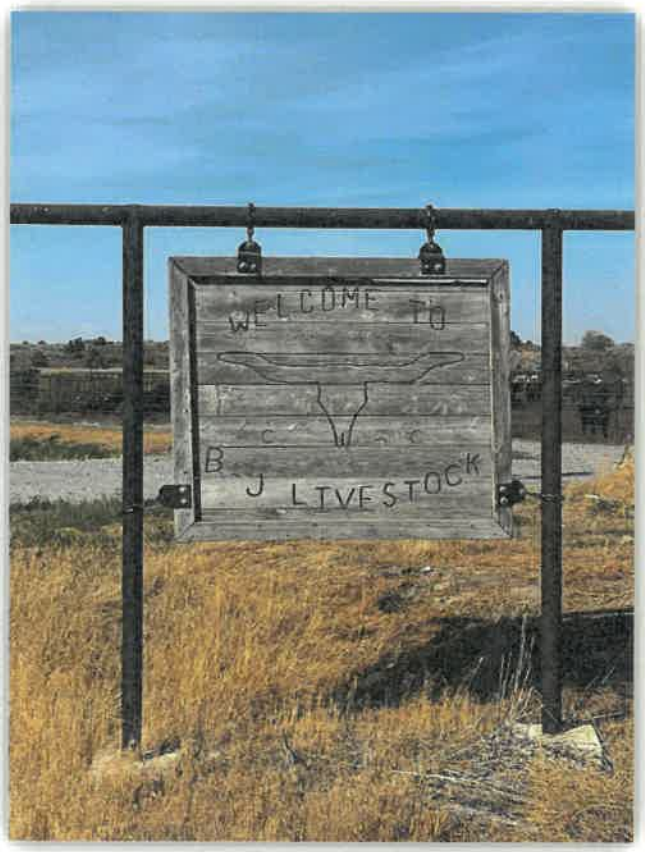
BJ Livestock Gravel Pit
Traffic Impact Study



PROFESSIONAL ENGINEER
LICENSED
14209
9-30-24
STATE OF IDAHO
AARON E. SWENSON

Prepared By: Forsgren Associates and Stamped by Aaron Swenson, P.E.

Exhibit
A-8

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INTRODUCTION AND SUMMARY

Purpose of Report and Study Objectives

The purpose of this report is to quantify the impact of the proposed project to the roadway network using engineering practices. The scope of this TIS is based on ITD's Requirements for Transportation Impact Studies (Supplement to Board Policy B-12-06), the guidance document titled Transportation Impact Analyses for Site Project published by the Institute of Transportation Engineers (ITE), and a study outlined provided by Bingham County Staff. These requirements outline a full or minor TIS as:

The Traffic Impact Study (TIS) serves to assess the traffic effects stemming from the proposed project and provide recommendations for mitigating any identified impacts if required. This study encompasses the following aspects:

- Discusses the proposed project
- Analysis of the existing 2024 traffic volumes and conditions
- Analysis of the 2029 build-out horizon year **without** the project
- Analysis of the 2049 20-year horizon year **without** the project
- Analysis of right and left turns for safety **without** the project
- Projected traffic generated from the project
- Analysis of the 2029 build-out horizon year **with** the project
- Analysis of the 2049 20-year horizon year **with** the project
- Analysis of right and left turns for safety **with** the project
- Mitigation Measures
- Conclusions
- Recommendations

It should be noted that all recommendations and/or advice presented in this document regarding probably project conditions are the opinions of Forsgren Associates. Project conditions are based on information and data sources that are readily available from the public sector, provided by the project owner, previously published studies by other competent professionals, and other reliable sources including state agencies and local municipal government entities, all of which are relied upon as accurate. Our recommendations and/or advice are made on the basis of our experience and represent our judgment and opinions. We have no control over new and/or non-public information, changing conditions, cost of land, cost of labor, materials, equipment, and/or other construction costs, or over competitive bidding or market conditions. Therefore, we do not guarantee that actual conditions or actual costs will not vary from those presented in this report.

EXECUTIVE SUMMARY

Site Location and Study Area

The proposed gravel pit is located at 224 Berggren Lane just east of the North Blackfoot Rest Area on I-15; reference the following chapter for a vicinity map. For a visual of the proposed property that will be used for the gravel pit, see the following figure.

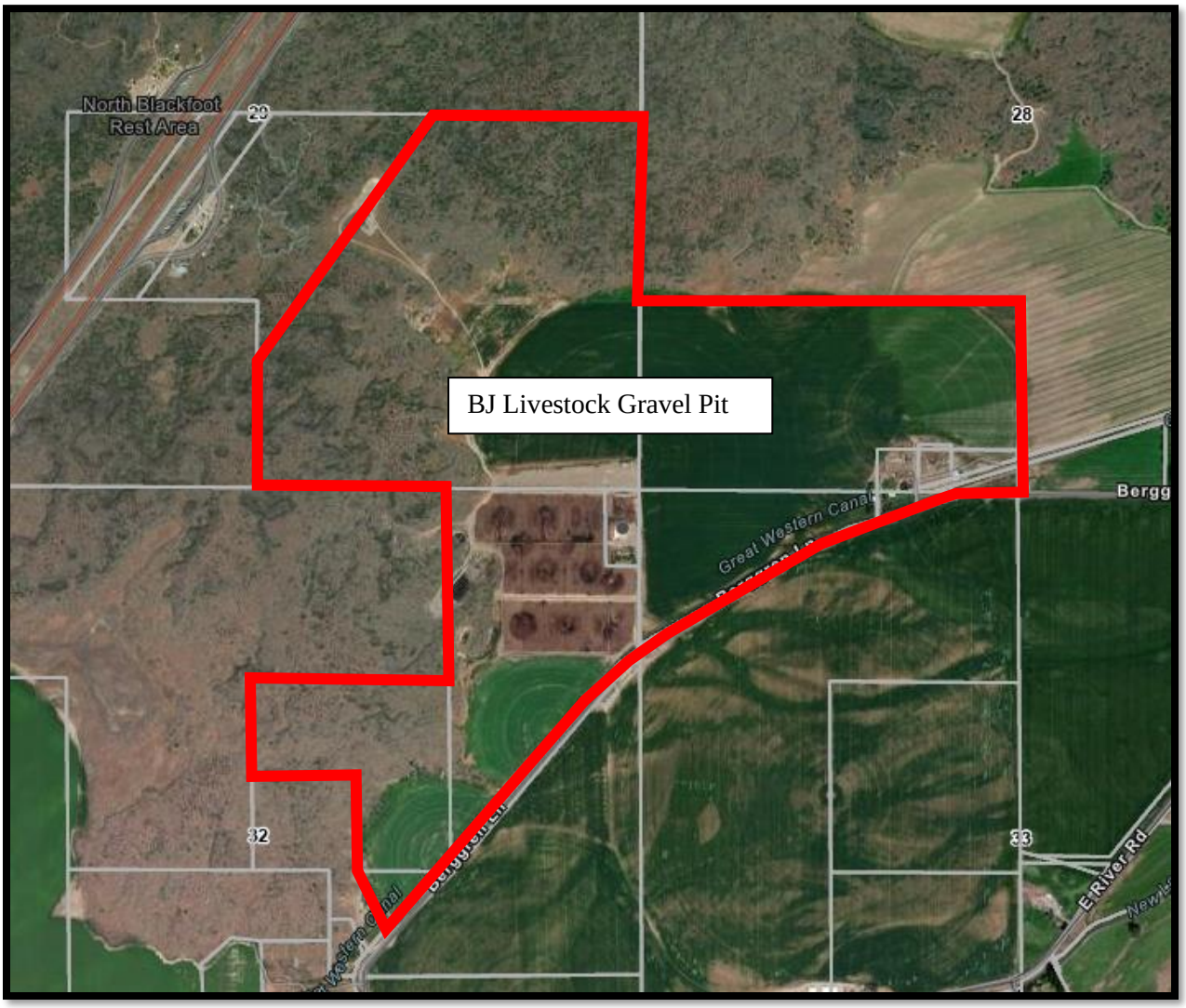


Figure 1: Project Location Map

In discussions with Bingham County staff, it has been identified that there will be two (2) road segment and three (3) intersections analyzed. These segments and intersections are:

- Segment 1: Berggren Lane (from BJ Livestock access to East River Road)
- Segment 2: East River Road (from Berggren to Christensen Lane)
- Intersection 1: Berggren Lane/East River Road
- Intersection 2: East River Road/Christensen Lane
- Intersection 3: New Access/Berggren Lane

The following map shows the location of the segments and intersections to be analyzed.

Figure 2: Project Study Area

Project Description

The current use is agriculture with 30 acres of gated pastures that support 3,200 cattle and has four (4) pivots that irrigate 150 acres. The State of Idaho has a gravel pit one (1) mile from the proposed pit location and 300 yards from the property line. The existing access shall be improved per project scope. The plan is to convert 240.24 acres into a gravel source.

Principal Findings

Level of Service Analysis

Level of service (LOS) is a qualitative measure used to relate the quality of motor vehicle traffic service. LOS is used to analyze roadways and intersections by categorizing traffic flow and assigning quality levels of traffic based on performance measure like vehicle speed, density, congestion, etc.

Segment LOS

The two (2) segments that were identified for analysis are Berggren Lane and East River Road as shown on Figure 2. The following table shows the results of the segment LOS analysis; as can be seen, all the segments throughout each horizon year results in an acceptable LOS.

Table 1 – Segment Traffic Conditons Progression Each Horizon Year

Segment 1: Berggren Ln	Northbound LOS	Southbound LOS
2024 Existing Traffic without the Project	A	A
2029 Buildout Traffic without the Project	A	A
2049 Horizon Year Traffic without the Project	A	A
2024 Existing Traffic with the Project	A	A
2029 Buildout Traffic with the Project	A	A
2049 Horizon Year Traffic with the Project	A	A
Segment 2: East River Road	**Eastbound LOS**	**Westbound LOS**
2024 Existing Traffic without the Project	A	A
2029 Buildout Traffic without the Project	A	A
2049 Horizon Year Traffic without the Project	A	A
2024 Existing Traffic with the Project	A	A
2029 Buildout Traffic with the Project	A	A
2049 Horizon Year Traffic with the Project	A	A

Intersection LOS

The three (3) intersections that were identified for analysis are Berggren Ln/East River Road, East River Road/Christensen Ln, and the New Access/Berggren Ln as shown on Figure 2. The following table shows the results of the intersection LOS analysis; as can be seen, all the turning movements at each intersection throughout each horizon year results in an acceptable LOS.

Table 2 – Intersection Traffic Conditons Progression Each Horizon Year

Intersection 1: Berggren Ln/East River Road	Eastbound LOS	Westbound LOS	Northbound LOS	Southbound LOS
2024 Existing Traffic without the Project	A	A	n/a	A
2029 Buildout Traffic without the Project	A	A	n/a	A
2049 Horizon Year Traffic without the Project	A	A	n/a	A
2024 Existing Traffic with the Project	A	A	n/a	A
2029 Buildout Traffic with the Project	A	A	n/a	A
2049 Horizon Year Traffic with the Project	A	A	n/a	A
Intersection 2: East River Road/Christensen Ln	**Eastbound LOS**	**Westbound LOS**	**Northbound LOS**	**Southbound LOS**
2024 Existing Traffic without the Project	A	A	A	n/a
2029 Buildout Traffic without the Project	A	A	A	n/a
2049 Horizon Year Traffic without the Project	A	A	A	n/a
2024 Existing Traffic with the Project	A	A	A	n/a
2029 Buildout Traffic with the Project	A	A	A	n/a
2049 Horizon Year Traffic with the Project	A	A	A	n/a
Intersection 3: New Access/Berggren Ln	**Eastbound LOS**	**Westbound LOS**	**Northbound LOS**	**Southbound LOS**
2024 Existing Traffic without the Project	n/a	n/a	n/a	n/a
2029 Buildout Traffic without the Project	n/a	n/a	n/a	n/a
2049 Horizon Year Traffic without the Project	n/a	n/a	n/a	n/a
2024 Existing Traffic with the Project	A	A	n/a	A
2029 Buildout Traffic with the Project	A	A	n/a	A
2049 Horizon Year Traffic with the Project	A	A	n/a	A

Turn Lane Warrants

This study analyzed each intersection for traffic conditions and safety. For safety, the ITD guidelines were used to determine if either left or right turn lanes were warranted, not for traffic conditions but for safety conditions. This study has identified that the existing and forecasted traffic, without or with the project, does not warrant the construction of either left turn or right turn lanes throughout the study area or period.

Traffic Safety Implications

This analysis shows that the project will have minimal impact on the safety of the existing roadways. However, it is recommended that the following improvements to the new access be made.

1. Install a private stop sign at the new intersection for southbound traffic
2. Update skew to meet ITD standard maximum skew.
3. Improve the turning radius and skew angle at the new intersection (See Appendix J for exhibit)
4. Potentially relocate the power poles to allow for a safer intersection

Additionally, sight distances were analyzed for the intersections. All sight distances meet AASHTO criteria and is discussed further in the body of the report.

Conclusions and Recommendations

This study has identified that the current road segments are adequate to handle the capacity required without or with the proposed project throughout the study period. All intersections are forecasted to operate within all minimum required thresholds. For safety, both left and right turn lane analyses were performed to identify if there is a safety concern according to ITD guidelines; this study determined that turn lanes are not warranted. Additionally, sight distances were analyzed for the intersections. All sight distances meet AASHTO criteria and is discussed further in the body of the report.

It has been identified that improvements to the new intersection accessing the proposed gravel pit be upgraded. These upgrades include:

- Install a stop sign at the new intersection for southbound traffic
- Improve the turning radius at the new intersection
- Potentially relocate the power poles to allow for a safer intersection

Overall, it is the recommendation of this study that the proposed project will have negligible impacts to the traffic network within the study area for each horizon year and that no other improvements to the roadway network, other than those identified at the new access, are warranted.

CHAPTER 1: STUDY METHODOLOGY

Traffic Model

The data gathered will be entered into the Synchro Traffic Modeling Software Version 11. The traffic volumes (in vehicles per hour) during the pm peak hour will be entered into the traffic model. The following steps will be followed in this TIS:

1. PM peak hour traffic and turning movements for all the segments and intersections identified will be collected.
2. The collected traffic data will be seasonally adjusted to the peak month.
3. The seasonally adjusted volumes will be entered into a model for the 2024 existing conditions to establish a baseline.
4. The 2024 seasonally adjusted volumes will be annually increased for the 2029 buildout year and 2049 20-year horizon year analyses.
5. The proposed project will be analyzed to determine the projected generated traffic.
6. The generated traffic will be added to the 2029 buildout year and the 20-year horizon year seasonally adjusted volumes to determine the impacts of the project.
7. If a poor Level of Service (LOS) is determined, mitigation measures will be discussed and modeled to help improve the projected LOS

Along with entering in the traffic volumes into the model, a peak hour factor, as recommended by the Highway Capacity Manual HCM for rural roadways, of 0.88. Typically, a 5% heavy vehicle factor is used but due to the agriculture in the study area an 8% heavy vehicle factor will be used.

Anticipated Annual Growth

The traffic data from the ITD shows that the AADT on the East River Road decreased from 2020 (640 vpd) to 2023 (510 vpd). However, a positive annual increase is needed for projecting traffic out to the 20-year horizon year. Therefore, the increase in population for Bingham County will be used. Data shows that in 2020 the population was 47,992 and the estimated population in 2023 was 50,395. Using the population growth formula of P=P*(exp(rt)) we find that there is an increase of 1.63% since 2020. This value will be used to project traffic volumes for the 2029 build out year and the 2049 horizon year.

Seasonal Adjustment

Data from the ITD shows that in 2023 (the last set of traffic counts for East River Road) that the peak month was June with an AADT of 561 vpd. The traffic volumes for this project were collected in the end of August. The ITD database shows the AADT in 2023 for August was 555 vpd. This shows that the seasonal adjustment is 1.10%.

Level of Service (LOS)

The traffic modeling software is used to determine the LOS. The LOS helps to determine when improvements are needed. The following sections discuss the difference between the segment and intersection LOS.

Segment LOS

The HCM defines the LOS as a quantitative stratification of a performance measure or measures representing the quality of service. The HCM defines six levels of service, ranging from A to F; LOS A represents the best operating conditions from the traveler's perspective, and LOS F is the most

unfavorable. It is common practice to consider the LOS of A to D as acceptable with a LOS of E or F as unacceptable. For each rural roadway class (I, II, and III), the HCM measures for calculating the LOS are:

- Class I Roadway – Average Travel Speed (ATS) and Percent Time Spent Following (PTSF)
- Class II Roadway – Percent Time Spent Following (PTSF)
- Class III Roadway – Percent of Free Flow Speed (PFFS)

Roadway Classification

This analysis considers both Berggren Ln and East River Road as a Class III two-lane highway. Therefore, the PFFS will be calculated determine the segment LOS.

Percent of free-flow speed (PFFS)

The PFFS represents the ability of vehicles to travel at or near the posted speed limit. The PFFS is a function of the Average Travel Speed (ATS), which is the average travel speed for vehicles to traverse the roadway during the analysis period, and the Free Flow Speed (FFS) which is the desired speed of drivers in low volume conditions and the absence of traffic control devices.

Free Flow Speed (FFS)

The equation for the Free Flow Speed (FFS) is:

$$FFS = BFFS - F_{LS} - F_A \quad \text{(Equation 15-2 in the HCM).}$$

The variables in the equation are:

- BFFS - base free flow speed (the speed limit plus 10 mph)
- F_{LS} - adjusted lane and shoulder width (from the HCM Exhibit 15-7)
- F_A - adjustment for access point density (from the HCM Exhibit 15.8)

Average Travel Speed (ATS)

The first step is to calculate the demand flow rate for both the analysis and the opposing direction. The equation used is Equation 15-3 from the HCM which is the following:

$$V_{i,ats} = \frac{V_i}{PHF * f_{g,ats} * f_{hv,ats}} \quad \text{(Equation 15-3 in the HCM).}$$

The variables in this equation are:

- V_i (demand volume)
- PHF (peak hour factor from HCM Exhibit 15-5)
- $F_{g,ats}$ (grade adjustment from HCM Exhibit 15-9)
- $F_{hv,ats}$ (heavy vehicle adjustment, using HCM Equation 15-4)

PFFS Results

Lastly, the PFFS is calculated by dividing the ATS by the FFS.

$$PFFS = \frac{ATS}{FFS}$$

LOS Results

The LOS correlation for the resulting PFFS for Class III highways is shown in the following table which is from Exhibit 15-3 of the HCM.

Table 3 - LOS Criteria for General Two-Lane Highway Segments

Exhibit 15-3
Motorized Vehicle LOS for Two-Lane Highways

LOS	Class I Highways ATS (mi/h)	Class I Highways PTSF (%)	Class II Highways PTSF (%)	Class III Highways PFFS (%)
A	>55	≤35	≤40	>91.7
B	>50–55	>35–50	>40–55	>83.3–91.7
C	>45–50	>50–65	>55–70	>75.0–83.3
D	>40–45	>65–80	>70–85	>66.7–75.0
E	≤40	>80	>85	≤66.7
F	Demand exceeds capacity			

Note: For Class I highways, LOS is determined by the worse of ATS-based LOS and PTSF-based LOS.

The following figure helps define each of the six (6) segment LOS levels. When a LOS decreases to a LOS of E, mitigation measures/improvements are recommended.

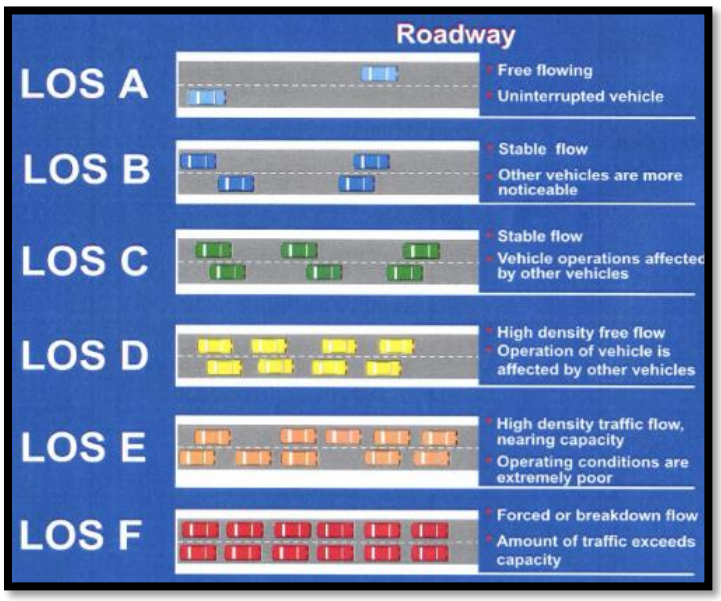


Figure 3 – Segment: Six (6) Levels of LOS

Intersection LOS

The LOS for an intersection is determined by the control delay per vehicle. The LOS is broken down into six (6) categories A through F; A being the best, F being the worst and E being the start of failure. In other words, when a LOS decreases from a D to an E, improvements are recommended. The following bulleted items and table break down the six (6) categories and show the correlation between the delay time and a LOS.

- LOS A: The intersection has no congestion, has less than a 10-second control delay per vehicle, and is operating below 55% capacity.
- LOS B: The intersection has very little congestion, has a control delay per vehicle between 10 and 15 seconds, and is operating between 55% and 64% capacity.
- LOS C: The intersection has no major congestion, has a control delay per vehicle between 15 and 25 seconds, and is operating between 64% and 73% capacity.
- LOS D: The intersection normally has no congestion, has a control delay per vehicle between 25 and 35 seconds, and is operating between 73% and 82% capacity.
- LOS E: The intersection is right on the verge of congested conditions, has a control delay per vehicle between 35 and 50 seconds, and is operating between 82% and 91% capacity.
- LOS F: The intersection is over capacity and experiences congestion, has a control delay per vehicle between 50 seconds or more, and is operating between 91% and 100% capacity.

Table 4 - Control Delay per Vehicle to LOS Correlation Table

Control Delay Per Vehicle (s)	LOS
≤10	A
10 to 15	B
15 to 25	C
25 to 35	D
35 to 50	E
>50	F

Left Turn and Right Turn Lane Warrant Analysis

The left-hand turn and right-hand turn lane warrants are analyzed following the guidance found in ITD's *Traffic Manual: Idaho's Supplementary Guide to the MUTCD*, which references *NCHRP Report 745 – Left-Turn Accommodations at Unsignalized Intersections.* In addition, the *NCHRP 457 – Evaluating Intersection Improvements: An Engineering Study Guide* was utilized for right-turn movements. The following figures show the left-turn and right-turn warrant charts for intersections on a two-lane rural highway.

