long Term	
Potential platoon deficiency due to new traffic signal	27th St / I-90 WB ramps	Long Term	Ramp Capacity
Potential platoon deficiency due to new traffic signal	27th St / I-90 EB ramps	Long Term	
None identified			Safety
Lack of sidewalks & crosswalks except on I-90 bridge	27th St	Existing	Pedestrian
None identified			Bicycle
Crossroad and ramp lighting does not meet CIL standards	27th St	Long Term	Lighting
I-90 mainline highway lighting does not meet CIL standards	I-90 at 27th St	Long Term	

[1] 2023 hourly forecasts meet MUTCD volume warrants, but adequate ramp right turn capacity may alleviate need for signal

[2] Forecasts only meet MUTCD volume signal warrants in Long Term 2023

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**Table 17**  
**Interchange Deficiencies**  
**US 87 Lockwood Interchange - Exit 452**

Deficiency	Location	Time Frame	Category
Intersection configuration	US 87 / N Frontage Rd	Existing	Geometric
Skewed intersection	US 87 / I-90 WB off-ramp	Existing	
Skewed intersection	US 87 / I-90 EB off-ramp	Existing	
Narrow lane widths	US 87	Existing	
Truck turn movements	US 87 / N Frontage Rd	Existing	
Truck turn movements at gas station private entrance	SB US 87 just south of N Frontage Rd	Existing	
Truck turn movements	US 87 / I-90 WB on-ramp	Existing	
Truck turn movements	US 87 / I-90 EB on-ramp	Existing	
Truck turn movements	US 87 / Coburn Rd	Long term (1)	
Access management near gas station	US 87 / Coburn Rd	Long term (1)	
Jet I-90 signs before previous intersection	SB US 87 north of N Frontage Rd	Existing	Traffic Control
Lack of lane control signs on mast arm	NB and SB US 87 at N Frontage Rd	Existing	
Lack of lane control signs on mast arm	NB and SB US 87 at I-90 WB ramps	Existing	
Lack of lane control signs on mast arm	NB and SB US 87 at I-90 EB ramps	Existing	
Inappropriate advance turn arrow with route guide signs	facing I-90 WB off-ramp on US 87	Existing	
Lack of intersection lane control signs or markings	EB gas station approach at US 87 / N Frontage Rd	Existing	
New traffic signal	US 87 / Coburn Rd	Long Term	Traffic Control (Signal)
Coordinate N Frontage Rd signal with ramp signals	US 87	Short Term	
Coordinate new Coburn Rd signal with ramp signals	US 87	Long Term	
Signal timing updates	3 existing signals on US 87	Short Term	Intersection Capacity
Inadequate SB right turn storage	N Frontage Rd at US 87	Long Term	
Inadequate capacity	US 87 / I-90 EB ramps	Long Term (1)	
Consider adding NB left turn lane	NB Coburn Rd at US 87	Long Term (1)	
Evaluate proximity of lane drop after Coburn Rd signal installation	SB US 87 S of Coburn Rd	Long Term (1)	
Evaluate proximity of lane add after Coburn Rd signal installation	NB US 87 S of Coburn Rd	Long Term (1)	Ramp Capacity
Potential platoon deficiency due to signalized double left turn	US 87 / I-90 EB ramps	Long Term	
Frequency of left turn accidents	US 87 / N Frontage Rd	Existing	Safety
Frequency of left turn accidents	US 87 / I-90 EB ramps	Existing	
Lack of sidewalks & crosswalks except on I-90 bridge	US 87	Existing	Pedestrian
Lack of pedestrian push buttons at signalized intersections	US 87 at N Frontage Rd, I-90 WB ramps, I-90 EB ramps	Existing	
Lack of crosswalk markings at pedestrian crossing signs	Private gas station leg of US 87 / N Frontage Rd	Existing	
Inadquate shoulder / outside lane width for bicycles	US 87 on bridge over I-90	Existing	Bicycle
Crossroad and ramp lighting does not meet CIL standards	US 87	Long Term	Lighting
I-90 mainline highway lighting does not meet CIL standards	I-90 at US 87	Long Term	