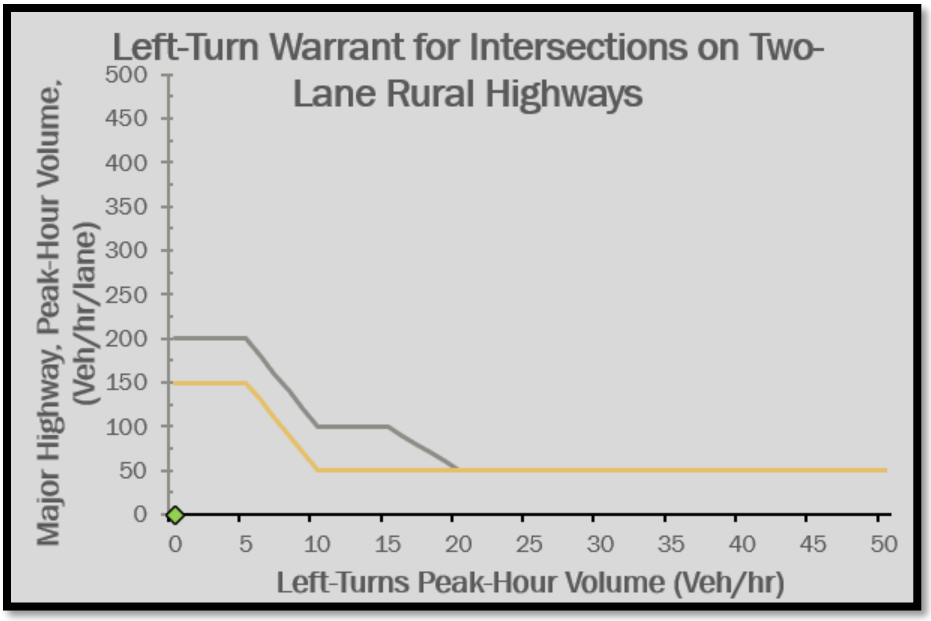


Figure 4 – Left-Turn Warrant Graph

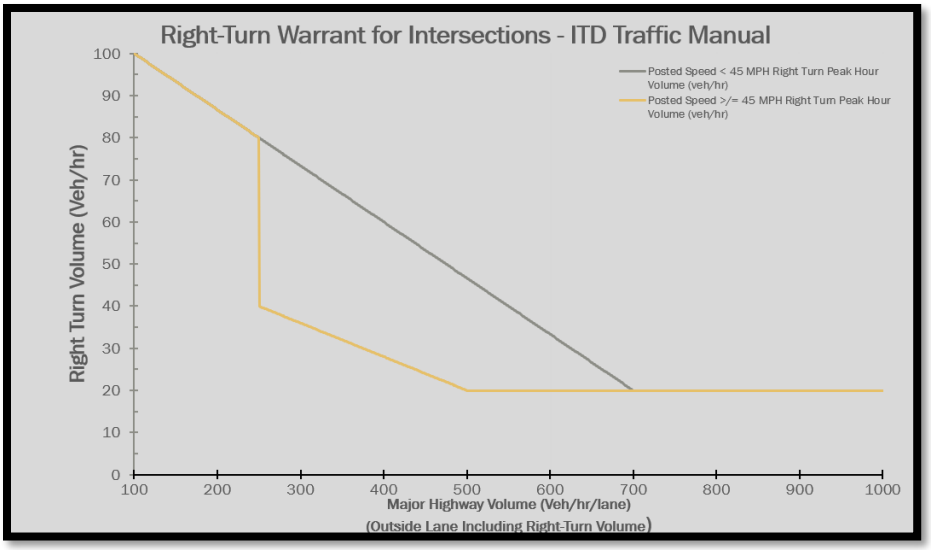


Figure 5 – Right-Turn Warrant Graph

CHAPTER 2: PROPOSED PROJECT

Site Location

The proposed project is located in the middle of Bingham County as shown in the following figure.

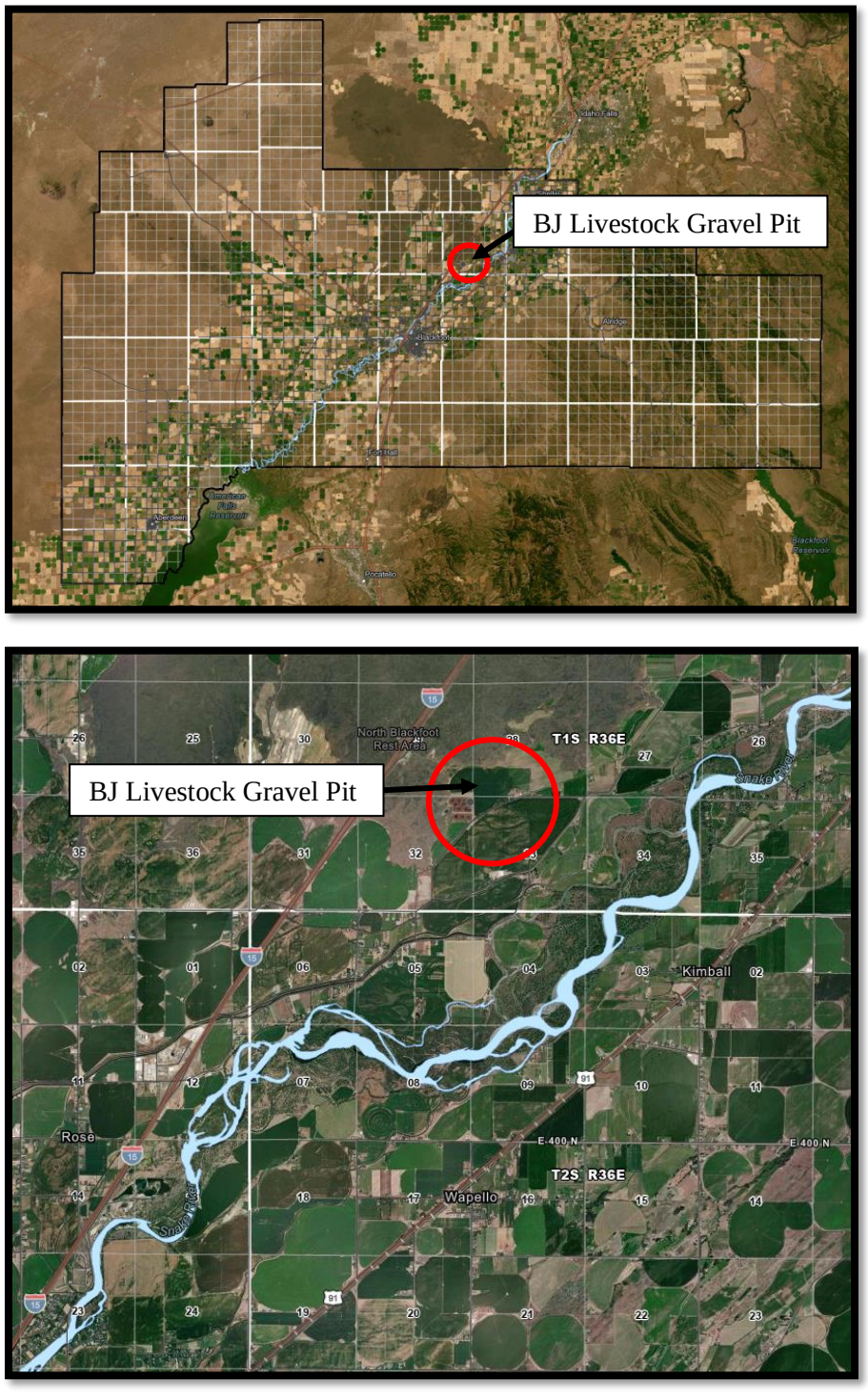


Figure 6: Project Vicinity Map

Land Use and Intensity

The existing land use is agricultural and natural resource.

Proposed Project Details

The gravel pit will consist of 240.24 acres and is proposed to generate 35 vehicles per day (vpd) with 16 vehicles per hour (vph) generated during the peak hour of the day.

Site Plan

The following figure is a site plan of the proposed project.

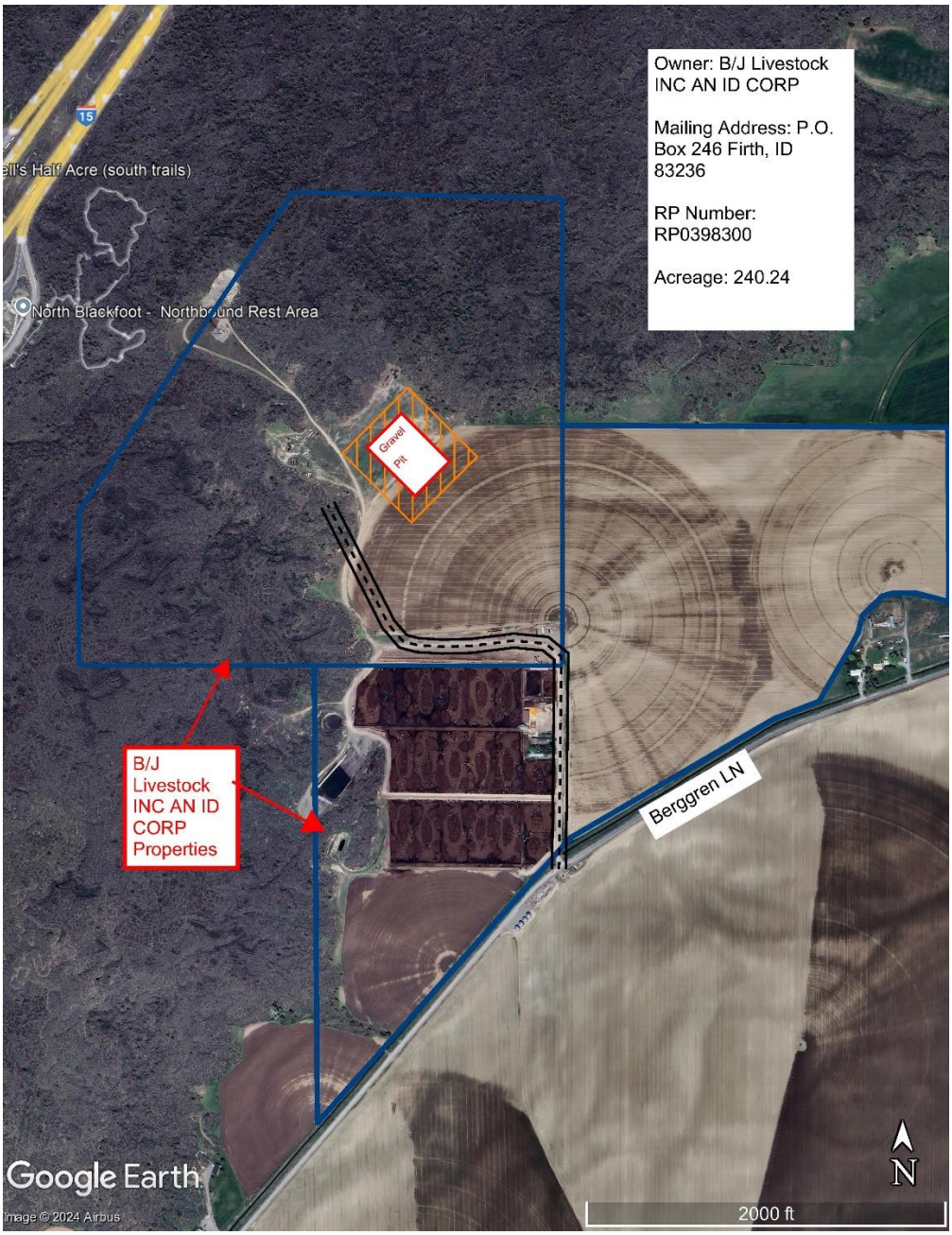


Figure 7: Project Site Plan

Access Geometrics

As part of our traffic impact evaluation for the BJ Livestock gravel pit, we conducted an analysis of turning radii to assess the ability of trucks, specifically WB-50 vehicles, to safely navigate key intersections along the designated haul route. The corridor studied spans from the gravel pit onto Berggren Lane, continuing along East River Road, and leading to I-15. The primary intersections evaluated were:

- **New Site Access/Berggren Lane**
- **Berggren Lane/East River Road**
- **East River Road/Christensen Road**

Using AutoCAD, we simulated the WB-50 turning movements at each intersection to determine whether trucks could make the required maneuvers within the designated lanes of traffic.

Findings

Berggren Lane/East River Road: The WB-50 turning movement at this intersection was evaluated and found to be acceptable, with no modifications required to accommodate truck traffic.

East River Road/Christensen Road: The turning movements at this intersection were also within acceptable limits, with trucks able to navigate the intersection without leaving their designated lanes.

New Access/Berggren Lane: The turning movement from the gravel pit onto Berggren Lane was found to be problematic. Trucks were observed encroaching into the oncoming lane in order to complete the right turn onto Berggren Lane, which poses a potential safety hazard. To mitigate this issue, intersection geometry adjustments will be necessary to improve the safety and functionality of this turn. The proposed adjustments will allow trucks to stay within their lane during the turn. The lane will need to be widened to the southwest with possible adjustments to the adjacent fence. Alternatively, the intersection could be realigned to the north east to come in square to Berggren, this option would require moving a power pole.

All turning movements, aside from the right turn from the site onto Berggren Lane, were deemed acceptable (refer to the exhibits in the attached Appendix J for additional detail).

For the identified issue at the site access, we recommend geometric improvements to the intersection to ensure trucks can safely complete the turn without encroaching into opposing traffic lanes as shown in the following figure.

Figure 8: New Access Improvements

Project Phasing and Timing

It is anticipated that the gravel pit will be in full operation within the next five (5) years (2029).

CHAPTER 3: ANALYSIS OF EXISTING CONDITIONS (2024)

This chapter will analyze the current conditions to develop a baseline for the buildout and 20-year horizon year without and with the project.

Roadway Characteristics

The following are the base roadway characteristics:

- Segment 1 (Berggren Lane): Paved, 22' - 24' wide
- Segment 2 (East River Road): Paved, 22' - 24' wide
- Intersection 1 (Berggren Lane/East River Road): 3 leg intersection, no turn lanes, East River Road is the major roadway
- Intersection 2 (East River Road/Christensen Lane): 3 leg intersection, no turn lanes, East River Road is the major roadway
- Intersection 3 (New Access/Berggren Lane): Currently only considered a driveway. No analysis will be performed for the 2024 existing conditions.

Traffic Control Devices

The following are the existing traffic control devices.

- Intersection 1 (Berggren Lane/East River Road): Stop controlled on Berggren Lane
- Intersection 2 (East River Road/Christensen Lane): Stop controlled on Christensen Lane
- Intersection 3 (New Access/Berggren Lane): Currently only considered a driveway that does not have any traffic control devices.

Pedestrian/Bicycle Facilities

The study area is in a rural area with no evidence of pedestrian or bicycle facilities. According to the Bingham County Transportation Plan, no pedestrian/bicycle facilities projects are planned within the study area.

Traffic Volumes

Segment Traffic Volumes

The segment daily and peak hour traffic volumes collected by the traffic counters were seasonally adjusted and are shown in the following tables; reference Appendix A for the traffic counts.

Table 5 – Seg. 1 (Berggren Ln): Existing 2024 Segment Daily and Peak Hour Traffic Volumes

Segment 1: Berggren Ln	Units	Year	Traffic Volume	Northbound	Southbound
AADT	VPD	2024	55	31	24
Peak Hour	VPH	2024	8	4	4

Table 6 – Seg. 2 (East River Road): Existing 2024 Segment Daily and Peak Hour Traffic Volumes

Segment 2: East River Road	Units	Year	Traffic Volume	Eastbound	Westbound
AADT	VPD	2024	671	355	316
Peak Hour	VPH	2024	72	50	22

Intersection Traffic Volumes

Along with the traffic counters, visual traffic counts were performed to determine turning movements. The two (2) sets of counts were used to integrate the turning percentages and the highest PM peak hour volume collected on Friday, August 30th at 4:00 pm; the results are shown in the following figures.

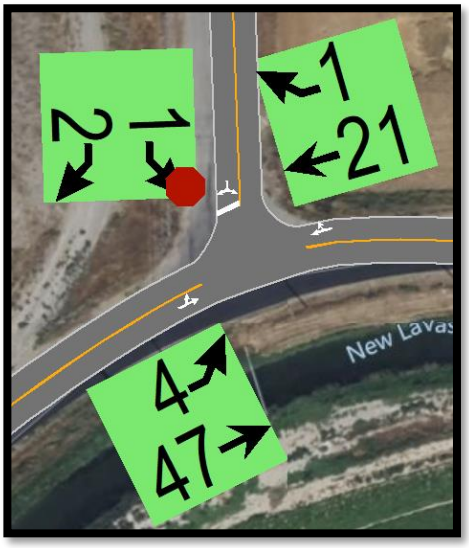


Figure 9: Int. 1 Existing 2024 PM Peak Hr Volumes

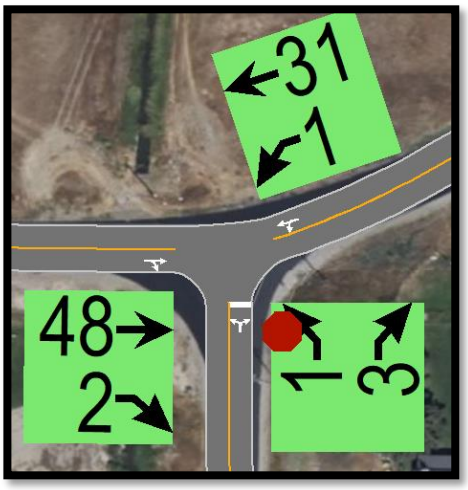


Figure 10: Int. 2 Existing 2024 PM Peak Hr Volumes

Level of Service

Segment LOS

The methods discussed in Chapter 1 will be used to calculate the PFFS and LOS. The following tables are a result of these calculations. For a more in-depth look at these calculations, reference Appendix B.

Table 7 – Seg. 1 (Berggren Ln): Existing 2024 Segment PM Peak Traffic LOS

Segment 1	Existing 2024	
Berggren Ln	Value	LOS
FFS (mph)	46.15	n/a
PFFS (%)	99.4%	A

Table 8 – Seg. 2 (East River Road): Existing 2024 Segment PM Peak Traffic LOS

Segment 2	Existing 2024	
East River Road	Value	LOS
FFS (mph)	38.25	n/a
PFFS (%)	97.7%	A

Intersection LOS

In order to determine how well an intersection is functioning, the level of service (LOS), control delay, volume/capacity ratio (v/c Ratio), and the 95th percentile queue are determined. Using the traffic volumes and turning movements shown previously, the existing 2024 traffic conditions for each intersection can be determined.

The traffic volumes, identified in this chapter, were entered into the computer modeling software Synchro. The results from the model for each intersection are shown in the following tables and more in-depth in Appendix C.

Table 9 – Int. 1: Existing 2024 Intersection PM Peak Traffic LOS

HCM 2000 SIGNING SETTINGS	EBL	EBT	WBT	WBR	SBL	SBR
Lanes and Sharing (#RL)						
Traffic Volume (vph)	4	47	21	1	1	2
Future Volume (vph)	4	47	21	1	1	2
Sign Control	—	Free	Free	—	Stop	—
Median Width (ft)	—	0	0	—	12	—
TWLTL Median	—	☐	☐	—	☐	—
Right Turn Channelized	—	None	—	None	—	None
Critical Gap, tC (s)	4.2	—	—	—	6.5	6.3
Follow Up Time, tF (s)	2.3	—	—	—	3.6	3.4
Volume to Capacity Ratio	0.00	0.00	0.01	0.01	0.00	0.00
Control Delay (s)	0.0	0.7	0.0	0.0	8.7	8.7
Level of Service	A	A	A	A	A	A
Queue Length 95th (ft)	0	0	0	0	0	0
Approach Delay (s)	—	0.7	0.0	—	8.7	—

Table 10 – Int. 2: Existing 2024 Intersection PM Peak Traffic LOS

HCM 2000 SIGNING SETTINGS	EBT	EBR	WBL	WBT	NBL	NBR
Lanes and Sharing (#RL)						
Traffic Volume (vph)	48	2	1	31	1	3
Future Volume (vph)	48	2	1	31	1	3
Sign Control	Free	—	—	Free	Stop	—
Median Width (ft)	0	—	—	0	12	—
TWLTL Median	☐	—	—	☐	☐	—
Right Turn Channelized	—	None	—	None	—	None
Critical Gap, tC (s)	—	—	4.2	—	6.5	6.3
Follow Up Time, tF (s)	—	—	2.3	—	3.6	3.4
Volume to Capacity Ratio	0.03	0.03	0.00	0.00	0.00	0.00
Control Delay (s)	0.0	0.0	0.0	0.2	8.7	8.7
Level of Service	A	A	A	A	A	A
Queue Length 95th (ft)	0	0	0	0	0	0
Approach Delay (s)	0.0	—	—	0.2	8.7	—

Safety (Turn lane Warrants)

Existing 2024 Conditions Left Turn Lane Analysis

Using the guidelines and procedures as described in Chapter 1, we learn that left turn lanes are not warranted for the existing 2024 conditions at each intersection; reference Appendix H for the left turn analysis worksheet.

Existing 2024 Conditions Right Turn Lane Analysis

Using the guidelines and procedures as described in Chapter 1, we learn that right turn lanes are not warranted for the existing 2024 conditions at each intersection; reference Appendix I for the left turn analysis worksheet.

Existing 2024 PM Peak Hr Traffic Conditions Summary

Segments

The following table is a summary of the traffic conditions for the roadway segments.

Table 11 – Existing 2024 Segment Traffic Conditions Summary

Segment 1	Existing 2024	
Berggren Ln	Value	LOS
FFS (mph)	46.15	n/a
PFFS (%)	99.4%	A
Segment 2	Existing 2024	
East River Road	Value	LOS
FFS (mph)	38.25	n/a
PFFS (%)	97.7%	A

Segments Summary

As can be seen in the above table, each segment is operating at an acceptable level; no improvements are warranted.

Intersections

The following tables show each intersection's LOS and delay times for the existing 2024 conditions.

Table 12 – Int. 1: Existing 2024 Intersection Traffic Conditions

Int 1 - Berggren/East River Road: Existing 2024 LOS and Delay Times												
	Eastbound			Westbound			Northbound			Southbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
2024 Traffic	4	47	n/a	n/a	21	1	n/a	n/a	n/a	1	n/a	2
LOS	A	A	n/a	n/a	A	A	n/a	n/a	n/a	A	n/a	A
Delay (sec)	0	0.7	n/a	n/a	0	0	n/a	n/a	n/a	8.7	n/a	8.7

Table 13 – Int. 2: Existing 2024 Intersection Traffic Conditions

Int 2 - East River Road/Christensen Ln: Existing 2024 LOS and Delay Times												
	Eastbound			Westbound			Northbound			Southbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
2024 Traffic	n/a	48	2	1	31	n/a	1	n/a	3	n/a	n/a	n/a
LOS	n/a	A	A	A	A	n/a	A	n/a	A	n/a	n/a	n/a
Delay	n/a	0	0	0	0.2	n/a	8.7	n/a	8.7	n/a	n/a	n/a

Intersections Summary

As can be seen from these two (2) tables, all turning movements are operating within the recommended thresholds. Therefore, no mitigation measures are warranted.

Turn Lane Analysis

Left Turn Lane Analysis

The following left turn lane(s) are warranted for the existing 2024 traffic.

1. None

Right Turn Lane Analysis

The following right turn lane(s) are warranted for the existing 2024 traffic.

1. None

Overall Summary for the Existing 2024 Traffic Conditions

This analysis has determined that no improvements are warranted to handle the existing 2024 traffic volumes. In addition, no left or right turn lanes are warranted to improve safety.

CHAPTER 4: ANALYSIS OF FUTURE WITHOUT PROJECT CONDITIONS

This chapter will take the conditions outlined in Chapter 3 and increase them by the annual growth rate without the project for both the 2029 buildout and 20-year 2049 horizon years. It should be noted that only intersections 1 and 2 will be analyzed in this chapter; the new access known as Intersection 3 will be analyzed in the following chapter (with the project).

2029 Buildout Year without the Project

Roadway Characteristics

It was determined in Chapter 3 that the roadways are functioning at acceptable levels and that no improvements were needed. Therefore, all roadway characteristics for the 2029 buildout year are the same as existing.

Traffic Control Devices

It is assumed that the traffic control devices will be the same as those identified in Chapter 3; Intersections 1 and 2 are stop controlled on the minor roads (Berggren Ln and Christensen Ln).

Pedestrian/Bicycle Facilities

The study area is in a rural area with no evidence of pedestrian or bicycle facilities. According to the Bingham County Transportation Plan, no pedestrian/bicycle facilities projects are planned within the study area.

Traffic Volumes

Volume Forecast Methods

The traffic data from the ITD shows that the AADT on the East River Road decreased from 2020 (640 vpd) to 2023 (510 vpd). However, a positive annual increase is needed for projecting traffic out to the 20-year horizon year. Therefore, the increase in population for Bingham County will be used. Data shows that in 2020 the population was 47,992 and the estimated population in 2023 was 50,395. Using the population growth formula of P=P*(exp(rt)) we find that there is an increase of 1.63% since 2020. This value will be used to project traffic volumes for the 2029 build out year and the 2049 horizon year.

Forecasted Volumes by Horizon Year without the Project

The 2029 buildout year forecasted traffic volumes were calculated by taking the existing 2024 traffic counts (see Chapter 3) and increasing them by the annual increase discussed in the previous paragraph. The results of these counts are shown in the following tables and figures.

Table 14 – Seg. 1 2029 Buildout Year Daily and Peak Hr Traffic Volumes without the Project

Segment 1: Berggren Ln	Units	Year	Traffic Volume	Northbound	Southbound
AADT	VPD	2024	55	31	24
Peak Hour	VPH	2024	8	4	4
AADT	VPD	2029	60	34	26
Peak Hour	VPH	2029	10	5	5

Table 15 – Seg. 2 2029 Buildout Year Daily and Peak Hr Traffic Volumes without the Project

Segment 2: East River Road	Units	Year	Traffic Volume	Eastbound	Westbound
AADT	VPD	2024	671	355	316
Peak Hour	VPH	2024	72	50	22
AADT	VPD	2029	728	385	343
Peak Hour	VPH	2029	78	54	24

The following two (2) figures show the forecasted volumes for the intersections for the 2029 buildout year.

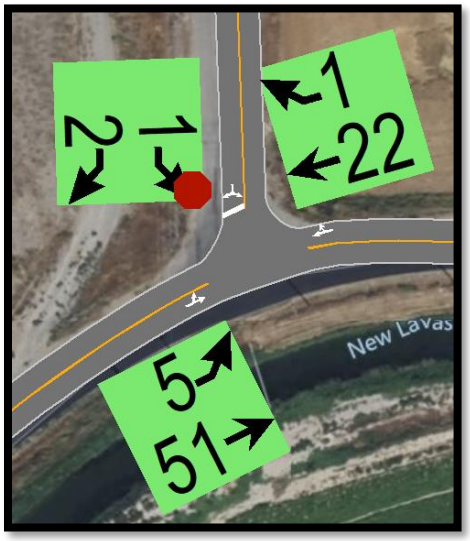


Figure 11: Int. 1 2029 Buildout Year PM Peak Hr Volumes without the Project

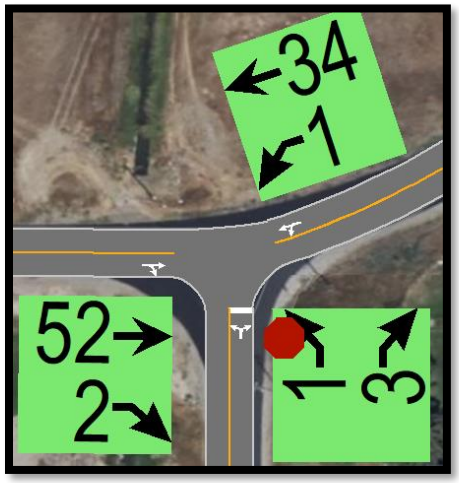


Figure 12: Int. 2 2029 Buildout Year PM Peak Hr Volumes without the Project

Level of Service without the Project

Segment LOS without the Project

The methods discussed in Chapter 1 will be used to calculate the PFFS and LOS. The following tables are a result of these calculations. For a more in-depth look at these calculations, reference Appendix B.

Table 16 – Seg. 1 2029 Buildout Year Segment PM Peak Traffic LOS without the Project

Segment 1	Existing 2024		2029 Buildout	
Berggren Ln	Value	LOS	Value	LOS
FFS (mph)	46.15	n/a	46.15	n/a
PFFS (%)	99.4%	A	99.4%	A

Table 17 – Seg. 2 2029 Buildout Year Segment PM Peak Traffic LOS without the Project

Segment 2	Existing 2024		2029 Buildout	
East River Road	Value	LOS	Value	LOS
FFS (mph)	38.25	n/a	38.25	n/a
PFFS (%)	97.7%	A	97.5%	A

Intersection LOS without the Project

In order to determine how well an intersection is functioning, the level of service (LOS), control delay, volume/capacity ratio (v/c Ratio), and the 95th percentile queue are determined. Using the traffic volumes and turning movements shown previously, the 2029 buildout traffic conditions for each intersection can be determined.

The traffic volumes, identified in this chapter, were entered into the computer modeling software Synchro. The results from the model for each intersection are shown in the following tables and more in-depth in Appendix C.

Table 18 – Int. 1: 2029 Buildout Intersection PM Peak Traffic LOS without the Project

HCM 2000 SIGNING SETTINGS	EBL	EBT	WBT	WBR	SBL	SBR
Lanes and Sharing (#RL)						
Traffic Volume (vph)	5	51	22	1	1	2
Future Volume (vph)	5	51	22	1	1	2
Sign Control	—	Free	Free	—	Stop	—
Median Width (ft)	—	0	0	—	12	—
TWLTL Median	—	☐	☐	—	☐	—
Right Turn Channelized	—	None	—	None	—	None
Critical Gap, tC (s)	4.2	—	—	—	6.5	6.3
Follow Up Time, tF (s)	2.3	—	—	—	3.6	3.4
Volume to Capacity Ratio	0.00	0.00	0.02	0.02	0.00	0.00
Control Delay (s)	0.0	0.7	0.0	0.0	8.7	8.7
Level of Service	A	A	A	A	A	A
Queue Length 95th (ft)	0	0	0	0	0	0
Approach Delay (s)	—	0.7	0.0	—	8.7	—

Table 19 – Int. 2: 2029 Buildout Intersection PM Peak Traffic LOS without the Project

HCM 2000 SIGNING SETTINGS	EBT	EBR	WBL	WBT	NBL	NBR
Lanes and Sharing (#RL)						
Traffic Volume (vph)	52	2	1	34	1	3
Future Volume (vph)	52	2	1	34	1	3
Sign Control	Free	—	—	Free	Stop	—
Median Width (ft)	0	—	—	0	12	—
TWLTL Median	☐	—	—	☐	☐	—
Right Turn Channelized	—	None	—	None	—	None
Critical Gap, tC (s)	—	—	4.2	—	6.5	6.3
Follow Up Time, tF (s)	—	—	2.3	—	3.6	3.4
Volume to Capacity Ratio	0.04	0.04	0.00	0.00	0.00	0.00
Control Delay (s)	0.0	0.0	0.0	0.2	8.8	8.8
Level of Service	A	A	A	A	A	A
Queue Length 95th (ft)	0	0	0	0	0	0
Approach Delay (s)	0.0	—	—	0.2	8.8	—

Safety (Turn lane Warrants) without the Project

2029 Buildout Conditions Left Turn Lane Analysis

Using the guidelines and procedures as described in Chapter 1, we learn that left turn lanes are not warranted for the 2029 buildout conditions at each intersection; reference Appendix H for the left turn analysis worksheet.

2029 Buildout Conditions Right Turn Lane Analysis

Using the guidelines and procedures as described in Chapter 1, we learn that right turn lanes are not warranted for the 2029 buildout conditions at each intersection; reference Appendix I for the left turn analysis worksheet.

2029 Buildout PM Peak Hr Traffic Conditions Summary without the Project

Segments

The following table is a summary of the traffic conditions for the roadway segments.

Table 20 – 2029 Buildout Segment Traffic Conditions Summary without the Project

Segment 1	Existing 2024		2029 Buildout	
Berggren Ln	Value	LOS	Value	LOS
FFS (mph)	46.15	n/a	46.15	n/a
PFFS (%)	99.4%	A	99.4%	A
Segment 2	Existing 2024		2029 Buildout	
East River Road	Value	LOS	Value	LOS
FFS (mph)	38.25	n/a	38.25	n/a
PFFS (%)	97.7%	A	97.5%	A

As can be seen in the above table, each segment is operating at an acceptable level.

Intersections

The following tables show each intersection's LOS and delay times.

Table 21 – Int. 1: 2029 Buildout Intersection Traffic Conditions Summary without the Project

Int 1 - Berggren/East River Road: 2029 Buildout LOS and Delay Times without Project												
	Eastbound			Westbound			Northbound			Southbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
2029 Traffic	5	51	n/a	n/a	22	1	n/a	n/a	n/a	1	n/a	2
LOS	A	A	n/a	n/a	A	A	n/a	n/a	n/a	A	n/a	A
Delay (sec)	0	0.7	n/a	n/a	0	0	n/a	n/a	n/a	8.7	n/a	8.7

Table 22 – Int. 2: 2029 Buildout Intersection Traffic Conditions Summary without the Project

Int 2 - East River Road/Christensen Ln: 2029 Buildout LOS and Delay Times without Project												
	Eastbound			Westbound			Northbound			Southbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
2029 Traffic	n/a	52	2	1	34	n/a	1	n/a	3	n/a	n/a	n/a
LOS	n/a	A	A	A	A	n/a	A	n/a	A	n/a	n/a	n/a
Delay	n/a	0	0	0	0.2	n/a	8.8	n/a	8.8	n/a	n/a	n/a

As can be seen from these two (2) tables, all turning movements are operating within the recommended thresholds. Therefore, no mitigation measures are warranted.

Turn Lane Analysis

Left Turn Lane Analysis

The following left turn lane(s) are warranted for the 2029 buildout traffic.

1. None

Right Turn Lane Analysis

The following right turn lane(s) are warranted for the 2029 buildout traffic.

1. None

Overall Summary for the 2029 Buildout Traffic Conditions Summary without the Project

This analysis has determined that no improvements are warranted to handle the 2029 buildout traffic volumes. In addition, no left or right turn lanes are warranted to improve safety.

2049 Horizon Year without the Project

Roadway Characteristics

It was determined in the previous section of this chapter that the roadways are functioning at acceptable levels and that no improvements were needed. Therefore, all roadway characteristics for the 2049 horizon year are the same as existing.

Traffic Control Devices

It is assumed that the traffic control devices will be the same as those identified in Chapter 3; Intersections 1 and 2 are stop controlled on the minor roads (Berggren Ln and Christensen Ln).

Pedestrian/Bicycle Facilities

The study area is in a rural area with no evidence of pedestrian or bicycle facilities. According to the Bingham County Transportation Plan, no pedestrian/bicycle facilities projects are planned within the study area.

Traffic Volumes

Volume Forecast Methods

The population growth rate of 1.63% that was calculated earlier will be used.

Forecasted Volumes by Horizon Year without the Project

The 2049 horizon year forecasted traffic volumes were calculated by taking the existing 2024 traffic counts (see Chapter 3) and increasing them by the annual increase discussed in the previous paragraph. The results of these counts are shown in the following tables and figures.

Table 23 – Seg. 1 2049 Horizon Year Daily and Peak Hr Traffic Volumes without the Project

Segment 1: Berggren Ln	Units	Year	Traffic Volume	Northbound	Southbound
AADT	VPD	2024	55	31	24
Peak Hour	VPH	2024	8	4	4
AADT	VPD	2029	60	34	26
Peak Hour	VPH	2029	10	5	5
AADT	VPD	2049	83	47	36
Peak Hour	VPH	2049	14	7	7

Table 24 – Seg. 2 2049 Horizon Year Daily and Peak Hr Traffic Volumes without the Project

Segment 2: East River Road	Units	Year	Traffic Volume	Eastbound	Westbound
AADT	VPD	2024	671	355	316
Peak Hour	VPH	2024	72	50	22
AADT	VPD	2029	728	385	343
Peak Hour	VPH	2029	78	54	24
AADT	VPD	2049	1009	533	476
Peak Hour	VPH	2049	108	74	33

The following two (2) figures show the forecasted volumes for the intersections for the 2049 horizon year.

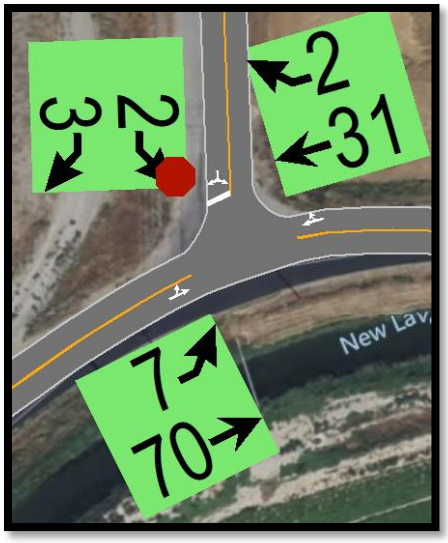


Figure 13: Int. 1 2049 Horizon Year PM Peak Hr Volumes without the Project

Figure 14: Int. 2 2049 Horizon Year PM Peak Hr Volumes without the Project

Level of Service without the Project

Segment LOS without the Project

The methods discussed in Chapter 1 will be used to calculate the PFFS and LOS. The following tables are a result of these calculations. For a more in-depth look at these calculations, reference Appendix B.

Table 25 – Seg. 1 2049 Horizon Year Segment PM Peak Traffic LOS without the Project

Segment 1	Existing 2024		2029 Buildout		2049 Horizon	
Berggren Ln	Value	LOS	Value	LOS	Value	LOS
FFS (mph)	46.15	n/a	46.15	n/a	46.15	n/a
PFFS (%)	99.4%	A	99.4%	A	99.3%	A

Table 26 – Seg. 2 2049 Horizon Year Segment PM Peak Traffic LOS without the Project

Segment 2	Existing 2024		2029 Buildout		2049 Horizon	
East River Road	Value	LOS	Value	LOS	Value	LOS
FFS (mph)	38.25	n/a	38.25	n/a	38.25	n/a
PFFS (%)	97.7%	A	97.5%	A	96.5%	A

Intersection LOS without the Project

In order to determine how well an intersection is functioning, the level of service (LOS), control delay, volume/capacity ratio (v/c Ratio), and the 95th percentile queue are determined. Using the traffic volumes and turning movements shown previously, the 2049 horizon year conditions for each intersection can be determined.

The traffic volumes, identified in this chapter, were entered into the computer modeling software Synchro. The results from the model for each intersection are shown in the following tables and more in-depth in Appendix C.

Table 27 – Int. 1: 2049 Horizon Year Intersection PM Peak Traffic LOS without the Project

HCM 2000 SIGNING SETTINGS	EBL	EBT	WBT	WBR	SBL	SBR
Lanes and Sharing (#RL)						
Traffic Volume (vph)	7	70	31	2	2	3
Future Volume (vph)	7	70	31	2	2	3
Sign Control	—	Free	Free	—	Stop	—
Median Width (ft)	—	0	0	—	12	—
TWLTL Median	—			—		—
Right Turn Channelized	—	None	—	None	—	None
Critical Gap, tC (s)	4.2	—	—	—	6.5	6.3
Follow Up Time, tF (s)	2.3	—	—	—	3.6	3.4
Volume to Capacity Ratio	0.01	0.01	0.02	0.02	0.01	0.01
Control Delay (s)	0.0	0.7	0.0	0.0	8.8	8.8
Level of Service	A	A	A	A	A	A
Queue Length 95th (ft)	0	0	0	0	0	0
Approach Delay (s)	—	0.7	0.0	—	8.8	—

Table 28 – Int. 2: 2049 Horizon Year Intersection PM Peak Traffic LOS without the Project

HCM 2000 SIGNING SETTINGS	EBT	EBR	WBL	WBT	NBL	NBR
Lanes and Sharing (#RL)						
Traffic Volume (vph)	73	2	2	47	2	5
Future Volume (vph)	73	2	2	47	2	5
Sign Control	Free	—	—	Free	Stop	—
Median Width (ft)	0	—	—	0	12	—
TWLTL Median		—	—			—
Right Turn Channelized	—	None	—	None	—	None
Critical Gap, tC (s)	—	—	4.2	—	6.5	6.3
Follow Up Time, tF (s)	—	—	2.3	—	3.6	3.4
Volume to Capacity Ratio	0.05	0.05	0.00	0.00	0.01	0.01
Control Delay (s)	0.0	0.0	0.0	0.3	8.9	8.9
Level of Service	A	A	A	A	A	A
Queue Length 95th (ft)	0	0	0	0	1	1
Approach Delay (s)	0.0	—	—	0.3	8.9	—

Safety (Turn lane Warrants) without the Project

2049 Horizon Year Conditions Left Turn Lane Analysis

Using the guidelines and procedures as described in Chapter 1, we learn that left turn lanes are not warranted for the 2049 Horizon Year conditions at each intersection; reference Appendix H for the left turn analysis worksheet.

2049 Horizon Year Conditions Right Turn Lane Analysis

Using the guidelines and procedures as described in Chapter 1, we learn that right turn lanes are not warranted for the 2049 Horizon Year conditions at each intersection; reference Appendix I for the left turn analysis worksheet.

2049 Horizon Year PM Peak Hr Traffic Conditions Summary without the Project

Segments

The following table is a summary of the traffic conditions for the roadway segments.

Table 29 – 2049 Horizon Year Segment Traffic Conditions Summary without the Project

Segment 1	Existing 2024		2029 Buildout		2049 Horizon	
Berggren Ln	Value	LOS	Value	LOS	Value	LOS
FFS (mph)	46.15	n/a	46.15	n/a	46.15	n/a
PFFS (%)	99.4%	A	99.4%	A	99.3%	A
Segment 2	**Existing 2024**		**2029 Buildout**		**2049 Horizon**	
East River Road	Value	LOS	Value	LOS	Value	LOS
FFS (mph)	38.25	n/a	38.25	n/a	38.25	n/a
PFFS (%)	97.7%	A	97.5%	A	96.5%	A

As can be seen in the above table, each segment is operating at an acceptable level.

Intersections

The following tables show each intersection's LOS and delay times.

Table 30 – Int. 1: 2049 Horizon Year Intersection Traffic Conditions Summary without the Project

Int 1 - Berggren/East River Road: 2049 Horizon Year LOS and Delay Times without Project												
	Eastbound			Westbound			Northbound			Southbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
2049 Traffic	7	70	n/a	n/a	31	2	n/a	n/a	n/a	2	n/a	3
LOS	A	A	n/a	n/a	A	A	n/a	n/a	n/a	A	n/a	A
Delay (sec)	0	0.7	n/a	n/a	0	0	n/a	n/a	n/a	8.8	n/a	8.8

Table 31 – Int. 2: 2049 Horizon Year Intersection Traffic Conditions Summary without the Project

Int 2 - East River Road/Christensen Ln: 2049 Horizon Year LOS and Delay Times without Project												
	Eastbound			Westbound			Northbound			Southbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
2049 Traffic	n/a	73	2	2	47	n/a	2	n/a	5	n/a	n/a	n/a
LOS	n/a	A	A	A	A	n/a	A	n/a	A	n/a	n/a	n/a
Delay	n/a	0	0	0	0.3	n/a	8.9	n/a	8.9	n/a	n/a	n/a

As can be seen from these two (2) tables, all turning movements are operating within the recommended thresholds. Therefore, no mitigation measures are warranted.

Turn Lane Analysis

Left Turn Lane Analysis

The following left turn lane(s) are warranted for the 2049 Horizon Year traffic.

1. None

Right Turn Lane Analysis

The following right turn lane(s) are warranted for the 2049 Horizon Year traffic.

1. None

Overall Summary for the 2049 Horizon Year Traffic Conditions without the Project

This analysis has determined that no improvements are warranted to handle the 2049 Horizon Year traffic volumes. In addition, no left or right turn lanes are warranted to improve safety.

CHAPTER 5: ANALYSIS OF FUTURE WITH PROJECT CONDITIONS

This chapter will take the conditions outlined in Chapter 3, increase them by the annual growth rate, and add the generated traffic from the project for both the 2029 buildout and 20-year 2049 horizon years.

Site Traffic Forecasts (each horizon year)

Trip Generation

It is anticipated that the buildout of the development will be complete by 2029. From discussions with the project owners, it is anticipated that the trips generated are:

- Daily
  - 25 vpd (heavy vehicles)
  - 10 vpd (smaller vehicles)
- Peak Hour
  - 10 vph (heavy vehicles)
  - 6 vph (smaller vehicles)

Mode Split

Modal split is the determination of different travel modes (automobile, heavy vehicles, walk, etc.) from an origin to a given destination. The modal split assumptions are:

- 70% of all traffic generated by the development will be heavy vehicles
- 30% will be automobile traffic
- 0 pedestrian trips will be generated

Pass-by Traffic (if applicable)

Pass-by trips are made as intermediate stops on the way from an origin to a destination without a route diversion. In other words, a pass-by trip is when the traffic on an adjacent roadway is attracted to a certain land use in a development as non-site traffic. The trip generally goes from the origin to the generator and then returns to the origin. The proposed project does not have any land uses that would be considered pass-by trips.

Trip Distribution

For study purposes, it is assumed that:

- Daily Trips
  - Primary Trips Entering = 50%
  - Primary Trips Exiting = 50%
- Peak Hour
  - Primary Trips Entering = 50%
  - Primary Trips Exiting = 50%

Trip Assignment

For study purposes, it is assumed that all traffic will travel from the project location west to I-15.

Total With-Project Volumes (each horizon year)

The following figures show the forecasted PM peak hour trip assignment and generated volumes that will be used in this analysis.

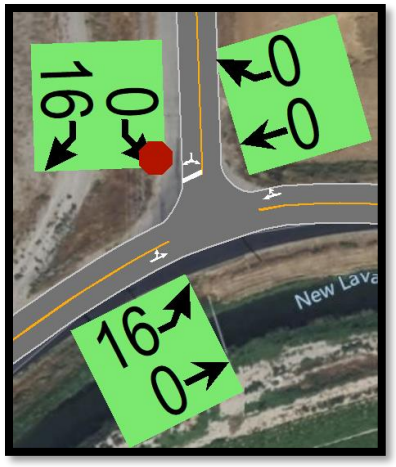


Figure 15: Int. 1 PM Peak Generated Traffic

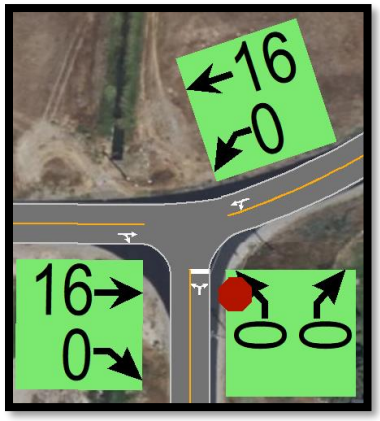


Figure 16: Int. 2 PM Peak Generated Traffic

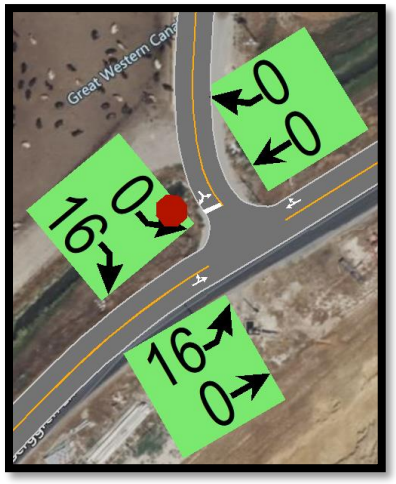


Figure 17: Int. 3 PM Peak Generated Traffic

2029 Buildout Year with the Project

Roadway Characteristics

It was determined in Chapter 3 that the roadways are functioning at acceptable levels and that no improvements were needed. Therefore, all roadway characteristics for the 2029 buildout year are the same as existing.

Traffic Control Devices

It is assumed that the traffic control devices will be the same as those identified in Chapter 3; Intersections 1 and 2 are stop controlled on the minor roads (Berggren Ln and Christensen Ln). It is recommended that a stop sign be installed at the new intersection. This analysis will include a stop sign at the new intersection.

Pedestrian/Bicycle Facilities

The study area is in a rural area with no evidence of pedestrian or bicycle facilities. According to the Bingham County Transportation Plan, no pedestrian/bicycle facilities projects are planned within the study area.

Traffic Volumes

Volume Forecast Methods

The population growth rate of 1.63% that was calculated earlier will be used.

Forecasted Volumes by Horizon Year with the Project

The 2029 buildout year forecasted traffic volumes were calculated by taking the existing 2024 traffic counts (see Chapter 3), increasing them by the annual increase discussed in the previous paragraph, and by adding the generated traffic from the project. The results of these counts are shown in the following tables and figures.

Table 32 – Seg. 1 2029 Buildout Year Daily and Peak Hr Traffic Volumes with the Project

Segment 1: Berggren Ln	Units	Year	Traffic Volume	Northbound	Southbound
AADT	VPD	2024	55	31	24
Peak Hour	VPH	2024	8	4	4
AADT	VPD	2029	130	69	61
Peak Hour	VPH	2029	42	21	21

Table 33 – Seg. 2 2029 Buildout Year Daily and Peak Hr Traffic Volumes with the Project

Segment 2: East River Road	Units	Year	Traffic Volume	Eastbound	Westbound
AADT	VPD	2024	671	355	316
Peak Hour	VPH	2024	72	50	22
AADT	VPD	2029	798	420	378
Peak Hour	VPH	2029	110	70	40

The following figures show the forecasted volumes for the intersections for the 2029 buildout year.