[1] Needed when traffic signal is installed - US 87 / Coburn Rd meets signal warrants in long term 2023

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**Table 18**  
**Interchange Deficiencies**  
**Johnson Lane Interchange - Exit 455**

Deficiency	Location	Time Frame	Category
Skewed intersection	Johnson Ln / I-90 EB off-ramp	Existing	Geometric
Skewed intersection	Johnson Ln / Old Hardin Rd	Existing	
Narrow lane and paved shoulder widths	Johnson under / near I-90 bridge	Existing	
Taper length	NB Johnson Ln at I-90 WB ramps	Existing	
Truck turn movements	Johnson Ln / N Frontage Rd	Existing	
Truck turn movements	Johnson Ln / I-90 WB on-ramp	Existing	
Truck turn movements	Johnson Ln / I-90 EB on-ramp	Existing	
Truck turn movements	Johnson Ln / Old Hardin Rd	Existing	
Intersection sight distance	I-90 EB off-ramp at Johnson Ln	Existing	
Intersection sight distance	I-90 WB off-ramp at Johnson Ln	Existing	
Vertical clearance	I-90 bridge over Johnson Ln	Existing	
Access management at Flying J service station	Old Hardin Rd west of Johnson Ln	Short Term	
Access management	Johnson Ln south of Old Hardin Rd	Long Term	
Access management at gas station	Old Hardin Rd east of Johnson Ln	Long Term	
Less advance I-90 guide signage than other interchanges	Johnson Ln	Existing	Traffic Control
Lack of left turn lane control signs	Johnson Ln at N Frontage Rd	Existing	
Lack of left turn lane control signs	Johnson Ln at I-90 WB ramps	Existing	
Lack of left turn lane control signs	Johnson Ln at I-90 EB ramps	Existing	
No posted speed limit before limited sight distance intersection	SB Johnson Ln before I-90 EB ramps	Existing	
Lack of end of guardrail object marker	NB & SB Johnson Ln between ramps	Existing	Traffic Control (Signal)
Monitor need for new traffic signal	Johnson Ln / N Frontage Rd	Long Term (1)	
New traffic signal	Johnson Ln / I-90 WB ramps	Long Term	
New traffic signal	Johnson Ln / I-90 EB ramps	Long Term	
Monitor need for new traffic signal	Old Hardin Rd / Becraft Ln	Long Term (1)	
Coordinated signal system	Johnson Ln	Long Term	Intersection Capacity
Inadequate capacity for stop controlled approach	WB N Frontage Rd at Johnson Ln	Long Term	
Inadequate capacity for stop controlled approach	WB I-90 off-ramp at Johnson Ln	Existing	
Potential inadequate left turn storage length	NB Johnson Ln at I-90 WB ramps	Long Term (2)	
Potential inadequate capacity	Johnson Ln / I-90 EB ramps	Long Term	
Potential inadequate capacity	Johnson Ln / Old Hardin Rd	Short Term	
Inadequate capacity	Johnson Ln / Old Hardin Rd	Long Term	
Inadequate capacity for stop controlled approach	NB Becraft Ln at Old Hardin Rd	Long Term	Ramp Capacity
Potential platoon deficiency due to new traffic signal	Johnson Ln / I-90 WB ramps	Long Term	
Potential platoon deficiency due to signalized double left turn	Johnson Ln / I-90 WB ramps	Long Term	
Potential platoon deficiency due to new traffic signal	Johnson Ln / I-90 EB ramps	Long Term	Safety
None identified			
Lack of sidewalks & crosswalks	Johnson Rd	Existing	Pedestrian
Lack of crosswalk & ped push buttons	north leg of Old Hardin Rd at Johnson Ln	Existing	
Inadequate shoulder width for bicycles	Johnson Ln under / near I-90 bridge	Existing	Bicycle
Only one intersection streetlight	Johnson Ln / I-90 WB ramps	Existing (3)	Lighting
Crossroad and ramp lighting does not meet CIL standards	Johnson Ln	Short Term	
I-90 mainline highway lighting does not meet CIL standards	I-90 at Johnson Ln	Short Term	