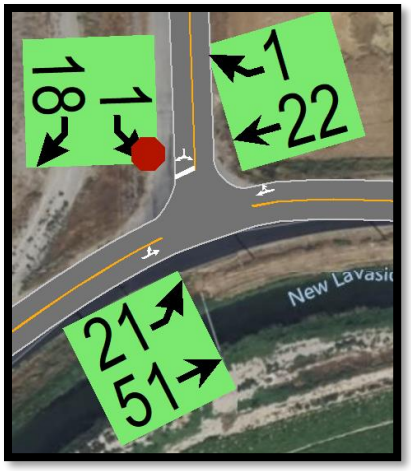


Figure 18: Int. 1 2029 Buildout Year PM Peak Hr Volumes with the Project

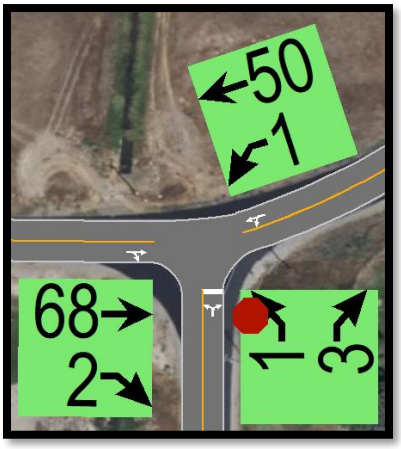


Figure 19: Int. 2 2029 Buildout Year PM Peak Hr Volumes with the Project

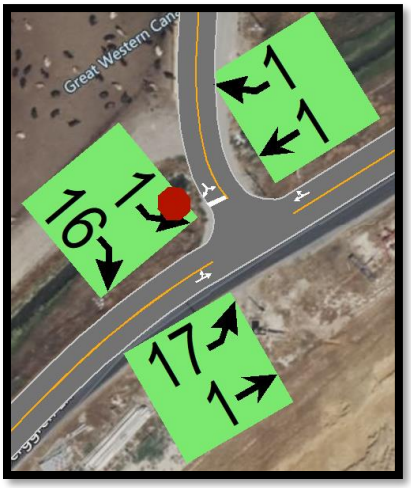


Figure 20: Int. 3 2029 Buildout Year PM Peak Hr Volumes with the Project

Level of Service with the Project

Segment LOS with the Project

The methods discussed in Chapter 1 will be used to calculate the PFFS and LOS. The following tables are a result of these calculations. For a more in-depth look at these calculations, reference Appendix B.

Table 34 – Seg. 1 2029 Buildout Year Segment PM Peak Traffic LOS with the Project

Segment 1	Existing 2024		2029 Buildout	
Berggren Ln	Value	LOS	Value	LOS
FFS (mph)	46.15	n/a	46.15	n/a
PFFS (%)	99.4%	A	98.7%	A

Table 35 – Seg. 2 2029 Buildout Year Segment PM Peak Traffic LOS with the Project

Segment 2	Existing 2024		2029 Buildout	
East River Road	Value	LOS	Value	LOS
FFS (mph)	38.25	n/a	38.25	n/a
PFFS (%)	97.7%	A	96.4%	A

Intersection LOS with the Project

In order to determine how well an intersection is functioning, the level of service (LOS), control delay, volume/capacity ratio (v/c Ratio), and the 95th percentile queue are determined. Using the traffic volumes and turning movements shown previously, the 2029 buildout traffic conditions for each intersection can be determined.

The traffic volumes, identified in this chapter, were entered into the computer modeling software Synchro. The results from the model for each intersection are shown in the following tables and more in-depth in Appendix C.

Table 36 – Int. 1: 2029 Buildout Intersection PM Peak Traffic LOS with the Project

HCM 2000 SIGNING SETTINGS	EBL	EBT	WBT	WBR	SBL	SBR
Lanes and Sharing (#RL)						
Traffic Volume (vph)	21	51	22	1	1	18
Future Volume (vph)	21	51	22	1	1	18
Sign Control	—	Free	Free	—	Stop	—
Median Width (ft)	—	0	0	—	12	—
TWLTL Median	—	☐	☐	—	☐	—
Right Turn Channelized	—	None	—	None	—	None
Critical Gap, tC (s)	4.2	—	—	—	6.5	6.3
Follow Up Time, tF (s)	2.3	—	—	—	3.6	3.4
Volume to Capacity Ratio	0.02	0.02	0.02	0.02	0.02	0.02
Control Delay (s)	0.1	2.2	0.0	0.0	8.6	8.6
Level of Service	A	A	A	A	A	A
Queue Length 95th (ft)	1	1	0	0	2	2
Approach Delay (s)	—	2.2	0.0	—	8.6	—

Table 37 – Int. 2: 2029 Buildout Intersection PM Peak Traffic LOS with the Project

HCM 2000 SIGNING SETTINGS	EBT	EBR	WBL	WBT	NBL	NBR
Lanes and Sharing (#RL)						
Traffic Volume (vph)	68	2	1	50	1	3
Future Volume (vph)	68	2	1	50	1	3
Sign Control	Free	—	—	Free	Stop	—
Median Width (ft)	0	—	—	0	12	—
TWLTL Median	☐	—	—	☐	☐	—
Right Turn Channelized	—	None	—	None	—	None
Critical Gap, tC (s)	—	—	4.2	—	6.5	6.3
Follow Up Time, tF (s)	—	—	2.3	—	3.6	3.4
Volume to Capacity Ratio	0.05	0.05	0.00	0.00	0.00	0.00
Control Delay (s)	0.0	0.0	0.0	0.1	8.9	8.9
Level of Service	A	A	A	A	A	A
Queue Length 95th (ft)	0	0	0	0	0	0
Approach Delay (s)	0.0	—	—	0.1	8.9	—

Table 38 – Int. 3: 2029 Buildout Intersection PM Peak Traffic LOS with the Project

HCM 2000 SIGNING SETTINGS	EBL	EBT	WBT	WBR	SEL	SER
Lanes and Sharing (#RL)						
Traffic Volume (vph)	17	1	1	1	1	16
Future Volume (vph)	17	1	1	1	1	16
Sign Control	—	Free	Free	—	Stop	—
Median Width (ft)	—	0	0	—	12	—
TWLTL Median	—	☐	☐	—	☐	—
Right Turn Channelized	—	None	—	None	—	None
Critical Gap, tC (s)	4.2	—	—	—	6.5	6.3
Follow Up Time, tF (s)	2.3	—	—	—	3.6	3.4
Volume to Capacity Ratio	0.01	0.01	0.00	0.00	0.02	0.02
Control Delay (s)	0.1	6.9	0.0	0.0	8.5	8.5
Level of Service	A	A	A	A	A	A
Queue Length 95th (ft)	1	1	0	0	1	1
Approach Delay (s)	—	6.9	0.0	—	8.5	—

Safety (Turn lane Warrants) with the Project

2029 Buildout Conditions Left Turn Lane Analysis

Using the guidelines and procedures as described in Chapter 1, we learn that left turn lanes are not warranted for the 2029 buildout conditions at each intersection; reference Appendix H for the left turn analysis worksheet.

2029 Buildout Conditions Right Turn Lane Analysis

Using the guidelines and procedures as described in Chapter 1, we learn that right turn lanes are not warranted for the 2029 buildout conditions at each intersection; reference Appendix I for the left turn analysis worksheet.

2029 Buildout PM Peak Hr Traffic Conditions Summary with the Project

Segments

The following table is a summary of the traffic conditions for the roadway segments.

Table 39 – 2029 Buildout Segment Traffic Conditions Summary with the Project

Segment 1	Existing 2024		2029 Buildout	
Berggren Ln	Value	LOS	Value	LOS
FFS (mph)	46.15	n/a	46.15	n/a
PFFS (%)	99.4%	A	98.7%	A
Segment 2	**Existing 2024**		**2029 Buildout**	
East River Road	Value	LOS	Value	LOS
FFS (mph)	38.25	n/a	38.25	n/a
PFFS (%)	97.7%	A	96.4%	A

As can be seen in the above table, each segment is operating at an acceptable level.

Intersections

The following tables show each intersection's LOS and delay times.

Table 40 – Int. 1: 2029 Buildout Intersection Traffic Conditions Summary with the Project

Int 1 - Berggren/East River Road: 2029 Buildout LOS and Delay Times with the Project												
	Eastbound			Westbound			Northbound			Southbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
2029 Traffic	21	51	n/a	n/a	22	1	n/a	n/a	n/a	1	n/a	18
LOS	A	A	n/a	n/a	A	A	n/a	n/a	n/a	A	n/a	A
Delay (sec)	0.1	2.2	n/a	n/a	0	0	n/a	n/a	n/a	8.6	n/a	8.6

Table 41 – Int. 2: 2029 Buildout Intersection Traffic Conditions Summary with the Project

Int 2 - East River Road/Christensen Ln: 2029 Buildout LOS and Delay Times with the Project												
	Eastbound			Westbound			Northbound			Southbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
2029 Traffic	n/a	68	2	1	50	n/a	1	n/a	3	n/a	n/a	n/a
LOS	n/a	A	A	A	A	n/a	A	n/a	A	n/a	n/a	n/a
Delay	n/a	0	0	0	0.1	n/a	8.9	n/a	8.9	n/a	n/a	n/a

Table 42 – Int. 3: 2029 Buildout Intersection Traffic Conditions Summary with the Project

Int 3 - New Access/Berggren Lane: 2029 Buildout LOS and Delay Times with the Project												
	Eastbound			Westbound			Northbound			Southbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
2029 Traffic	17	1	n/a	n/a	1	1	n/a	n/a	n/a	1	n/a	16
LOS	A	A	n/a	n/a	A	A	n/a	n/a	n/a	A	n/a	A
Delay	0	6.9	n/a	n/a	0	0	n/a	n/a	n/a	8.5	n/a	8.5

As can be seen from these tables, all turning movements are operating within the recommended thresholds. Therefore, no mitigation measures are warranted.

Turn Lane Analysis

Left Turn Lane Analysis

The following left turn lane(s) are warranted for the 2029 buildout traffic.

1. None

Right Turn Lane Analysis

The following right turn lane(s) are warranted for the 2029 buildout traffic.

1. None

Overall Summary for the 2029 Buildout Traffic Conditions with the Project

This analysis has determined that no improvements are warranted to handle the 2029 buildout traffic volumes. In addition, no left or right turn lanes are warranted to improve safety.

2049 Horizon Year with the Project

Roadway Characteristics

It was determined in the previous section of this chapter that the roadways are functioning at acceptable levels and that no improvements were needed. Therefore, all roadway characteristics for the 2049 horizon year are the same as existing.

Traffic Control Devices

It is assumed that the traffic control devices will be the same as those identified in Chapter 3; Intersections 1 and 2 are stop controlled on the minor roads (Berggren Ln and Christensen Ln). It is recommended that a stop sign be installed at the new intersection. The analysis will include a stop sign at the new intersection.

Pedestrian/Bicycle Facilities

The study area is in a rural area with no evidence of pedestrian or bicycle facilities. According to the Bingham County Transportation Plan, no pedestrian/bicycle facilities projects are planned within the study area.

Traffic Volumes

Volume Forecast Methods

The population growth rate of 1.63% that was calculated earlier will be used.

Forecasted Volumes by Horizon Year without the Project

The 2049 horizon year forecasted traffic volumes were calculated by taking the existing 2024 traffic counts (see Chapter 3), increasing them by the annual increase discussed in the previous paragraph, and by adding the generated traffic from the project. The results of these counts are shown in the following tables and figures.

Table 43 – Seg. 1 2049 Horizon Year Daily and Peak Hr Traffic Volumes with the Project

Segment 1: Berggren Ln	Units	Year	Traffic Volume	Northbound	Southbound
AADT	VPD	2024	55	31	24
Peak Hour	VPH	2024	8	4	4
AADT	VPD	2029	130	69	61
Peak Hour	VPH	2029	42	21	21
AADT	VPD	2049	180	96	85
Peak Hour	VPH	2049	58	29	29

Table 44 – Seg. 2 2049 Horizon Year Daily and Peak Hr Traffic Volumes with the Project

Segment 2: East River Road	Units	Year	Traffic Volume	Eastbound	Westbound
AADT	VPD	2024	671	355	316
Peak Hour	VPH	2024	72	50	22
AADT	VPD	2029	798	420	378
Peak Hour	VPH	2029	110	70	40
AADT	VPD	2049	1106	582	524
Peak Hour	VPH	2049	152	97	56

The following figures show the forecasted volumes for the intersections for the 2049 horizon year.

Figure 21: Int. 1 2049 Horizon Year PM Peak Hr Volumes with the Project

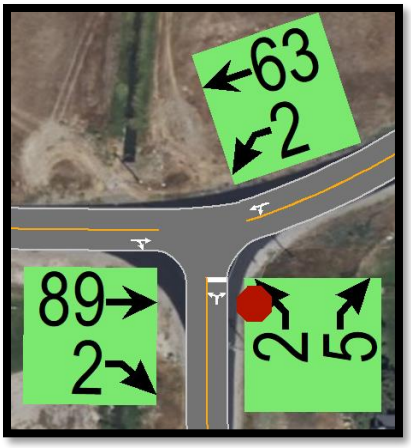


Figure 22: Int. 2 2049 Horizon Year PM Peak Hr Volumes with the Project

Figure 23: Int. 3 2049 Horizon Year PM Peak Hr Volumes with the Project

Level of Service with the Project

Segment LOS with the Project

The methods discussed in Chapter 1 will be used to calculate the PFFS and LOS. The following tables are a result of these calculations. For a more in-depth look at these calculations, reference Appendix B.

Table 45 – Seg. 1 2049 Horizon Year Segment PM Peak Traffic LOS with the Project

Segment 1	Existing 2024		2029 Buildout		2049 Horizon	
Berggren Ln	Value	LOS	Value	LOS	Value	LOS
FFS (mph)	46.15	n/a	46.15	n/a	46.15	n/a
PFFS (%)	99.4%	A	98.7%	A	96.8%	A

Table 46 – Seg. 2 2049 Horizon Year Segment PM Peak Traffic LOS with the Project

Segment 2	Existing 2024		2029 Buildout		2049 Horizon	
East River Road	Value	LOS	Value	LOS	Value	LOS
FFS (mph)	38.25	n/a	38.25	n/a	38.25	n/a
PFFS (%)	97.7%	A	96.4%	A	95.5%	A

Intersection LOS with the Project

In order to determine how well an intersection is functioning, the level of service (LOS), control delay, volume/capacity ratio (v/c Ratio), and the 95th percentile queue are determined. Using the traffic volumes and turning movements shown previously, the 2049 horizon year conditions for each intersection can be determined.

The traffic volumes, identified in this chapter, were entered into the computer modeling software Synchro. The results from the model for each intersection are shown in the following tables and more in-depth in Appendix C.

Table 47 – Int. 1: 2049 Horizon Year Intersection PM Peak Traffic LOS with the Project

HCM 2000 SIGNING SETTINGS	EBL	EBT	WBT	WBR	SBL	SBR
Lanes and Sharing (#RL)						
Traffic Volume (vph)	23	70	31	2	2	19
Future Volume (vph)	23	70	31	2	2	19
Sign Control	—	Free	Free	—	Stop	—
Median Width (ft)	—	0	0	—	12	—
TWLTL Median	—			—		—
Right Turn Channelized	—	None	—	None	—	None
Critical Gap, tC (s)	4.2	—	—	—	6.5	6.3
Follow Up Time, tF (s)	2.3	—	—	—	3.6	3.4
Volume to Capacity Ratio	0.02	0.02	0.02	0.02	0.02	0.02
Control Delay (s)	0.1	1.9	0.0	0.0	8.7	8.7
Level of Service	A	A	A	A	A	A
Queue Length 95th (ft)	1	1	0	0	2	2
Approach Delay (s)	—	1.9	0.0	—	8.7	—

Table 48 – Int. 2: 2049 Horizon Year Intersection PM Peak Traffic LOS with the Project

HCM 2000 SIGNING SETTINGS	EBT	EBR	WBL	WBT	NBL	NBR
Lanes and Sharing (#RL)						
Traffic Volume (vph)	89	2	2	63	2	5
Future Volume (vph)	89	2	2	63	2	5
Sign Control	Free	—	—	Free	Stop	—
Median Width (ft)	0	—	—	0	12	—
TWLTL Median		—	—			—
Right Turn Channelized	—	None	—	None	—	None
Critical Gap, tC (s)	—	—	4.2	—	6.5	6.3
Follow Up Time, tF (s)	—	—	2.3	—	3.6	3.4
Volume to Capacity Ratio	0.06	0.06	0.00	0.00	0.01	0.01
Control Delay (s)	0.0	0.0	0.0	0.2	9.0	9.0
Level of Service	A	A	A	A	A	A
Queue Length 95th (ft)	0	0	0	0	1	1
Approach Delay (s)	0.0	—	—	0.2	9.0	—

Table 49 – Int. 3: 2049 Horizon Year Intersection PM Peak Traffic LOS with the Project

HCM 2000 SIGNING SETTINGS	EBL	EBT	WBT	WBR	SEL	SER
Lanes and Sharing (#RL)						
Traffic Volume (vph)	18	2	2	2	2	19
Future Volume (vph)	18	2	2	2	2	19
Sign Control	—	Free	Free	—	Stop	—
Median Width (ft)	—	0	0	—	12	—
TWLTL Median	—	☐	☐	—	☐	—
Right Turn Channelized	—	None	—	None	—	None
Critical Gap, tC (s)	4.2	—	—	—	6.5	6.3
Follow Up Time, tF (s)	2.3	—	—	—	3.6	3.4
Volume to Capacity Ratio	0.01	0.01	0.00	0.00	0.02	0.02
Control Delay (s)	0.1	6.7	0.0	0.0	8.5	8.5
Level of Service	A	A	A	A	A	A
Queue Length 95th (ft)	1	1	0	0	2	2
Approach Delay (s)	—	6.7	0.0	—	8.5	—

Safety (Turn lane Warrants) with the Project

2049 Horizon Year Conditions Left Turn Lane Analysis

Using the guidelines and procedures as described in Chapter 1, we learn that left turn lanes are not warranted for the 2049 Horizon Year conditions at each intersection; reference Appendix H for the left turn analysis worksheet.

2049 Horizon Year Conditions Right Turn Lane Analysis

Using the guidelines and procedures as described in Chapter 1, we learn that right turn lanes are not warranted for the 2049 Horizon Year conditions at each intersection; reference Appendix I for the left turn analysis worksheet.

2049 Horizon Year PM Peak Hr Traffic Conditions Summary with the Project

Segments

The following table is a summary of the traffic conditions for the roadway segments.

Table 50 – 2049 Horizon Year Segment Traffic Conditions Summary with the Project

Segment 1	Existing 2024		2029 Buildout		2049 Horizon	
Berggren Ln	Value	LOS	Value	LOS	Value	LOS
FFS (mph)	46.15	n/a	46.15	n/a	46.15	n/a
PFFS (%)	99.4%	A	98.7%	A	96.8%	A
Segment 2	Existing 2024		2029 Buildout		2049 Horizon	
East River Road	Value	LOS	Value	LOS	Value	LOS
FFS (mph)	38.25	n/a	38.25	n/a	38.25	n/a
PFFS (%)	97.7%	A	96.4%	A	95.5%	A

As can be seen in the above table, each segment is operating at an acceptable level.

Intersections

The following tables show each intersection's LOS and delay times.

Table 51 – Int. 1: 2049 Horizon Year Intersection Traffic Conditions Summary with the Project

Int 1 - Berggren/East River Road: 2049 Horizon Year LOS and Delay Times with the Project												
	Eastbound			Westbound			Northbound			Southbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
2049 Traffic	23	70	n/a	n/a	31	2	n/a	n/a	n/a	2	n/a	19
LOS	A	A	n/a	n/a	A	A	n/a	n/a	n/a	A	n/a	A
Delay (sec)	0.1	1.9	n/a	n/a	0	0	n/a	n/a	n/a	8.7	n/a	8.7

Table 52 – Int. 2: 2049 Horizon Year Intersection Traffic Conditions Summary with the Project

Int 2 - East River Road/Christensen Ln: 2049 Horizon Year LOS and Delay Times with the Project												
	Eastbound			Westbound			Northbound			Southbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
2049 Traffic	n/a	89	2	2	63	n/a	2	n/a	5	n/a	n/a	n/a
LOS	n/a	A	A	A	A	n/a	A	n/a	A	n/a	n/a	n/a
Delay	n/a	0	0	0	0.2	n/a	9.0	n/a	9.0	n/a	n/a	n/a

Table 53 – Int. 3: 2049 Horizon Year Intersection Traffic Conditions Summary with the Project

Int 3 - New Access/Berggren Lane: 2049 Buildout LOS and Delay Times with the Project												
	Eastbound			Westbound			Northbound			Southbound		
	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right	Left	Thru	Right
2049 Traffic	18	2	n/a	n/a	2	2	n/a	n/a	n/a	2	n/a	19
LOS	A	A	n/a	n/a	A	A	n/a	n/a	n/a	A	n/a	A
Delay	0.1	7	n/a	n/a	0	0	n/a	n/a	n/a	8.5	n/a	8.5

As can be seen from these tables, all turning movements are operating within the recommended thresholds. Therefore, no mitigation measures are warranted.

Turn Lane Analysis

Left Turn Lane Analysis

The following left turn lane(s) are warranted for the 2049 Horizon Year traffic.

1. None

Right Turn Lane Analysis

The following right turn lane(s) are warranted for the 2049 Horizon Year traffic.

1. None

Overall Summary for the 2049 Horizon Year Traffic Conditions Summary with the Project

This analysis has determined that no improvements are warranted to handle the 2049 Horizon Year traffic volumes. In addition, no left or right turn lanes are warranted to improve safety.

CHAPTER 6: MITIGATION MEASURES

Areas not Meeting Minimum Thresholds

This study has identified that with or without the proposed project the transportation network is forecasted to function within recommended minimum thresholds. No areas were determined deficient warranting mitigation measures or improvements.

Mitigation Measures

Due to the fact that all the no areas were determined deficient without or with the proposed project, no mitigations measures are warranted.

CHAPTER 7: CONCLUSIONS AND RECOMMENDATIONS

After evaluating the proposed development within the context of zoning; projected land use; existing transportation system; background traffic counts for the principal roadways within the study impact area; projected traffic for horizon year's corresponding with project opening, project buildout, and a 20-year horizon year; the findings of the Traffic Impact Study are summarized in this chapter.

Level of Service Analysis

Segment LOS

The following table shows the results of the segment LOS analysis; as can be seen, all the segments throughout each horizon year results in an acceptable LOS.

Table 54 – Segment Traffic Conditons Progression Each Horizon Year

Segment 1: Berggren Ln	Northbound LOS	Southbound LOS
2024 Existing Traffic without the Project	A	A
2029 Buildout Traffic without the Project	A	A
2049 Horizon Year Traffic without the Project	A	A
2024 Existing Traffic with the Project	A	A
2029 Buildout Traffic with the Project	A	A
2049 Horizon Year Traffic with the Project	A	A
Segment 2: East River Road	**Eastbound LOS**	**Westbound LOS**
2024 Existing Traffic without the Project	A	A
2029 Buildout Traffic without the Project	A	A
2049 Horizon Year Traffic without the Project	A	A
2024 Existing Traffic with the Project	A	A
2029 Buildout Traffic with the Project	A	A
2049 Horizon Year Traffic with the Project	A	A

Intersection LOS

The following table shows the results of the intersection LOS analysis; as can be seen, all the turning movements at each intersection throughout each horizon year results in an acceptable LOS.

Table 55 – Intersection Traffic Conditons Progression Each Horizon Year

Intersection 1: Berggren Ln/East River Road	Eastbound LOS	Westbound LOS	Northbound LOS	Southbound LOS
2024 Existing Traffic without the Project	A	A	n/a	A
2029 Buildout Traffic without the Project	A	A	n/a	A
2049 Horizon Year Traffic without the Project	A	A	n/a	A
2024 Existing Traffic with the Project	A	A	n/a	A
2029 Buildout Traffic with the Project	A	A	n/a	A
2049 Horizon Year Traffic with the Project	A	A	n/a	A
Intersection 2: East River Road/Christensen Ln	**Eastbound LOS**	**Westbound LOS**	**Northbound LOS**	**Southbound LOS**
2024 Existing Traffic without the Project	A	A	A	n/a
2029 Buildout Traffic without the Project	A	A	A	n/a
2049 Horizon Year Traffic without the Project	A	A	A	n/a
2024 Existing Traffic with the Project	A	A	A	n/a
2029 Buildout Traffic with the Project	A	A	A	n/a
2049 Horizon Year Traffic with the Project	A	A	A	n/a
Intersection 3: New Access/Berggren Ln	**Eastbound LOS**	**Westbound LOS**	**Northbound LOS**	**Southbound LOS**
2024 Existing Traffic without the Project	n/a	n/a	n/a	n/a
2029 Buildout Traffic without the Project	n/a	n/a	n/a	n/a
2049 Horizon Year Traffic without the Project	n/a	n/a	n/a	n/a
2024 Existing Traffic with the Project	A	A	n/a	A
2029 Buildout Traffic with the Project	A	A	n/a	A
2049 Horizon Year Traffic with the Project	A	A	n/a	A

Turn Lane Warrants

This study has identified that both left turn and right turn lanes are not warranted without or with the proposed project.

Traffic Safety Implications

This analysis shows that the project will have minimal impact on the safety of the existing roadways. However, it is recommended that the following improvements to the new access be made.

1. Install a stop sign at the new intersection for southbound traffic
2. Improve the turning radius at the new intersection
3. Potentially relocate the power poles to allow for a safer intersection

Sight Distance

The intersection's sight triangle is the area required to have a clear sight for safe turning movements. This area is called the "sight distance triangle". The length of the sight triangle leg or ISD along the major road is collected from an equation in the *AASHTO Guide for Very Low Volume Roads.* The calculated ISD distance for 25, 35, 45, and 55 mph is 150, 240, 350, and 475 feet respectively. The following figure shows the sight triangle traffic approaching the left and right.

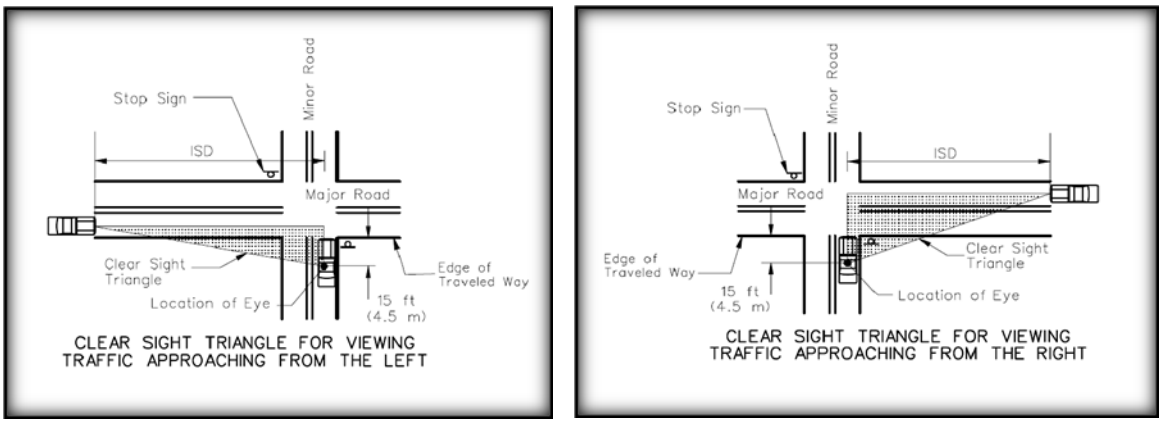


Figure 24: AASHTO Sight Triangle

This analysis has determined that each intersection meets the minimum sight triangle requirement.

Pedestrian/Bicycle Considerations

The project type does not generate any type of need for pedestrian or bicycle infrastructure. Additionally, the Bingham County Transportation plan does not identify plans for the study area. Therefore, considerations for new or updated pedestrian/bicycle facilities are not warranted for this project.

On-Site Traffic Circulation

All site traffic will enter the gravel pit at one (1) access point. The proposed gravel pit has sufficient area to circulate traffic in a safe manner.

Consistency with Adopted Transportation Plan

The Bingham County Transportation Plan identifies that the road section should be 24' in width; see the following figure. The roadways vary between 22' and 24' in width.

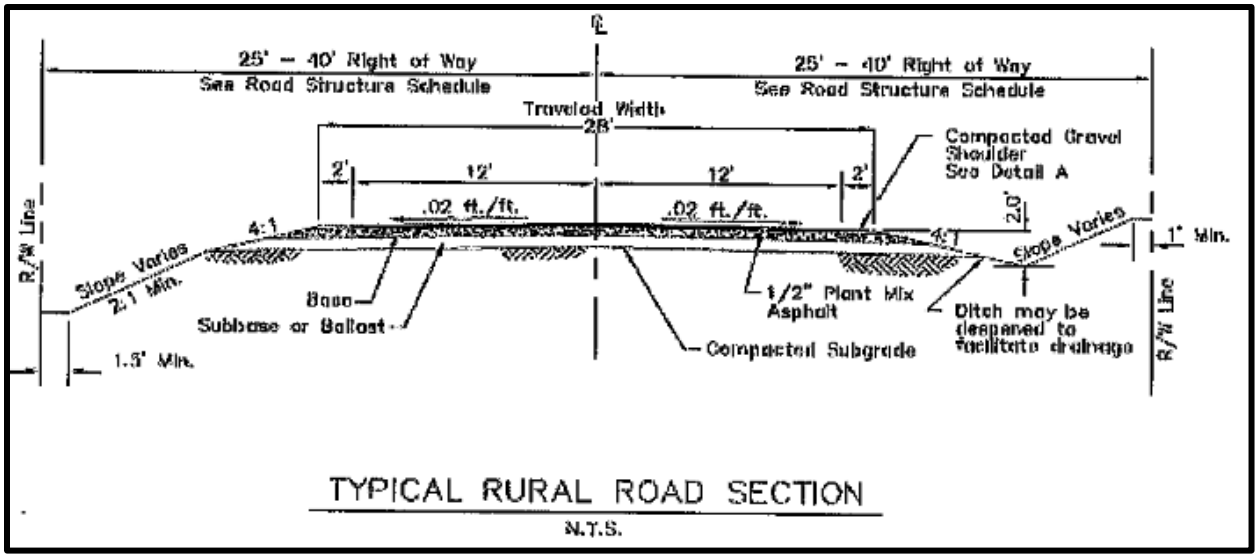


Figure 25: Bingham County Rural Road Section

According to the transportation plan, the bridges in the study area are sufficient and do not need replaced. Lastly, the Capital Improvement Plan identifies a project for pavement rehabilitation for East River Road; for project details, see the following figure taken from the transportation plan. The proposed project does not alter the East River Road Rehabilitation Project plans.

Item Description	Quantity	Unit	Unit Price	Estimated Cost
Mobilization	1	LS	$25,000.00	$25,000
Pulverizing Existing Asphalt	24,640	SY	1.60	$39,424
Gravel Widening	4,107	SY	$15.00	$61,605
Plant Mix Pavement	28,746	SY	$15.00	$400,500
Construction Surveying	1	LS	$12,500.00	$12,500
Material Testing	1	LS	$10,000.00	$10,000
Estimated Construction Subtotal (Rounded to Nearest Thousand)				**$549,000**

*Cost does not include engineering fees or contingency amount.

Figure 26: Bingham County Transportation Plan East River Road Improvements Project

Recommendations

This study has identified that the current road segments are adequate to handle the capacity required without or with the proposed project throughout the study period. All intersections are forecasted to operate within all minimum required thresholds. For safety, both left and right turn lane analyses were performed to identify if there is a safety concern according to ITD guidelines; this study determined that turn lanes are not warranted. Additionally, sight distances were analyzed for the intersections. All sight distances meet AASHTO criteria and is discussed further in the body of the report.

It has been identified that improvements to the new intersection accessing the proposed gravel pit be upgraded. These upgrades include:

- Install a stop sign at the new intersection for southbound traffic
- Improve the turning radius and skew angle at the new intersection (see Appendix J)
- Potentially relocate the power poles to allow for a safer intersection

Overall, it is the recommendation of this study that the proposed project will have negligible impacts to the traffic network within the study area for each horizon year and that no other improvements to the roadway network, other than those identified at the new access, are warranted.

APPENDIX

Appendix A: Traffic Counts

Berggren Lane

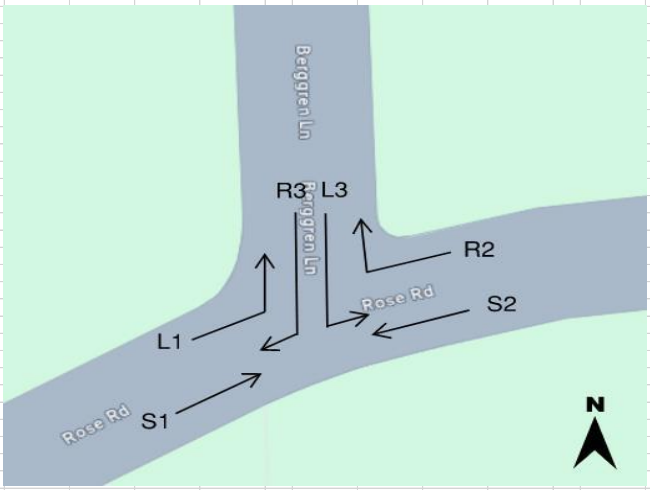
Date/Time	Approaching, Near Lane	Receding, Far Lane	Total
8/28/2024 9:00 AM	2	0	2
8/28/2024 10:00 AM	1	1	2
8/28/2024 11:00 AM	5	2	7
8/28/2024 12:00 PM	0	3	3
8/28/2024 1:00 PM	1	4	5
8/28/2024 2:00 PM	0	1	1
8/28/2024 3:00 PM	1	2	3
8/28/2024 4:00 PM	0	1	1
8/28/2024 5:00 PM	2	1	3
8/28/2024 6:00 PM	3	4	7
8/28/2024 7:00 PM	0	1	1
8/28/2024 8:00 PM	1	0	1
8/28/2024 9:00 PM	0	0	0
8/28/2024 10:00 PM	1	2	3
8/28/2024 11:00 PM	0	0	0
8/29/2024 12:00 AM	0	0	0
8/29/2024 1:00 AM	0	0	0
8/29/2024 2:00 AM	0	0	0
8/29/2024 3:00 AM	1	0	1
8/29/2024 4:00 AM	1	0	1
8/29/2024 5:00 AM	0	1	1
8/29/2024 6:00 AM	2	1	3
8/29/2024 7:00 AM	2	3	5
8/29/2024 8:00 AM	3	1	4
8/29/2024 9:00 AM	3	0	3
8/29/2024 10:00 AM	3	3	6
8/29/2024 11:00 AM	2	0	2
8/29/2024 12:00 PM	3	2	5
8/29/2024 1:00 PM	2	1	3
8/29/2024 2:00 PM	0	0	0
8/29/2024 3:00 PM	3	1	4
8/29/2024 4:00 PM	2	2	4
8/29/2024 5:00 PM	2	3	5
8/29/2024 6:00 PM	3	4	7
8/29/2024 7:00 PM	4	2	6
8/29/2024 8:00 PM	2	2	4
8/29/2024 9:00 PM	2	4	6
8/29/2024 10:00 PM	1	2	3
8/29/2024 11:00 PM	1	1	2
8/30/2024 12:00 AM	0	0	0
8/30/2024 1:00 AM	0	0	0
8/30/2024 2:00 AM	0	0	0
8/30/2024 3:00 AM	0	0	0
8/30/2024 4:00 AM	0	0	0
8/30/2024 5:00 AM	0	0	0
8/30/2024 6:00 AM	0	2	2
8/30/2024 7:00 AM	2	1	3
8/30/2024 8:00 AM	1	0	1

Date/Time	Approaching, Near Lane	Receding, Far Lane	Total
8/30/2024 9:00 AM	1	5	6
8/30/2024 10:00 AM	0	1	1
8/30/2024 11:00 AM	4	0	4
8/30/2024 12:00 PM	1	1	2
8/30/2024 1:00 PM	0	0	0
8/30/2024 2:00 PM	2	2	4
8/30/2024 3:00 PM	2	4	6
8/30/2024 4:00 PM	0	4	4
8/30/2024 5:00 PM	2	3	5
8/30/2024 6:00 PM	2	4	6
8/30/2024 7:00 PM	3	2	5
8/30/2024 8:00 PM	1	1	2
8/30/2024 9:00 PM	0	0	0
8/30/2024 10:00 PM	3	0	3
8/30/2024 11:00 PM	0	1	1
8/31/2024 12:00 AM	0	0	0
8/31/2024 1:00 AM	0	0	0
8/31/2024 2:00 AM	1	1	2
8/31/2024 3:00 AM	0	0	0
8/31/2024 4:00 AM	0	0	0
8/31/2024 5:00 AM	0	0	0
8/31/2024 6:00 AM	1	1	2
8/31/2024 7:00 AM	0	1	1
8/31/2024 8:00 AM	0	1	1
8/31/2024 9:00 AM	3	2	5
8/31/2024 10:00 AM	2	2	4
8/31/2024 11:00 AM	2	1	3
8/31/2024 12:00 PM	2	2	4
8/31/2024 1:00 PM	2	1	3
8/31/2024 2:00 PM	0	0	0
8/31/2024 3:00 PM	1	1	2
8/31/2024 4:00 PM	2	1	3
8/31/2024 5:00 PM	2	4	6
8/31/2024 6:00 PM	3	1	4
8/31/2024 7:00 PM	0	0	0
8/31/2024 8:00 PM	2	0	2
8/31/2024 9:00 PM	2	1	3
8/31/2024 10:00 PM	0	0	0
8/31/2024 11:00 PM	0	0	0
9/1/2024 12:00 AM	0	0	0
9/1/2024 1:00 AM	0	0	0
9/1/2024 2:00 AM	0	0	0
9/1/2024 3:00 AM	0	0	0
9/1/2024 4:00 AM	0	0	0
9/1/2024 5:00 AM	0	0	0
9/1/2024 6:00 AM	0	0	0
9/1/2024 7:00 AM	0	1	1
9/1/2024 8:00 AM	2	0	2
9/1/2024 9:00 AM	3	2	5

Date/Time	Approaching, Near Lane	Receding, Far Lane	Total
9/1/2024 10:00 AM	2	1	3
9/1/2024 11:00 AM	1	1	2
9/1/2024 12:00 PM	0	1	1
9/1/2024 1:00 PM	0	0	0
9/1/2024 2:00 PM	1	2	3
9/1/2024 3:00 PM	2	0	2
9/1/2024 4:00 PM	1	0	1
9/1/2024 5:00 PM	0	0	0
9/1/2024 6:00 PM	2	2	4
9/1/2024 7:00 PM	0	1	1
9/1/2024 8:00 PM	0	1	1
9/1/2024 9:00 PM	0	1	1
9/1/2024 10:00 PM	0	1	1
9/1/2024 11:00 PM	1	0	1
9/2/2024 12:00 AM	0	0	0
9/2/2024 1:00 AM	0	0	0
9/2/2024 2:00 AM	0	0	0
9/2/2024 3:00 AM	0	0	0
9/2/2024 4:00 AM	0	0	0
9/2/2024 5:00 AM	0	0	0
9/2/2024 6:00 AM	0	1	1
9/2/2024 7:00 AM	1	1	2
9/2/2024 8:00 AM	2	3	5
9/2/2024 9:00 AM	0	0	0
9/2/2024 10:00 AM	2	2	4
9/2/2024 11:00 AM	3	0	3
9/2/2024 12:00 PM	4	0	4
9/2/2024 1:00 PM	1	0	1
9/2/2024 2:00 PM	0	1	1
9/2/2024 3:00 PM	4	2	6
9/2/2024 4:00 PM	1	1	2
9/2/2024 5:00 PM	7	2	9
9/2/2024 6:00 PM	3	1	4
9/2/2024 7:00 PM	3	46	49
9/2/2024 8:00 PM	2	1	3
9/2/2024 9:00 PM	0	1	1
9/2/2024 10:00 PM	0	0	0
9/2/2024 11:00 PM	0	0	0
9/3/2024 12:00 AM	0	0	0
9/3/2024 1:00 AM	0	0	0
9/3/2024 2:00 AM	0	0	0
9/3/2024 3:00 AM	0	0	0
9/3/2024 4:00 AM	0	0	0
9/3/2024 5:00 AM	10	2	12
9/3/2024 6:00 AM	2	0	2
9/3/2024 7:00 AM	1	1	2
9/3/2024 8:00 AM	1	2	3
9/3/2024 9:00 AM	2	1	3
9/3/2024 10:00 AM	3	2	5

Date/Time	Approaching, Near Lane	Receding, Far Lane	Total
9/3/2024 11:00 AM	1	1	2
9/3/2024 12:00 PM	1	1	2
9/3/2024 1:00 PM	1	1	2
9/3/2024 2:00 PM	0	2	2
9/3/2024 3:00 PM	0	3	3
9/3/2024 4:00 PM	2	2	4
9/3/2024 5:00 PM	1	1	2
9/3/2024 6:00 PM	1	3	4
9/3/2024 7:00 PM	2	1	3
9/3/2024 8:00 PM	1	2	3
9/3/2024 9:00 PM	1	0	1
9/3/2024 10:00 PM	1	1	2
9/3/2024 11:00 PM	0	0	0
9/4/2024 12:00 AM	1	0	1
9/4/2024 1:00 AM	0	0	0
9/4/2024 2:00 AM	0	0	0
9/4/2024 3:00 AM	0	0	0
9/4/2024 4:00 AM	0	0	0
9/4/2024 5:00 AM	0	1	1
9/4/2024 6:00 AM	3	1	4
9/4/2024 7:00 AM	3	4	7
9/4/2024 8:00 AM	2	2	4
9/4/2024 9:00 AM	2	1	3
9/4/2024 10:00 AM	3	0	3
9/4/2024 11:00 AM	2	2	4
9/4/2024 12:00 PM	2	5	7
Total	205	224	429

Date	Rose Rd (Eastbound)				Rose Rd (Westbound)				Berggren Ln (Southbound)			
8/22/2024	S1		L1		S2		R2		L3		R3	
Time	Cars	Trucks	Cars	Trucks	Cars	Trucks	Cars	Trucks	Cars	Trucks	Cars	Trucks
7:30 AM - 8:30 AM	12	0	2	0	14	1	1	0	0	0	1	1
4:30 PM - 5:30 PM	29	1	1	1	15	0	0	0	0	0	1	1
Total	41	1	3	1	29	1	1	0	0	0	2	2



East River Road

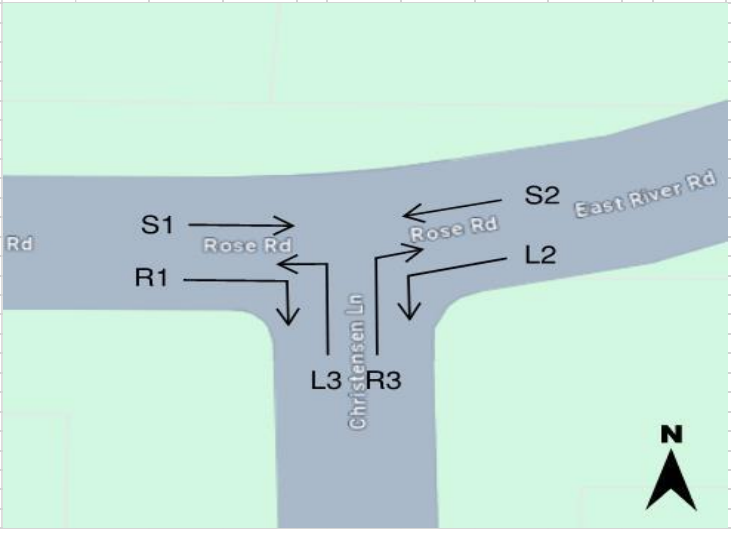
Date/Time	Approaching, Far Lane	Receding, Near Lane	Total
8/28/2024 10:00 AM	11	10	21
8/28/2024 11:00 AM	7	16	23
8/28/2024 12:00 PM	7	5	12
8/28/2024 1:00 PM	17	16	33
8/28/2024 2:00 PM	22	11	33
8/28/2024 3:00 PM	16	19	35
8/28/2024 4:00 PM	20	30	50
8/28/2024 5:00 PM	27	27	54
8/28/2024 6:00 PM	24	20	44
8/28/2024 7:00 PM	12	7	19
8/28/2024 8:00 PM	11	8	19
8/28/2024 9:00 PM	2	2	4
8/28/2024 10:00 PM	5	1	6
8/28/2024 11:00 PM	1	3	4
8/29/2024 12:00 AM	1	3	4
8/29/2024 1:00 AM	0	1	1
8/29/2024 2:00 AM	1	1	2
8/29/2024 3:00 AM	1	1	2
8/29/2024 4:00 AM	3	4	7
8/29/2024 5:00 AM	3	6	9
8/29/2024 6:00 AM	11	15	26
8/29/2024 7:00 AM	21	19	40
8/29/2024 8:00 AM	12	11	23
8/29/2024 9:00 AM	11	15	26
8/29/2024 10:00 AM	10	11	21
8/29/2024 11:00 AM	13	14	27
8/29/2024 12:00 PM	18	21	39
8/29/2024 1:00 PM	17	17	34
8/29/2024 2:00 PM	12	15	27
8/29/2024 3:00 PM	27	10	37
8/29/2024 4:00 PM	24	33	57
8/29/2024 5:00 PM	44	28	72
8/29/2024 6:00 PM	23	20	43
8/29/2024 7:00 PM	16	16	32
8/29/2024 8:00 PM	12	10	22
8/29/2024 9:00 PM	9	5	14
8/29/2024 10:00 PM	4	4	8
8/29/2024 11:00 PM	1	2	3
8/30/2024 12:00 AM	1	4	5
8/30/2024 1:00 AM	0	2	2
8/30/2024 2:00 AM	1	0	1
8/30/2024 3:00 AM	2	2	4
8/30/2024 4:00 AM	2	2	4
8/30/2024 5:00 AM	0	2	2
8/30/2024 6:00 AM	3	18	21
8/30/2024 7:00 AM	11	19	30
8/30/2024 8:00 AM	12	14	26
8/30/2024 9:00 AM	19	8	27

Date/Time	Approaching, Far Lane	Receding, Near Lane	Total
8/30/2024 10:00 AM	20	7	27
8/30/2024 11:00 AM	19	18	37
8/30/2024 12:00 PM	11	20	31
8/30/2024 1:00 PM	7	15	22
8/30/2024 2:00 PM	28	16	44
8/30/2024 3:00 PM	31	19	50
8/30/2024 4:00 PM	49	22	71
8/30/2024 5:00 PM	32	26	58
8/30/2024 6:00 PM	42	30	72
8/30/2024 7:00 PM	26	17	43
8/30/2024 8:00 PM	14	12	26
8/30/2024 9:00 PM	9	24	33
8/30/2024 10:00 PM	6	15	21
8/30/2024 11:00 PM	6	1	7
8/31/2024 12:00 AM	3	3	6
8/31/2024 1:00 AM	1	0	1
8/31/2024 2:00 AM	1	1	2
8/31/2024 3:00 AM	2	0	2
8/31/2024 4:00 AM	1	2	3
8/31/2024 5:00 AM	1	3	4
8/31/2024 6:00 AM	4	7	11
8/31/2024 7:00 AM	2	10	12
8/31/2024 8:00 AM	7	8	15
8/31/2024 9:00 AM	28	20	48
8/31/2024 10:00 AM	22	20	42
8/31/2024 11:00 AM	21	9	30
8/31/2024 12:00 PM	28	19	47
8/31/2024 1:00 PM	30	21	51
8/31/2024 2:00 PM	21	15	36
8/31/2024 3:00 PM	19	17	36
8/31/2024 4:00 PM	22	13	35
8/31/2024 5:00 PM	20	20	40
8/31/2024 6:00 PM	19	14	33
8/31/2024 7:00 PM	14	12	26
8/31/2024 8:00 PM	13	10	23
8/31/2024 9:00 PM	9	7	16
8/31/2024 10:00 PM	8	9	17
8/31/2024 11:00 PM	6	6	12
9/1/2024 12:00 AM	2	1	3
9/1/2024 1:00 AM	2	4	6
9/1/2024 2:00 AM	0	0	0
9/1/2024 3:00 AM	2	0	2
9/1/2024 4:00 AM	0	0	0
9/1/2024 5:00 AM	0	3	3
9/1/2024 6:00 AM	1	0	1
9/1/2024 7:00 AM	3	8	11
9/1/2024 8:00 AM	5	6	11
9/1/2024 9:00 AM	17	10	27
9/1/2024 10:00 AM	11	11	22