[1] 2023 projected hourly volumes do not meet MUTCD volume warrants, but stop controlled approaches will operate at poor LOS

[2] After traffic signal is installed

[3] Interchange currently meets MDT volume guidelines for Partial Interchange Lighting (PIL); PIL intersections should have two streetlights

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**Table 19**  
**Recommended O&M Improvements**  
**Shiloh Interchange - Exit 443**

<b>Recommended Improvement</b>	<b>Location</b>	<b>Category</b>
Add stop sign in median to increase visibility	Zoo Dr / S Frontage Rd	Safety
Add Speed Limit Sign	Zoo Dr	Traffic Control
Add Advance I-90 Guide Signs	Zoo Dr	
Remove Stop Bar; Re-stripe as yield condition	NB Shiloh Rd to EB Zoo Dr	
Add Road Closed signing behind Type 3 barrier	Zoo Dr south of S Frontage Rd	
Add Road Closed signing behind Type 3 barrier	Future entrance legs	
Replace Shiloh Road advance street name sign *	NB & SB S Frontage Rd at Zoo Dr	

\* Replace at end of existing sign maintenance cycle

**Table 20**  
**Recommended O&M Improvements**  
**South Billings Boulevard Interchange - Exit 447**

Deficiency	Location	Category
Lack of I-90 advance directional sign	SB S Billings Blvd north of I-90 EB ramps	Traffic Control
Add posted speed limit in SB direction	SB S Billings Blvd	
Add lane control sign for wide thru-right lane on mast arm	SB S Billings Blvd at King Ave	
Add lane control signs for thru and right turns on mast arm	EB King Ave at S Billings Blvd	
Add end of guardrail object marker	NB & SB S Billings Blvd overpass	
Improve pedestrian push button accessibility	SW corner of S Billings Blvd / King Ave	Pedestrian
Reconfigure guard rail to improve access to sidewalk	NB S Billings Blvd on I-90 bridge	

**Table 21**  
**Recommended O&M Improvements**  
**27th Street Interchange - Exit 450**

Deficiency	Location	Category
Modify guard rail to improve intersection sight distance	I-90 EB off-ramp at 27th St	Geometry
Add Advance I-90 Guide Signs between ramps	27th Street / I-90 WB ramps	Traffic Control
Add Advance I-90 Guide Signs between ramps	27th Street / I-90 EB ramps	
Add speed limit sign for NB (or WB) direction	27th Street	
Add lane control signs on mast arm	EB State Ave at 27th St	
Add end of guardrail object marker	SB 27th St north of I-90 WB	
Add signs and markings for lane drop	SB 27th St south of I-90 EB ramps	

**Table 22**  
**Recommended O&M Improvements**  
**US 87 Lockwood Interchange - Exit 452**

Deficiency	Location	Time Frame	Category
Add lane control signs on mast arm	NB and SB US 87 at N Frontage Rd	Existing	Traffic Control
Add lane control signs on mast arm	NB and SB US 87 at I-90 WB ramps	Existing	
Add lane control signs on mast arm	NB and SB US 87 at I-90 EB ramps	Existing	
Replace existing inappropriate advance turn arrow sign*	facing I-90 WB off-ramp on US 87	Existing	
Add intersection lane control signs and markings	NB gas station approach at US 87 / N Frontage Rd	Existing	

\* Replace at end of existing sign maintenance cycle

**Table 23**  
**Recommended O&M Improvements**  
**Johnson Lane Interchange - Exit 455**

Deficiency	Location	Time Frame	Category
Add left turn lane control signs	Johnson Ln at N Frontage Rd	Existing	Traffic Control
Add left turn lane control signs	Johnson Ln at I-90 WB ramps	Existing	
Add left turn lane control signs	Johnson Ln at I-90 EB ramps	Existing	
Add speed limit sign	SB Johnson Ln before I-90 EB ramps	Existing	
Add end of guardrail object marker	NB & SB Johnson Ln between ramps	Existing	