Date/Time	Approaching, Far Lane	Receding, Near Lane	Total
9/1/2024 11:00 AM	12	7	19
9/1/2024 12:00 PM	9	11	20
9/1/2024 1:00 PM	7	13	20
9/1/2024 2:00 PM	18	17	35
9/1/2024 3:00 PM	18	18	36
9/1/2024 4:00 PM	14	15	29
9/1/2024 5:00 PM	15	16	31
9/1/2024 6:00 PM	14	15	29
9/1/2024 7:00 PM	22	3	25
9/1/2024 8:00 PM	15	9	24
9/1/2024 9:00 PM	7	6	13
9/1/2024 10:00 PM	10	4	14
9/1/2024 11:00 PM	11	3	14
9/2/2024 12:00 AM	1	0	1
9/2/2024 1:00 AM	0	0	0
9/2/2024 2:00 AM	1	1	2
9/2/2024 3:00 AM	2	0	2
9/2/2024 4:00 AM	0	1	1
9/2/2024 5:00 AM	1	3	4
9/2/2024 6:00 AM	4	1	5
9/2/2024 7:00 AM	7	5	12
9/2/2024 8:00 AM	9	9	18
9/2/2024 9:00 AM	20	12	32
9/2/2024 10:00 AM	23	16	39
9/2/2024 11:00 AM	39	24	63
9/2/2024 12:00 PM	38	89	127
9/2/2024 1:00 PM	38	296	334
9/2/2024 2:00 PM	31	281	312
9/2/2024 3:00 PM	43	312	355
9/2/2024 4:00 PM	55	309	364
9/2/2024 5:00 PM	52	236	288
9/2/2024 6:00 PM	26	77	103
9/2/2024 7:00 PM	41	18	59
9/2/2024 8:00 PM	6	13	19
9/2/2024 9:00 PM	1	3	4
9/2/2024 10:00 PM	11	1	12
9/2/2024 11:00 PM	3	6	9
9/3/2024 12:00 AM	0	1	1
9/3/2024 1:00 AM	0	0	0
9/3/2024 2:00 AM	0	1	1
9/3/2024 3:00 AM	0	3	3
9/3/2024 4:00 AM	1	3	4
9/3/2024 5:00 AM	6	8	14
9/3/2024 6:00 AM	7	16	23
9/3/2024 7:00 AM	23	23	46
9/3/2024 8:00 AM	21	10	31
9/3/2024 9:00 AM	11	16	27
9/3/2024 10:00 AM	13	14	27
9/3/2024 11:00 AM	12	14	26

Date/Time	Approaching, Far Lane	Receding, Near Lane	Total
9/3/2024 12:00 PM	15	15	30
9/3/2024 1:00 PM	14	16	30
9/3/2024 2:00 PM	9	18	27
9/3/2024 3:00 PM	16	19	35
9/3/2024 4:00 PM	27	43	70
9/3/2024 5:00 PM	35	30	65
9/3/2024 6:00 PM	22	19	41
9/3/2024 7:00 PM	15	15	30
9/3/2024 8:00 PM	10	7	17
9/3/2024 9:00 PM	4	7	11
9/3/2024 10:00 PM	4	2	6
9/3/2024 11:00 PM	1	0	1
9/4/2024 12:00 AM	1	2	3
9/4/2024 1:00 AM	0	1	1
9/4/2024 2:00 AM	0	0	0
9/4/2024 3:00 AM	1	0	1
9/4/2024 4:00 AM	1	3	4
9/4/2024 5:00 AM	5	9	14
9/4/2024 6:00 AM	14	14	28
9/4/2024 7:00 AM	30	30	60
9/4/2024 8:00 AM	14	11	25
9/4/2024 9:00 AM	16	10	26
9/4/2024 10:00 AM	19	19	38
9/4/2024 11:00 AM	15	9	24
9/4/2024 12:00 PM	13	12	25
Total	2191	3329	

Date												
8/21/2024	Rose Rd (Eastbound)				Rose Rd (Westbound)				Christensen Ln (Northbound)			
	S1		R1		S2		L2		L3		R3	
Time	Cars	Trucks	Cars	Trucks	Cars	Trucks	Cars	Trucks	Cars	Trucks	Cars	Trucks
7:40 AM - 8:40 AM	18	8	0	0	16	3	2	1	0	0	0	1
4:30 PM - 5:30 PM	28	2	0	0	24	7	1	0	0	0	1	1
Total	46	10	0	0	40	10	3	1	0	0	1	2



Appendix B: Segment LOS Calculations

Existing 2024 without Project: Berggren Lane

Input Data (Step #1)

Input Cell

Road Name	Berggren Ln	
Lane Width	12	ft
Shoulder Width	3	ft
Total Accesses	5	Accesses
Segment Length	1	miles
Speed Limit	40	mph
PHF	0.88	HCM Ex. 15-5
Truck %	8%	
RV %	0%	
Grade %	0%	
No Passing %	0%	

Free Flow Speed (FFS) Calcs (Step #2)

			Calc Cell / Input Cell
FFS=BFFS-f_{LS}-f_A	46.15	mph	HCM Eq. 15-2
Base Free Flow Speed (BFFS)	50	mph	From HCM: BFFS = Speed Limit + 10
Lane/Shoulder Width Adj. F_{LS}	2.6		From HCM Ex. 15-7
Accesses/mile	5.00	Accesses	
Round down nearest 10	0.00		Auto roundown to nearest 10
Rounded down FFS reduction	0	mph	From HCM Ex. 15-8
Round down value	5.00		Difference for interpolation
Interpolated FFS reduction	1.25	mph	Every 10 access/mile = 2.5 reduction
Access Density Reduction f_a	1.25	mph	From HCM Ex. 15-8

Demand Flow Rate (Step #3)

			Calc Cell / Input Cell
Direction 1 Volume	4	vph	
Direction 2 Volume	4	vph	
Equvalent Trucks E_t	1.9		From HCM Ex. 15-11
Equvalent RV E_R	1		From HCM Ex. 15-11
Heavy Veh Adj. f_{hv}	0.93		From HCM Eq. 15-5
Grade Adj. f_g	1		From HCM Ex. 15-9
Demand Flow Eq.	$v_{i,ats} = \frac{V_i}{PHF * f_{g,ats} * f_{hv,ats}}$		From HCM Eq. 15-3
Direction 1 Demand Flow (v	5	vph	
Direction 2 Demand Flow (v	5	vph	

Average Travel Speed (ATS) (Step #4)

			Calc Cell / Input Cell
ATS = FFS – 0.00776(v_1,ats + v_2,ats) – f_{np},ats			From HCM Eq. 15-6
No Pass Adj Factor f_{np}	0.2		From HCM Ex. 15-15
ATS	45.87	mph	

Percent of Free Flow Speed (PFFS)

Exhibit 15-3
Motorized Vehicle LOS for Two-Lane Highways

LOS	Class I Highways ATS (mi/h)	Class I Highways PTSF (%)	Class II Highways PTSF (%)	Class III Highways PFFS (%)
A	>55	≤35	≤40	>91.7
B	>50–55	>35–50	>40–55	>83.3–91.7
C	>45–50	>50–65	>55–70	>75.0–83.3
D	>40–45	>65–80	>70–85	>66.7–75.0
E	≤40	>80	>85	≤66.7
F	Demand exceeds capacity			

Note: For Class I highways, LOS is determined by the worse of ATS-based LOS and PTSF-based LOS.

Percent of Free Flow Speed (PFFS)

PFFS = ATS/FFS	99.4%	
ATS	45.87	mph
FFS	46.15	mph

Level of Service (LOS)

LOS	A

Existing 2024 without Project: East River Road

Input Data (Step #1)

Input Cell

Road Name	East River Road	
Lane Width	12	ft
Shoulder Width	3	ft
Total Accesses	5	Accesses
Segment Length	1	miles
Speed Limit	35	mph
PHF	0.88	HCM Ex. 15-5
Truck %	8%	
RV %	0%	
Grade %	0%	
No Passing %	0%	

Free Flow Speed (FFS) Calcs (Step #2)

	Calc Cell		Input Cell
FFS=BFFS-f_{LS}-f_A	38.25	mph	HCM Eq. 15-2
Base Free Flow Speed (BFFS)	45	mph	From HCM: BFFS = Speed Limit + 10
Lane/Shoulder Width Adj. F_{LS}	3		From HCM Ex. 15-7
Accesses/mile	5.00	Accesses	
Round down nearest 10	0.00		Auto roundown to nearest 10
Rounded down FFS reduction	2.5	mph	From HCM Ex. 15-8
Round down value	5.00		Difference for interpolation
Interpolated FFS reduction	1.25	mph	Every 10 access/mile = 2.5 reduction
Access Density Reduction f_a	3.75	mph	From HCM Ex. 15-8

Demand Flow Rate (Step #3)

		Calc Cell / Input Cell	
Direction 1 Volume	50	vph	
Direction 2 Volume	22	vph	
Equvalent Trucks E_t	1.9		From HCM Ex. 15-11
Equvalent RV E_R	1		From HCM Ex. 15-11
Heavy Veh Adj. f_{hv}	0.93		From HCM Eq. 15-5
Grade Adj. f_g	1		From HCM Ex. 15-9
Demand Flow Eq.	$v_{i,ats} = \frac{V_i}{PHF * f_{g,ats} * f_{hv,ats}}$		From HCM Eq. 15-3
Direction 1 Demand Flow (v	61	vph	
Direction 2 Demand Flow (v	27	vph	

Average Travel Speed (ATS) (Step #4)

	Calc Cell		Input Cell
ATS = FFS – 0.00776(v_1,ats + v_2,ats) – f_{np},ats			From HCM Eq. 15-6
No Pass Adj Factor f_{np}	0.2		From HCM Ex. 15-15
ATS	37.37	mph	

Percent of Free Flow Speed (PFFS)

Exhibit 15-3
Motorized Vehicle LOS for Two-Lane Highways

LOS	Class I Highways ATS (mi/h)	Class I Highways PTSF (%)	Class II Highways PTSF (%)	Class III Highways PFFS (%)
A	>55	≤35	≤40	>91.7
B	>50–55	>35–50	>40–55	>83.3–91.7
C	>45–50	>50–65	>55–70	>75.0–83.3
D	>40–45	>65–80	>70–85	>66.7–75.0
E	≤40	>80	>85	≤66.7
F	Demand exceeds capacity			

Note: For Class I highways, LOS is determined by the worse of ATS-based LOS and PTSF-based LOS.

Percent of Free Flow Speed (PFFS)		
PFFS = ATS/FFS	97.7%	
ATS	37.37	mph
FFS	38.25	mph

Level of Service (LOS)	
LOS	A

Existing 2029 without Project: Berggren Lane

Input Data (Step #1)

Input Cell

Road Name	Berggren Ln	
Lane Width	12	ft
Shoulder Width	3	ft
Total Accesses	5	Accesses
Segment Length	1	miles
Speed Limit	40	mph
PHF	0.88	HCM Ex. 15-5
Truck %	8%	
RV %	0%	
Grade %	0%	
No Passing %	0%	

Free Flow Speed (FFS) Calcs (Step #2)

	Calc Cell		Input Cell
FFS=BFFS-f_{LS}-f_A	46.15	mph	HCM Eq. 15-2
Base Free Flow Speed (BFFS)	50	mph	From HCM: BFFS = Speed Limit + 10
Lane/Shoulder Width Adj. F_{LS}	2.6		From HCM Ex. 15-7
Accesses/mile	5.00	Accesses	
Round down nearest 10	0.00		Auto roundown to nearest 10
Rounded down FFS reduction	0	mph	From HCM Ex. 15-8
Round down value	5.00		Difference for interpolation
Interpolated FFS reduction	1.25	mph	Every 10 access/mile = 2.5 reduction
Access Density Reduction f_a	1.25	mph	From HCM Ex. 15-8

Demand Flow Rate (Step #3)

			Calc Cell	Input Cell
Direction 1 Volume	5	vph		
Direction 2 Volume	5	vph		
Equvalent Trucks E_t	1.9		From HCM Ex. 15-11	
Equvalent RV E_R	1		From HCM Ex. 15-11	
Heavy Veh Adj. f_{hv}	0.93		From HCM Eq. 15-5	
Grade Adj. f_g	1		From HCM Ex. 15-9	
Demand Flow Eq.	$v_{i,ats} = \frac{V_i}{PHF * f_{g,ats} * f_{hv,ats}}$		From HCM Eq. 15-3	
Direction 1 Demand Flow (v	6	vph		
Direction 2 Demand Flow (v	6	vph		

Average Travel Speed (ATS) (Step #4)

			Calc Cell	Input Cell
ATS = FFS – 0.00776(v_1,ats + v_2,ats) – f_{np},ats			From HCM Eq. 15-6	
No Pass Adj Factor f_{np}	0.2		From HCM Ex. 15-15	
ATS	45.86	mph		

Percent of Free Flow Speed (PFFS)

Exhibit 15-3
Motorized Vehicle LOS for Two-Lane Highways

LOS	Class I Highways ATS (mi/h)	Class I Highways PTSF (%)	Class II Highways PTSF (%)	Class III Highways PFFS (%)
A	>55	≤35	≤40	>91.7
B	>50–55	>35–50	>40–55	>83.3–91.7
C	>45–50	>50–65	>55–70	>75.0–83.3
D	>40–45	>65–80	>70–85	>66.7–75.0
E	≤40	>80	>85	≤66.7
F	Demand exceeds capacity			

Note: For Class I highways, LOS is determined by the worse of ATS-based LOS and PTSF-based LOS.

Percent of Free Flow Speed (PFFS)

PFFS = ATS/FFS	99.4%	
ATS	45.86	mph
FFS	46.15	mph

Level of Service (LOS)

LOS	A

Existing 2029 without Project: East River Road

Input Data (Step #1)

Input Cell

Road Name	East River Road	
Lane Width	12	ft
Shoulder Width	3	ft
Total Accesses	5	Accesses
Segment Length	1	miles
Speed Limit	35	mph
PHF	0.88	HCM Ex. 15-5
Truck %	8%	
RV %	0%	
Grade %	0%	
No Passing %	0%	

Free Flow Speed (FFS) Calcs (Step #2)

			Calc Cell / Input Cell
FFS=BFFS-f_{LS}-f_A	38.25	mph	HCM Eq. 15-2
Base Free Flow Speed (BFFS)	45	mph	From HCM: BFFS = Speed Limit + 10
Lane/Shoulder Width Adj. F_{LS}	3		From HCM Ex. 15-7
Accesses/mile	5.00	Accesses	
Round down nearest 10	0.00		Auto roundown to nearest 10
Rounded down FFS reduction	2.5	mph	From HCM Ex. 15-8
Round down value	5.00		Difference for interpolation
Interpolated FFS reduction	1.25	mph	Every 10 access/mile = 2.5 reduction
Access Density Reduction f_a	3.75	mph	From HCM Ex. 15-8

Demand Flow Rate (Step #3)

			Calc Cell / Input Cell
Direction 1 Volume	54	vph	
Direction 2 Volume	24	vph	
Equvalent Trucks E_t	1.9		From HCM Ex. 15-11
Equvalent RV E_R	1		From HCM Ex. 15-11
Heavy Veh Adj. f_{hv}	0.93		From HCM Eq. 15-5
Grade Adj. f_g	1		From HCM Ex. 15-9
Demand Flow Eq.	$v_{i,ats} = \frac{v_i}{PHF * f_{g,ats} * f_{hv,ats}}$		From HCM Eq. 15-3
Direction 1 Demand Flow (v	66	vph	
Direction 2 Demand Flow (v	29	vph	

Average Travel Speed (ATS) (Step #4)

Calc Cell / Input Cell

ATS = FFS – 0.00776(v_1,ats + v_2,ats) – f_{np},ats — From HCM Eq. 15-6

No Pass Adj Factor f_{np}: 0.2 — From HCM Ex. 15-15

ATS: 37.31 mph

Percent of Free Flow Speed (PFFS)

Exhibit 15-3
Motorized Vehicle LOS for Two-Lane Highways

LOS	Class I Highways ATS (mi/h)	Class I Highways PTSF (%)	Class II Highways PTSF (%)	Class III Highways PFFS (%)
A	>55	≤35	≤40	>91.7
B	>50–55	>35–50	>40–55	>83.3–91.7
C	>45–50	>50–65	>55–70	>75.0–83.3
D	>40–45	>65–80	>70–85	>66.7–75.0
E	≤40	>80	>85	≤66.7
F	Demand exceeds capacity			

Note: For Class I highways, LOS is determined by the worse of ATS-based LOS and PTSF-based LOS.

Percent of Free Flow Speed (PFFS)

PFFS = ATS/FFS	97.5%	
ATS	37.31	mph
FFS	38.25	mph

Level of Service (LOS)

LOS: A

Existing 2049 without Project: Berggren Lane

Input Data (Step #1)

Input Cell

Road Name	Berggren Ln	
Lane Width	12	ft
Shoulder Width	3	ft
Total Accesses	5	Accesses
Segment Length	1	miles
Speed Limit	40	mph
PHF	0.88	HCM Ex. 15-5
Truck %	8%	
RV %	0%	
Grade %	0%	
No Passing %	0%	

Free Flow Speed (FFS) Calcs (Step #2)

	Calc Cell		Input Cell
FFS=BFFS-f_{LS}-f_A	46.15	mph	HCM Eq. 15-2
Base Free Flow Speed (BFFS)	50	mph	From HCM: BFFS = Speed Limit + 10
Lane/Shoulder Width Adj. F_{LS}	2.6		From HCM Ex. 15-7
Accesses/mile	5.00	Accesses	
Round down nearest 10	0.00		Auto roundown to nearest 10
Rounded down FFS reduction	0	mph	From HCM Ex. 15-8
Round down value	5.00		Difference for interpolation
Interpolated FFS reduction	1.25	mph	Every 10 access/mile = 2.5 reduction
Access Density Reduction f_a	1.25	mph	From HCM Ex. 15-8

Demand Flow Rate (Step #3)

			Calc Cell	Input Cell
Direction 1 Volume	7	vph		
Direction 2 Volume	7	vph		
Equvalent Trucks E_t	1.9		From HCM Ex. 15-11	
Equvalent RV E_R	1		From HCM Ex. 15-11	
Heavy Veh Adj. f_{hv}	0.93		From HCM Eq. 15-5	
Grade Adj. f_g	1		From HCM Ex. 15-9	
Demand Flow Eq.	$v_{i,ats} = \frac{V_i}{PHF * f_{g,ats} * f_{hv,ats}}$		From HCM Eq. 15-3	
Direction 1 Demand Flow (v	9	vph		
Direction 2 Demand Flow (v	9	vph		

Average Travel Speed (ATS) (Step #4)

			Calc Cell	Input Cell
ATS = FFS – 0.00776(v_1,ats + v_2,ats) – f_{np},ats			From HCM Eq. 15-6	
No Pass Adj Factor f_{np}	0.2		From HCM Ex. 15-15	
ATS	45.82	mph		

Percent of Free Flow Speed (PFFS)

Exhibit 15-3
Motorized Vehicle LOS for Two-Lane Highways

LOS	Class I Highways ATS (mi/h)	Class I Highways PTSF (%)	Class II Highways PTSF (%)	Class III Highways PFFS (%)
A	>55	≤35	≤40	>91.7
B	>50–55	>35–50	>40–55	>83.3–91.7
C	>45–50	>50–65	>55–70	>75.0–83.3
D	>40–45	>65–80	>70–85	>66.7–75.0
E	≤40	>80	>85	≤66.7
F	Demand exceeds capacity			

Note: For Class I highways, LOS is determined by the worse of ATS-based LOS and PTSF-based LOS.

Percent of Free Flow Speed (PFFS)

PFFS = ATS/FFS	99.3%	
ATS	45.82	mph
FFS	46.15	mph

Level of Service (LOS)

LOS	A

Existing 2049 without Project: East River Road

Input Data (Step #1)

Input Cell

Road Name	East River Road	
Lane Width	12	ft
Shoulder Width	3	ft
Total Accesses	5	Accesses
Segment Length	1	miles
Speed Limit	35	mph
PHF	0.88	HCM Ex. 15-5
Truck %	8%	
RV %	0%	
Grade %	0%	
No Passing %	0%	

Free Flow Speed (FFS) Calcs (Step #2)

	Calc Cell		Input Cell
FFS=BFFS-f_{LS}-f_A	38.25	mph	HCM Eq. 15-2
Base Free Flow Speed (BFFS)	45	mph	From HCM: BFFS = Speed Limit + 10
Lane/Shoulder Width Adj. F_{LS}	3		From HCM Ex. 15-7
Accesses/mile	5.00	Accesses	
Round down nearest 10	0.00		Auto roundown to nearest 10
Rounded down FFS reduction	2.5	mph	From HCM Ex. 15-8
Round down value	5.00		Difference for interpolation
Interpolated FFS reduction	1.25	mph	Every 10 access/mile = 2.5 reduction
Access Density Reduction f_a	3.75	mph	From HCM Ex. 15-8

Demand Flow Rate (Step #3)

			Calc Cell / Input Cell
Direction 1 Volume	73	vph	
Direction 2 Volume	47	vph	
Equvalent Trucks E_t	1.9		From HCM Ex. 15-11
Equvalent RV E_R	1		From HCM Ex. 15-11
Heavy Veh Adj. f_{hv}	0.93		From HCM Eq. 15-5
Grade Adj. f_g	1		From HCM Ex. 15-9
Demand Flow Eq.	$v_{i,ats} = \frac{V_i}{PHF * f_{g,ats} * f_{hv,ats}}$		From HCM Eq. 15-3
Direction 1 Demand Flow (v	89	vph	
Direction 2 Demand Flow (v	57	vph	

Average Travel Speed (ATS) (Step #4)

			Calc Cell / Input Cell
ATS = FFS – 0.00776(v_1,ats + v_2,ats) – f_{np},ats			From HCM Eq. 15-6
No Pass Adj Factor f_{np}	0.2		From HCM Ex. 15-15
ATS	36.92	mph	

Percent of Free Flow Speed (PFFS)

Exhibit 15-3
Motorized Vehicle LOS for Two-Lane Highways

LOS	Class I Highways ATS (mi/h)	Class I Highways PTSF (%)	Class II Highways PTSF (%)	Class III Highways PFFS (%)
A	>55	≤35	≤40	>91.7
B	>50–55	>35–50	>40–55	>83.3–91.7
C	>45–50	>50–65	>55–70	>75.0–83.3
D	>40–45	>65–80	>70–85	>66.7–75.0
E	≤40	>80	>85	≤66.7
F	Demand exceeds capacity			

Note: For Class I highways, LOS is determined by the worse of ATS-based LOS and PTSF-based LOS.

Percent of Free Flow Speed (PFFS)

PFFS = ATS/FFS	96.5%	
ATS	36.92	mph
FFS	38.25	mph

Level of Service (LOS)

LOS A

Existing 2029 with Project: Berggren Lane

Input Data (Step #1)

Input Cell

Road Name	Berggren Ln	
Lane Width	12	ft
Shoulder Width	3	ft
Total Accesses	5	Accesses
Segment Length	1	miles
Speed Limit	40	mph
PHF	0.88	HCM Ex. 15-5
Truck %	8%	
RV %	0%	
Grade %	0%	
No Passing %	0%	

Free Flow Speed (FFS) Calcs (Step #2)

	Calc Cell		Input Cell
FFS=BFFS-f_{LS}-f_A	46.15	mph	HCM Eq. 15-2
Base Free Flow Speed (BFFS)	50	mph	From HCM: BFFS = Speed Limit + 10
Lane/Shoulder Width Adj. F_{LS}	2.6		From HCM Ex. 15-7
Accesses/mile	5.00	Accesses	
Round down nearest 10	0.00		Auto roundown to nearest 10
Rounded down FFS reduction	0	mph	From HCM Ex. 15-8
Round down value	5.00		Difference for interpolation
Interpolated FFS reduction	1.25	mph	Every 10 access/mile = 2.5 reduction
Access Density Reduction f_a	1.25	mph	From HCM Ex. 15-8

Demand Flow Rate (Step #3)

		Calc Cell / Input Cell	
Direction 1 Volume	19	vph	
Direction 2 Volume	22	vph	
Equvalent Trucks E_t	1.9		From HCM Ex. 15-11
Equvalent RV E_R	1		From HCM Ex. 15-11
Heavy Veh Adj. f_{hv}	0.93		From HCM Eq. 15-5
Grade Adj. f_g	1		From HCM Ex. 15-9
Demand Flow Eq.	$v_{i,ats} = \frac{V_i}{PHF * f_{g,ats} * f_{hv,ats}}$		From HCM Eq. 15-3
Direction 1 Demand Flow (v	23	vph	
Direction 2 Demand Flow (v	27	vph	

Average Travel Speed (ATS) (Step #4)

	Calc Cell		Input Cell
ATS = FFS – 0.00776(v_1,ats + v_2,ats) – f_{np},ats			From HCM Eq. 15-6
No Pass Adj Factor f_{np}	0.2		From HCM Ex. 15-15
ATS	45.56	mph	

Percent of Free Flow Speed (PFFS)

Exhibit 15-3
Motorized Vehicle LOS for Two-Lane Highways

LOS	Class I Highways ATS (mi/h)	Class I Highways PTSF (%)	Class II Highways PTSF (%)	Class III Highways PFFS (%)
A	>55	≤35	≤40	>91.7
B	>50–55	>35–50	>40–55	>83.3–91.7
C	>45–50	>50–65	>55–70	>75.0–83.3
D	>40–45	>65–80	>70–85	>66.7–75.0
E	≤40	>80	>85	≤66.7
F	Demand exceeds capacity			

Note: For Class I highways, LOS is determined by the worse of ATS-based LOS and PTSF-based LOS.

Percent of Free Flow Speed (PFFS)

PFFS = ATS/FFS	98.7%	
ATS	45.56	mph
FFS	46.15	mph

Level of Service (LOS)

LOS	A

Existing 2029 with Project: East River Road

Input Data (Step #1)

Input Cell

Road Name	East River Road	
Lane Width	12	ft
Shoulder Width	3	ft
Total Accesses	5	Accesses
Segment Length	1	miles
Speed Limit	35	mph
PHF	0.88	HCM Ex. 15-5
Truck %	8%	
RV %	0%	
Grade %	0%	
No Passing %	0%	

Free Flow Speed (FFS) Calcs (Step #2)

	Calc Cell		Input Cell
FFS=BFFS-f_{LS}-f_A	38.25	mph	HCM Eq. 15-2
Base Free Flow Speed (BFFS)	45	mph	From HCM: BFFS = Speed Limit + 10
Lane/Shoulder Width Adj. F_{LS}	3		From HCM Ex. 15-7
Accesses/mile	5.00	Accesses	
Round down nearest 10	0.00		Auto roundown to nearest 10
Rounded down FFS reduction	2.5	mph	From HCM Ex. 15-8
Round down value	5.00		Difference for interpolation
Interpolated FFS reduction	1.25	mph	Every 10 access/mile = 2.5 reduction
Access Density Reduction f_a	3.75	mph	From HCM Ex. 15-8

Demand Flow Rate (Step #3)

			Calc Cell	Input Cell
Direction 1 Volume	72	vph		
Direction 2 Volume	51	vph		
Equvalent Trucks E_t	1.9		From HCM Ex. 15-11	
Equvalent RV E_R	1		From HCM Ex. 15-11	
Heavy Veh Adj. f_{hv}	0.93		From HCM Eq. 15-5	
Grade Adj. f_g	1		From HCM Ex. 15-9	
Demand Flow Eq.	$v_{i,ats} = \frac{V_i}{PHF * f_{g,ats} * f_{hv,ats}}$		From HCM Eq. 15-3	
Direction 1 Demand Flow (v	88	vph		
Direction 2 Demand Flow (v	62	vph		

Average Travel Speed (ATS) (Step #4)

			Calc Cell	Input Cell
ATS = FFS – 0.00776(v_1,ats + v_2,ats) – f_{np},ats			From HCM Eq. 15-6	
No Pass Adj Factor f_{np}	0.2		From HCM Ex. 15-15	
ATS	36.89	mph		

Percent of Free Flow Speed (PFFS)

Exhibit 15-3
Motorized Vehicle LOS for Two-Lane Highways

LOS	Class I Highways ATS (mi/h)	Class I Highways PTSF (%)	Class II Highways PTSF (%)	Class III Highways PFFS (%)
A	>55	≤35	≤40	>91.7
B	>50–55	>35–50	>40–55	>83.3–91.7
C	>45–50	>50–65	>55–70	>75.0–83.3
D	>40–45	>65–80	>70–85	>66.7–75.0
E	≤40	>80	>85	≤66.7
F	Demand exceeds capacity			

Note: For Class I highways, LOS is determined by the worse of ATS-based LOS and PTSF-based LOS.

Percent of Free Flow Speed (PFFS)

PFFS = ATS/FFS	96.4%	
ATS	36.89	mph
FFS	38.25	mph

Level of Service (LOS)

LOS	A

Existing 2049 with Project: Berggren Lane

Input Data (Step #1)

Input Cell

Road Name	Berggren Ln	
Lane Width	12	ft
Shoulder Width	3	ft
Total Accesses	5	Accesses
Segment Length	1	miles
Speed Limit	40	mph
PHF	0.88	HCM Ex. 15-5
Truck %	8%	
RV %	0%	
Grade %	0%	
No Passing %	0%	

Free Flow Speed (FFS) Calcs (Step #2)

	Calc Cell		Input Cell
FFS=BFFS-f_{LS}-f_A	46.15	mph	HCM Eq. 15-2
Base Free Flow Speed (BFFS)	50	mph	From HCM: BFFS = Speed Limit + 10
Lane/Shoulder Width Adj. F_{LS}	2.6		From HCM Ex. 15-7
Accesses/mile	5.00	Accesses	
Round down nearest 10	0.00		Auto roundown to nearest 10
Rounded down FFS reduction	0	mph	From HCM Ex. 15-8
Round down value	5.00		Difference for interpolation
Interpolated FFS reduction	1.25	mph	Every 10 access/mile = 2.5 reduction
Access Density Reduction f_a	1.25	mph	From HCM Ex. 15-8

Demand Flow Rate (Step #3)

			Calc Cell / Input Cell
Direction 1 Volume	93	vph	
Direction 2 Volume	40	vph	
Equvalent Trucks E_t	1.9		From HCM Ex. 15-11
Equvalent RV E_R	1		From HCM Ex. 15-11
Heavy Veh Adj. f_{hv}	0.93		From HCM Eq. 15-5
Grade Adj. f_g	1		From HCM Ex. 15-9
Demand Flow Eq.	$v_{i,ats} = \frac{V_i}{PHF * f_{g,ats} * f_{hv,ats}}$		From HCM Eq. 15-3
Direction 1 Demand Flow (v	113	vph	
Direction 2 Demand Flow (v	49	vph	

Average Travel Speed (ATS) (Step #4)

			Calc Cell / Input Cell
ATS = FFS – 0.00776(v_1,ats + v_2,ats) – f_{np},ats			From HCM Eq. 15-6
No Pass Adj Factor f_{np}	0.2		From HCM Ex. 15-15
ATS	44.69	mph	

Percent of Free Flow Speed (PFFS)

Exhibit 15-3
Motorized Vehicle LOS for Two-Lane Highways

LOS	Class I Highways ATS (mi/h)	Class I Highways PTSF (%)	Class II Highways PTSF (%)	Class III Highways PFFS (%)
A	>55	≤35	≤40	>91.7
B	>50–55	>35–50	>40–55	>83.3–91.7
C	>45–50	>50–65	>55–70	>75.0–83.3
D	>40–45	>65–80	>70–85	>66.7–75.0
E	≤40	>80	>85	≤66.7
F	Demand exceeds capacity			

Note: For Class I highways, LOS is determined by the worse of ATS-based LOS and PTSF-based LOS.

Percent of Free Flow Speed (PFFS)

PFFS = ATS/FFS	96.8%	
ATS	44.69	mph
FFS	46.15	mph

Level of Service (LOS)

LOS	A

Existing 2049 with Project: East River Road

Input Data (Step #1)

Input Cell

Road Name	East River Road	
Lane Width	12	ft
Shoulder Width	3	ft
Total Accesses	5	Accesses
Segment Length	1	miles
Speed Limit	35	mph
PHF	0.88	HCM Ex. 15-5
Truck %	8%	
RV %	0%	
Grade %	0%	
No Passing %	0%	

Free Flow Speed (FFS) Calcs (Step #2)

	Calc Cell		Input Cell
FFS=BFFS-f_{LS}-f_A	38.25	mph	HCM Eq. 15-2
Base Free Flow Speed (BFFS)	45	mph	From HCM: BFFS = Speed Limit + 10
Lane/Shoulder Width Adj. F_{LS}	3		From HCM Ex. 15-7
Accesses/mile	5.00	Accesses	
Round down nearest 10	0.00		Auto roundown to nearest 10
Rounded down FFS reduction	2.5	mph	From HCM Ex. 15-8
Round down value	5.00		Difference for interpolation
Interpolated FFS reduction	1.25	mph	Every 10 access/mile = 2.5 reduction
Access Density Reduction f_a	3.75	mph	From HCM Ex. 15-8

Demand Flow Rate (Step #3)

			Calc Cell	Input Cell
Direction 1 Volume	94	vph		
Direction 2 Volume	65	vph		
Equvalent Trucks E_t	1.9		From HCM Ex. 15-11	
Equvalent RV E_R	1		From HCM Ex. 15-11	
Heavy Veh Adj. f_{hv}	0.93		From HCM Eq. 15-5	
Grade Adj. f_g	1		From HCM Ex. 15-9	
Demand Flow Eq.	$v_{i,ats} = \frac{V_i}{PHF * f_{g,ats} * f_{hv,ats}}$		From HCM Eq. 15-3	
Direction 1 Demand Flow (v	115	vph		
Direction 2 Demand Flow (v	79	vph		

Average Travel Speed (ATS) (Step #4)

			Calc Cell	Input Cell
ATS = FFS – 0.00776(v_1,ats + v_2,ats) – f_{np},ats			From HCM Eq. 15-6	
No Pass Adj Factor f_{np}	0.2		From HCM Ex. 15-15	
ATS	36.55	mph		

Percent of Free Flow Speed (PFFS)

Exhibit 15-3
Motorized Vehicle LOS for Two-Lane Highways

LOS	Class I Highways ATS (mi/h)	Class I Highways PTSF (%)	Class II Highways PTSF (%)	Class III Highways PFFS (%)
A	>55	≤35	≤40	>91.7
B	>50–55	>35–50	>40–55	>83.3–91.7
C	>45–50	>50–65	>55–70	>75.0–83.3
D	>40–45	>65–80	>70–85	>66.7–75.0
E	≤40	>80	>85	≤66.7
F	Demand exceeds capacity			

Note: For Class I highways, LOS is determined by the worse of ATS-based LOS and PTSF-based LOS.

Percent of Free Flow Speed (PFFS)

PFFS = ATS/FFS	95.5%	
ATS	36.55	mph
FFS	38.25	mph

Level of Service (LOS)

LOS	A

Appendix C: 2024 Existing Conditions Traffic Model Results

2024 Existing Conditions - Int 1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	4	47	21	1	1	2
Future Volume (Veh/h)	4	47	21	1	1	2
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	5	53	24	1	1	2
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	25				88	24
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	25				88	24
tC, single (s)	4.2				6.5	6.3
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.4
p0 queue free %	100				100	100
cM capacity (veh/h)	1551				896	1035

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	58	25	3
Volume Left	5	0	1
Volume Right	0	1	2
cSH	1551	1700	984
Volume to Capacity	0.00	0.01	0.00
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.7	0.0	8.7
Lane LOS	A		A
Approach Delay (s)	0.7	0.0	8.7
Approach LOS			A

Intersection Summary			
Average Delay	0.7		
Intersection Capacity Utilization	16.5%	ICU Level of Service	A
Analysis Period (min)	15		

2024 Existing Conditions - Int 2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	48	2	1	31	1	3
Future Volume (Veh/h)	48	2	1	31	1	3
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	55	2	1	35	1	3
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			57		93	56
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			57		93	56
tC, single (s)			4.2		6.5	6.3
tC, 2 stage (s)						
tF (s)			2.3		3.6	3.4
p0 queue free %			100		100	100
cM capacity (veh/h)			1510		892	994

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	57	36	4
Volume Left	0	1	1
Volume Right	2	0	3
cSH	1700	1510	966
Volume to Capacity	0.03	0.00	0.00
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	0.2	8.7
Lane LOS		A	A
Approach Delay (s)	0.0	0.2	8.7
Approach LOS			A

Intersection Summary			
Average Delay	0.4		
Intersection Capacity Utilization	13.3%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix D: 2029 Buildout Year Conditions Traffic Model Results without the Project

2029 Buildout Conditions without the Project - Int 1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	5	51	22	1	1	2
Future Volume (Veh/h)	5	51	22	1	1	2
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	6	58	25	1	1	2
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	26				96	26
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	26				96	26
tC, single (s)	4.2				6.5	6.3
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.4
p0 queue free %	100				100	100
cM capacity (veh/h)	1550				886	1033

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	64	26	3
Volume Left	6	0	1
Volume Right	0	1	2
cSH	1550	1700	979
Volume to Capacity	0.00	0.02	0.00
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.7	0.0	8.7
Lane LOS	A		A
Approach Delay (s)	0.7	0.0	8.7
Approach LOS			A

Intersection Summary			
Average Delay	0.8		
Intersection Capacity Utilization	17.6%	ICU Level of Service	A
Analysis Period (min)	15		

2029 Buildout Conditions without the Project - Int 2

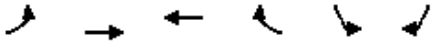
Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	52	2	1	34	1	3
Future Volume (Veh/h)	52	2	1	34	1	3
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	59	2	1	39	1	3
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			61		101	60
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			61		101	60
tC, single (s)			4.2		6.5	6.3
tC, 2 stage (s)						
tF (s)			2.3		3.6	3.4
p0 queue free %			100		100	100
cM capacity (veh/h)			1505		883	989

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	61	40	4
Volume Left	0	1	1
Volume Right	2	0	3
cSH	1700	1505	960
Volume to Capacity	0.04	0.00	0.00
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	0.2	8.8
Lane LOS		A	A
Approach Delay (s)	0.0	0.2	8.8
Approach LOS			A

Intersection Summary			
Average Delay		0.4	
Intersection Capacity Utilization		13.3%	ICU Level of Service A
Analysis Period (min)		15	

Appendix E: 2049 Horizon Year Conditions Traffic Model Results without the Project

2049 Horizon Year Conditions without the Project - Int 1



Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	7	70	31	2	2	3
Future Volume (Veh/h)	7	70	31	2	2	3
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	8	80	35	2	2	3
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	37				132	36
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	37				132	36
tC, single (s)	4.2				6.5	6.3
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.4
p0 queue free %	99				100	100
cM capacity (veh/h)	1536				843	1020

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	88	37	5
Volume Left	8	0	2
Volume Right	0	2	3
cSH	1536	1700	941
Volume to Capacity	0.01	0.02	0.01
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.7	0.0	8.8
Lane LOS	A		A
Approach Delay (s)	0.7	0.0	8.8
Approach LOS			A

Intersection Summary			
Average Delay		0.8	
Intersection Capacity Utilization		20.6%	ICU Level of Service
Analysis Period (min)		15	

2049 Horizon Year Conditions without the Project - Int 2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	73	2	2	47	2	5
Future Volume (Veh/h)	73	2	2	47	2	5
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	83	2	2	53	2	6
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			85		141	84
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			85		141	84
tC, single (s)			4.2		6.5	6.3
tC, 2 stage (s)						
tF (s)			2.3		3.6	3.4
p0 queue free %			100		100	99
cM capacity (veh/h)			1474		837	959

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	85	55	8
Volume Left	0	2	2
Volume Right	2	0	6
cSH	1700	1474	925
Volume to Capacity	0.05	0.00	0.01
Queue Length 95th (ft)	0	0	1
Control Delay (s)	0.0	0.3	8.9
Lane LOS		A	A
Approach Delay (s)	0.0	0.3	8.9
Approach LOS			A

Intersection Summary				
Average Delay		0.6		
Intersection Capacity Utilization		14.6%	ICU Level of Service	A
Analysis Period (min)		15		

Appendix F: 2029 Buildout Year Conditions Traffic Model Results with the Project

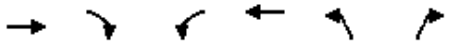
2029 Buildout Year with the Project - Int 1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	21	51	22	1	1	18
Future Volume (Veh/h)	21	51	22	1	1	18
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	24	58	25	1	1	20
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	26				132	26
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	26				132	26
tC, single (s)	4.2				6.5	6.3
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.4
p0 queue free %	98				100	98
cM capacity (veh/h)	1550				835	1033

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	82	26	21
Volume Left	24	0	1
Volume Right	0	1	20
cSH	1550	1700	1022
Volume to Capacity	0.02	0.02	0.02
Queue Length 95th (ft)	1	0	2
Control Delay (s)	2.2	0.0	8.6
Lane LOS	A		A
Approach Delay (s)	2.2	0.0	8.6
Approach LOS			A

Intersection Summary			
Average Delay	2.8		
Intersection Capacity Utilization	21.0%	ICU Level of Service	A
Analysis Period (min)	15		

2029 Buildout Year with the Project - Int 2

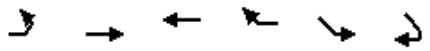


Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	68	2	1	50	1	3
Future Volume (Veh/h)	68	2	1	50	1	3
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	77	2	1	57	1	3
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			79		137	78
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			79		137	78
tC, single (s)			4.2		6.5	6.3
tC, 2 stage (s)						
tF (s)			2.3		3.6	3.4
p0 queue free %			100		100	100
cM capacity (veh/h)			1482		842	966

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	79	58	4
Volume Left	0	1	1
Volume Right	2	0	3
cSH	1700	1482	932
Volume to Capacity	0.05	0.00	0.00
Queue Length 95th (ft)	0	0	0
Control Delay (s)	0.0	0.1	8.9
Lane LOS		A	A
Approach Delay (s)	0.0	0.1	8.9
Approach LOS			A

Intersection Summary			
Average Delay	0.3		
Intersection Capacity Utilization	14.1%	ICU Level of Service	A
Analysis Period (min)	15		

2029 Buildout Year with the Project - Int 3



Movement	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations						
Traffic Volume (veh/h)	17	1	1	1	1	16
Future Volume (Veh/h)	17	1	1	1	1	16
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	19	1	1	1	1	18
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	2				40	2
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	2				40	2
tC, single (s)	4.2				6.5	6.3
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.4
p0 queue free %	99				100	98
cM capacity (veh/h)	1582				944	1066

Direction, Lane #	EB 1	WB 1	SE 1
Volume Total	20	2	19
Volume Left	19	0	1
Volume Right	0	1	18
cSH	1582	1700	1058
Volume to Capacity	0.01	0.00	0.02
Queue Length 95th (ft)	1	0	1
Control Delay (s)	6.9	0.0	8.5
Lane LOS	A		A
Approach Delay (s)	6.9	0.0	8.5
Approach LOS			A

Intersection Summary				
Average Delay	7.3			
Intersection Capacity Utilization	17.8%	ICU Level of Service	A	
Analysis Period (min)	15			

Appendix G: 2049 Horizon Year Conditions Traffic Model Results with the Project

2049 Horizon Year with the Project - Int 1

Movement	EBL	EBT	WBT	WBR	SBL	SBR
Lane Configurations						
Traffic Volume (veh/h)	23	70	31	2	2	19
Future Volume (Veh/h)	23	70	31	2	2	19
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	26	80	35	2	2	22
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	37				168	36
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	37				168	36
tC, single (s)	4.2				6.5	6.3
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.4
p0 queue free %	98				100	98
cM capacity (veh/h)	1536				795	1020

Direction, Lane #	EB 1	WB 1	SB 1
Volume Total	106	37	24
Volume Left	26	0	2
Volume Right	0	2	22
cSH	1536	1700	996
Volume to Capacity	0.02	0.02	0.02
Queue Length 95th (ft)	1	0	2
Control Delay (s)	1.9	0.0	8.7
Lane LOS	A		A
Approach Delay (s)	1.9	0.0	8.7
Approach LOS			A

Intersection Summary			
Average Delay		2.5	
Intersection Capacity Utilization		22.2%	ICU Level of Service A
Analysis Period (min)		15	

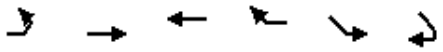
2049 Horizon Year with the Project - Int 2

Movement	EBT	EBR	WBL	WBT	NBL	NBR
Lane Configurations						
Traffic Volume (veh/h)	89	2	2	63	2	5
Future Volume (Veh/h)	89	2	2	63	2	5
Sign Control	Free			Free	Stop	
Grade	0%			0%	0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	101	2	2	72	2	6
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type	None			None		
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume			103		178	102
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol			103		178	102
tC, single (s)			4.2		6.5	6.3
tC, 2 stage (s)						
tF (s)			2.3		3.6	3.4
p0 queue free %			100		100	99
cM capacity (veh/h)			1452		797	937

Direction, Lane #	EB 1	WB 1	NB 1
Volume Total	103	74	8
Volume Left	0	2	2
Volume Right	2	0	6
cSH	1700	1452	898
Volume to Capacity	0.06	0.00	0.01
Queue Length 95th (ft)	0	0	1
Control Delay (s)	0.0	0.2	9.0
Lane LOS		A	A
Approach Delay (s)	0.0	0.2	9.0
Approach LOS			A

Intersection Summary			
Average Delay	0.5		
Intersection Capacity Utilization	15.5%	ICU Level of Service	A
Analysis Period (min)	15		

2049 Horizon Year with the Project - Int 3



Movement	EBL	EBT	WBT	WBR	SEL	SER
Lane Configurations						
Traffic Volume (veh/h)	18	2	2	2	2	19
Future Volume (Veh/h)	18	2	2	2	2	19
Sign Control		Free	Free		Stop	
Grade		0%	0%		0%	
Peak Hour Factor	0.88	0.88	0.88	0.88	0.88	0.88
Hourly flow rate (vph)	20	2	2	2	2	22
Pedestrians						
Lane Width (ft)						
Walking Speed (ft/s)						
Percent Blockage						
Right turn flare (veh)						
Median type		None	None			
Median storage veh)						
Upstream signal (ft)						
pX, platoon unblocked						
vC, conflicting volume	4				45	3
vC1, stage 1 conf vol						
vC2, stage 2 conf vol						
vCu, unblocked vol	4				45	3
tC, single (s)	4.2				6.5	6.3
tC, 2 stage (s)						
tF (s)	2.3				3.6	3.4
p0 queue free %	99				100	98
cM capacity (veh/h)	1579				938	1064

Direction, Lane #	EB 1	WB 1	SE 1
Volume Total	22	4	24
Volume Left	20	0	2
Volume Right	0	2	22
cSH	1579	1700	1052
Volume to Capacity	0.01	0.00	0.02
Queue Length 95th (ft)	1	0	2
Control Delay (s)	6.7	0.0	8.5
Lane LOS	A		A
Approach Delay (s)	6.7	0.0	8.5
Approach LOS			A

Intersection Summary			
Average Delay	7.0		
Intersection Capacity Utilization	17.9%	ICU Level of Service	A
Analysis Period (min)	15		

Appendix H: Left Turn Lane Warrant Analysis

Eastbound Traffic without the Project

IGN CRITERIA (Input the following based on observation, historical data, and/or results of a site specific study)

Jurisdiction	Bingham County	Horizon or Planning Year	2024	2029	2049	
Subdivision or Development Name	BJ Livestock Gravel Pit	Development Type	Rural	Rural	Rural	
Name of Major Roadway	East River Road	No. of lanes on the major	Two	Two	Two	
Name of Minor Roadway/Approach	Berggren Ln	Number of Legs	Three	Three	Three	
Peak Hour	PM	Peak-hr, left-turn lane vol	4	5	7	(vehicles per hour)
Posted Speed Limit (MPH)	55	Major Roadway Peak-hr vc	47	51	70	(veh/hour/lane).

ysis - Table and graph reproduced from NCHRP Report 745 (Axes on the graph are reversed from source)

rsection Intersection 1 **Horizon Years**

Consult chart below and evaluate the type of intersection and the left-turn, peak-hour volume

Left Turn Peak Hour Volume (Veh/hr)	Three Leg Intersection, Major Two-Lane Highway Peak-Hour Volume that Warrants a Left-Turn Lane (Veh/hr/lane)	Four Leg Intersection, Major Two-Lane Highway Peak-Hour Volume that Warrants a Left-Turn Lane (Veh/hr/lane)	Three Leg Intersection, Major Four-Lane Highway Peak-Hour Volume that Warrants a Left-Turn Lane (Veh/hr/lane)	Four Leg Intersection, Major Four-Lane Highway Peak-Hour Volume that Warrants a Left-Turn Lane (Veh/hr/lane)	Three Leg Intersection, Major Four-Lane Highway Peak-Hour Volume that Warrants a Left-Turn Lane (Veh/hr/lane)	Four Leg Intersection, Major Four-Lane Highway Peak-Hour Volume that Warrants a Left-Turn Lane (Veh/hr/lane)
5	200	150	75	50	450	50
10	100	50	75	25	300	50
15	100	50	50	25	250	50
20	50	<50	50	25	200	50
25	50	<50	50	<25	200	50
30	50	<50	50	<25	150	50
35	50	<50	50	<25	150	50
40	50	<50	50	<25	150	50
45	50	<50	50	<25	150	<50
50	50	<50	50	<25	100	<50

Check the plotted point(s) on the chart below against the anticpated intersection of major-road volume and peak-hour left-turn volume in the volume advancing.

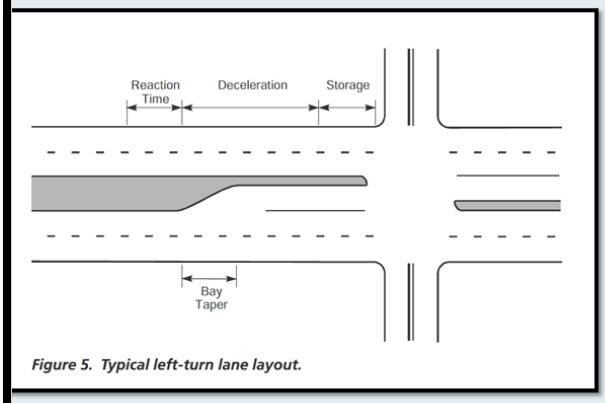
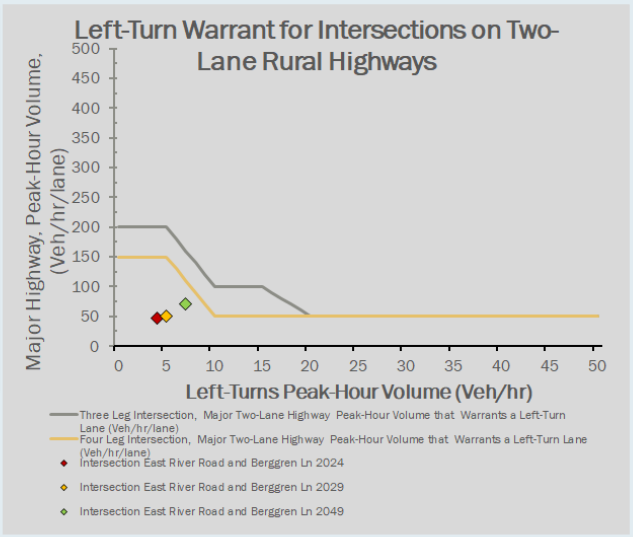


Figure 5. Typical left-turn lane layout.



LEFT-TURN WARRANTED **No**

Westbound Traffic without the Project

DESIGN CRITERIA (Input the following based on observation, historical data, and/or results of a site specific study)

1	Jurisdiction	Bingham County	Horizon or Planning Year	2024	2029	2049	
2	Subdivision or Development Name	BJ Livestock Gravel Pit	Development Type	Rural	Rural	Rural	
3	Name of Major Roadway	East River Road	No. of lanes on the major	Two	Two	Two	
4	Name of Minor Roadway/Approach	Berggren Ln	Number of Legs	Three	Three	Three	
5	Peak Hour	PM	Peak-hr, left-turn lane vol	1	1	2	(vehicles per hour)
6	Posted Speed Limit (MPH)	55	Major Roadway Peak-hr vc	31	34	47	(veh/hour/lane).

Analysis - Table and graph reproduced from NCHRP Report 745 (Axes on the graph are reversed from source)

Intersection Intersection 1 **Horizon Years**

1 Consult chart below and evaluate the type of intersection and the left-turn, peak-hour volume

Left Turn Peak Hour Volume (Veh/hr)	Three Leg Intersection, Major Two-Lane Highway Peak-Hour Volume that Warrants a Left-Turn Lane (Veh/hr/lane)	Four Leg Intersection, Major Two-Lane Highway Peak-Hour Volume that Warrants a Left-Turn Lane (Veh/hr/lane)	Three Leg Intersection, Major Four-Lane Highway Peak-Hour Volume that Warrants a Left-Turn Lane (Veh/hr/lane)	Four Leg Intersection, Major Four-Lane Highway Peak-Hour Volume that Warrants a Left-Turn Lane (Veh/hr/lane)	Three Leg Intersection, Major Four-Lane Highway Peak-Hour Volume that Warrants a Left-Turn Lane (Veh/hr/lane)	Four Leg Intersection, Major Four-Lane Highway Peak-Hour Volume that Warrants a Left-Turn Lane (Veh/hr/lane)
5	200	150	75	50	450	50
10	100	50	75	25	300	50
15	100	50	50	25	250	50
20	50	<50	50	25	200	50
25	50	<50	50	<25	200	50
30	50	<50	50	<25	150	50
35	50	<50	50	<25	150	50
40	50	<50	50	<25	150	50
45	50	<50	50	<25	150	<50
50	50	<50	50	<25	100	<50

2 Check the plotted point(s) on the chart below against the anticpated intersection of major-road volume and peak-hour left-turn volume in the volume advancing.

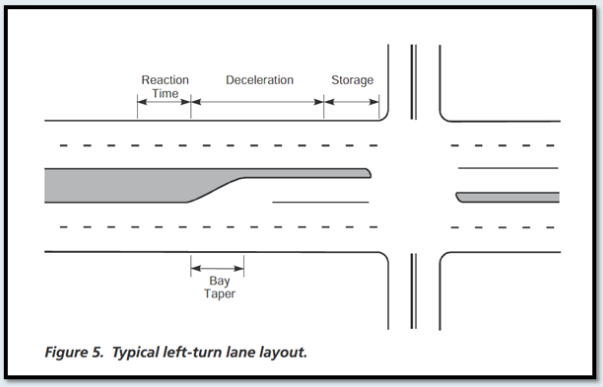
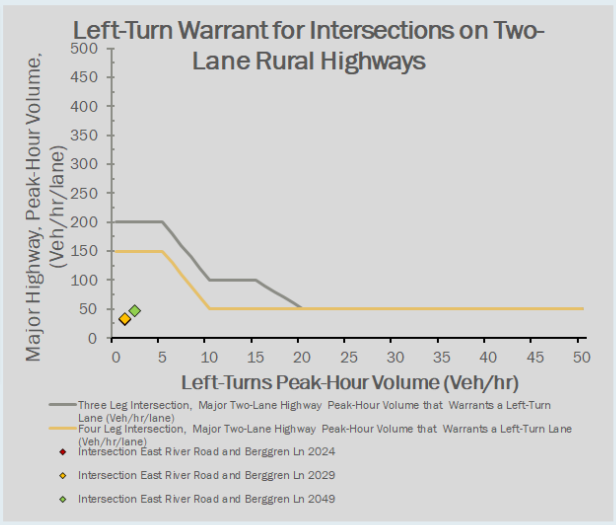


Figure 5. Typical left-turn lane layout.



LEFT-TURN WARRANTED **No**

Eastbound Traffic with the Project

DESIGN CRITERIA (Input the following based on observation, historical data, and/or results of a site specific study)

1	Jurisdiction	Bingham County	Horizon or Planning Year	2024	2029	2049	
2	Subdivision or Development Name	BJ Livestock Gravel Pit	Development Type	Rural	Rural	Rural	
3	Name of Major Roadway	East River Road	No. of lanes on the major	Two	Two	Two	
4	Name of Minor Roadway/Approach	Berggren Ln	Number of Legs	Three	Three	Three	
5	Peak Hour	PM	Peak-hr, left-turn lane vol	4	5	7	(vehicles per hour)
6	Posted Speed Limit (MPH)	55	Major Roadway Peak-hr vc	47	66	86	(veh/hour/lane).

Analysis - Table and graph reproduced from NCHRP Report 745 (Axes on the graph are reversed from source)

Intersection Intersection 1 **Horizon Years**

1 Consult chart below and evaluate the type of intersection and the left-turn, peak-hour volume

Left Turn Peak Hour Volume (Veh/hr)	Three Leg Intersection, Major Two-Lane Highway Peak-Hour Volume that Warrants a Left-Turn Lane (Veh/hr/lane)	Four Leg Intersection, Major Two-Lane Highway Peak-Hour Volume that Warrants a Left-Turn Lane (Veh/hr/lane)	Three Leg Intersection, Major Four-Lane Highway Peak-Hour Volume that Warrants a Left-Turn Lane (Veh/hr/lane)	Four Leg Intersection, Major Four-Lane Highway Peak-Hour Volume that Warrants a Left-Turn Lane (Veh/hr/lane)	Three Leg Intersection, Major Four-Lane Highway Peak-Hour Volume that Warrants a Left-Turn Lane (Veh/hr/lane)	Four Leg Intersection, Major Four-Lane Highway Peak-Hour Volume that Warrants a Left-Turn Lane (Veh/hr/lane)
5	200	150	75	50	450	50
10	100	50	75	25	300	50
15	100	50	50	25	250	50
20	50	<50	50	25	200	50
25	50	<50	50	<25	200	50
30	50	<50	50	<25	150	50
35	50	<50	50	<25	150	50
40	50	<50	50	<25	150	50
45	50	<50	50	<25	150	<50
50	50	<50	50	<25	100	<50

2 Check the plotted point(s) on the chart below against the anticpated intersection of major-road volume and peak-hour left-turn volume in the volume advancing.

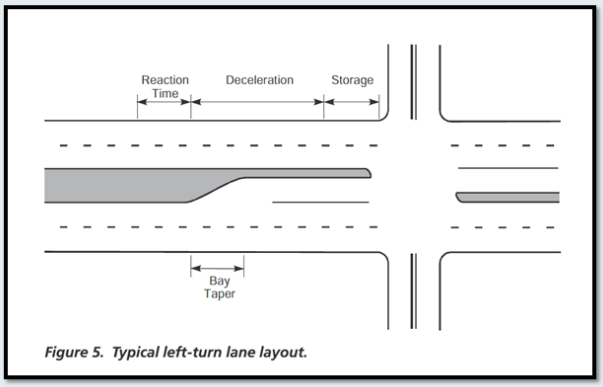
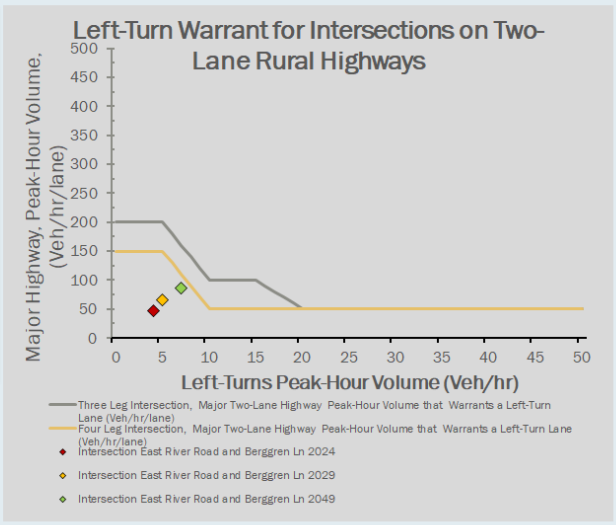


Figure 5. Typical left-turn lane layout.



LEFT-TURN WARRANTED **No**

Westbound Traffic with the Project

DESIGN CRITERIA (Input the following based on observation, historical data, and/or results of a site specific study)

1	Jurisdiction	Bingham County	Horizon or Planning Year	2024	2029	2049	
2	Subdivision or Development Name	BJ Livestock Gravel Pit	Development Type	Rural	Rural	Rural	
3	Name of Major Roadway	East River Road	No. of lanes on the major	Two	Two	Two	
4	Name of Minor Roadway/Approach	Berggren Ln	Number of Legs	Three	Three	Three	
5	Peak Hour	PM	Peak-hr, left-turn lane vol	1	1	2	(vehicles per hour)
6	Posted Speed Limit (MPH)	55	Major Roadway Peak-hr vc	31	56	79	(veh/hour/lane).

Analysis - Table and graph reproduced from NCHRP Report 745 (Axes on the graph are reversed from source)

Intersection Intersection 1 **Horizon Years**

1 Consult chart below and evaluate the type of intersection and the left-turn, peak-hour volume

Left Turn Peak Hour Volume (Veh/hr)	Three Leg Intersection, Major Two-Lane Highway Peak-Hour Volume that Warrants a Left-Turn Lane (Veh/hr/lane)	Four Leg Intersection, Major Two-Lane Highway Peak-Hour Volume that Warrants a Left-Turn Lane (Veh/hr/lane)	Three Leg Intersection, Major Four-Lane Highway Peak-Hour Volume that Warrants a Left-Turn Lane (Veh/hr/lane)	Four Leg Intersection, Major Four-Lane Highway Peak-Hour Volume that Warrants a Left-Turn Lane (Veh/hr/lane)	Three Leg Intersection, Major Four-Lane Highway Peak-Hour Volume that Warrants a Left-Turn Lane (Veh/hr/lane)	Four Leg Intersection, Major Four-Lane Highway Peak-Hour Volume that Warrants a Left-Turn Lane (Veh/hr/lane)
5	200	150	75	50	450	50
10	100	50	75	25	300	50
15	100	50	50	25	250	50
20	50	<50	50	25	200	50
25	50	<50	50	<25	200	50
30	50	<50	50	<25	150	50
35	50	<50	50	<25	150	50
40	50	<50	50	<25	150	50
45	50	<50	50	<25	150	<50
50	50	<50	50	<25	100	<50

2 Check the plotted point(s) on the chart below against the anticpated intersection of major-road volume and peak-hour left-turn volume in the volume advancing.

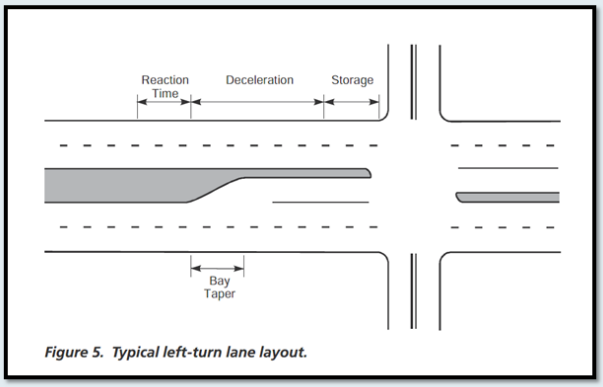
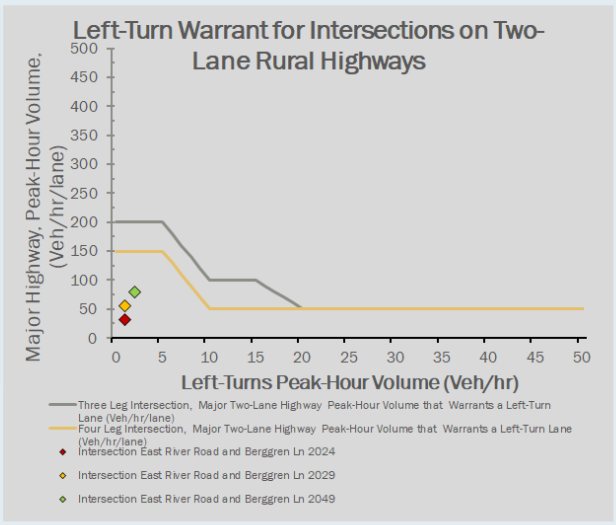


Figure 5. Typical left-turn lane layout.



LEFT-TURN WARRANTED **No**

Appendix I: Right Turn Lane Warrant Analysis

Eastbound Traffic without the Project

DESIGN CRITERIA (Input the following based on observation, historical data, and/or results of a site specific study)

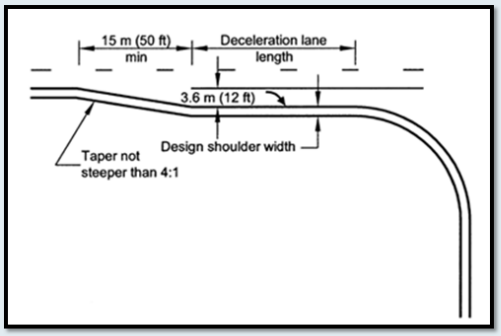
1	Jurisdiction	Bingham County	Horizon or Planning Year	2024	2029	2049	
2	Subdivision or Development Name	BJ Livestock Gravel Pit	Development Type	Rural	Rural	Rural	
3	Name of Major Roadway	East River Road	No. of lanes on the major	Two	Two	Two	
4	Name of Minor Roadway/Approach	Christensen Ln	Number of legs	Three	Three	Three	
5	Peak Hour	PM	Major roadway volume	48	52	73	(veh/hour/lane).
6	Posted Speed Limit (MPH)	50	Right-Turn, Peak Hour Vol	2	2	2	(veh/hour).

Analysis - Table and graph reproduced from NCHRP Report 745 (Axes on the graph are reversed from source)

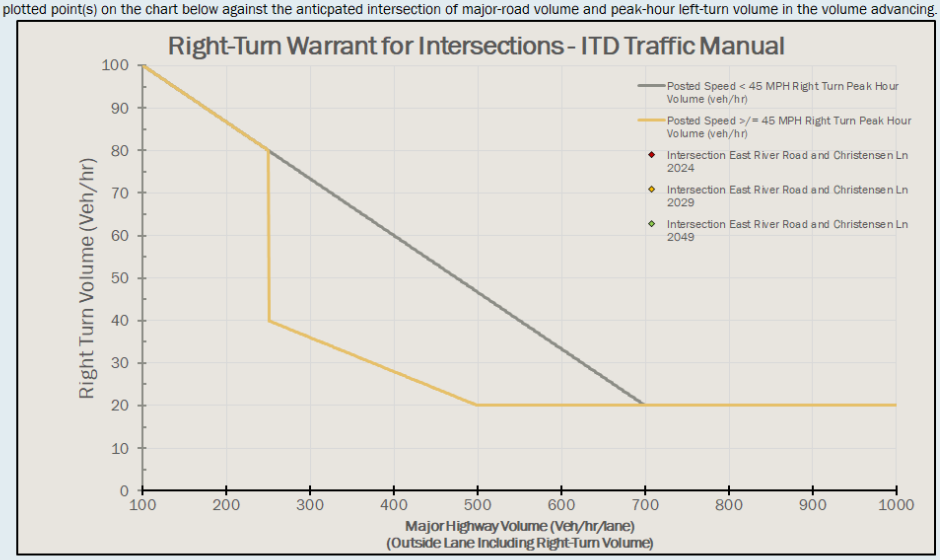
Intersection **Horizon Years**

1 Consult chart below and evaluate the type of intersection and the left-turn, peak-hour volume

Posted Speed < 45 MPH Highway Volume Outside Lane Only Including R-T Volume (Veh/hr/lane)	Posted Speed < 45 MPH Right Turn Peak Hour Volume (veh/hr)	Posted Speed >/= 45 MPH Right Turn Peak Hour Volume (veh/hr)
0	100	100
100	100	100
200	87	87
300	73	35
400	60	25
500	47	20
600	33	<20
700	20	<20
800	<20	<20
900	<20	<20
1000	<20	<20



2 Check the plotted point(s) on the chart below against the anticpated intersection of major-road volume and peak-hour left-turn volume in the volume advancing.



RIGHT-TURN WARRANTED **No**

Westbound Traffic without the Project

DESIGN CRITERIA (Input the following based on observation, historical data, and/or results of a site specific study)

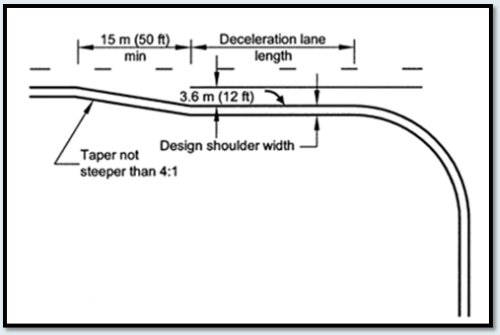
1	Jurisdiction	Bingham County	Horizon or Planning Year	2024	2029	2049	
2	Subdivision or Development Name	BJ Livestock Gravel Pit	Development Type	Rural	Rural	Rural	
3	Name of Major Roadway	East River Road	No. of lanes on the major	Two	Two	Two	
4	Name of Minor Roadway/Approach	Berggren Ln	Number of legs	Three	Three	Three	
5	Peak Hour	PM	Major roadway volume	21	22	31	(veh/hour/lane).
6	Posted Speed Limit (MPH)	50	Right-Turn, Peak Hour Vol	1	1	2	(veh/hour).

Analysis - Table and graph reproduced from NCHRP Report 745 (Axes on the graph are reversed from source)

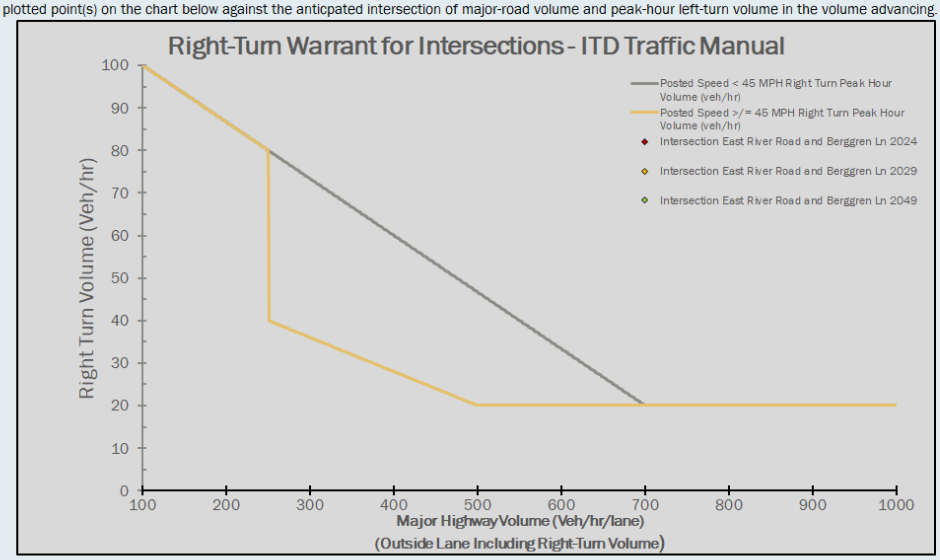
Intersection #REF! **Horizon Years**

1 Consult chart below and evaluate the type of intersection and the left-turn, peak-hour volume

Posted Speed < 45 MPH Highway Volume Outside Lane Only Including R-T Volume (Veh/hr/lane)	Posted Speed < 45 MPH Right Turn Peak Hour Volume (veh/hr)	Posted Speed >/= 45 MPH Right Turn Peak Hour Volume (veh/hr)
0	100	100
100	100	100
200	87	87
300	73	35
400	60	25
500	47	20
600	33	<20
700	20	<20
800	<20	<20
900	<20	<20
1000	<20	<20



2 Check the plotted point(s) on the chart below against the anticpated intersection of major-road volume and peak-hour left-turn volume in the volume advancing.



RIGHT-TURN WARRANTED **No**

Eastbound Traffic with the Project

DESIGN CRITERIA (Input the following based on observation, historical data, and/or results of a site specific study)

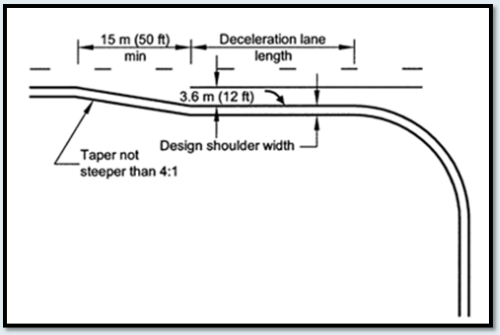
1	Jurisdiction	Bingham County	Horizon or Planning Year	2024	2029	2049	
2	Subdivision or Development Name	BJ Livestock Gravel Pit	Development Type	Rural	Rural	Rural	
3	Name of Major Roadway	East River Road	No. of lanes on the major	Two	Two	Two	
4	Name of Minor Roadway/Approach	Christensen Ln	Number of legs	Three	Three	Three	
5	Peak Hour	PM	Major roadway volume	48	52	73	(veh/hour/lane).
6	Posted Speed Limit (MPH)	50	Right-Turn, Peak Hour Vol	2	2	2	(veh/hour).

Analysis - Table and graph reproduced from NCHRP Report 745 (Axes on the graph are reversed from source)

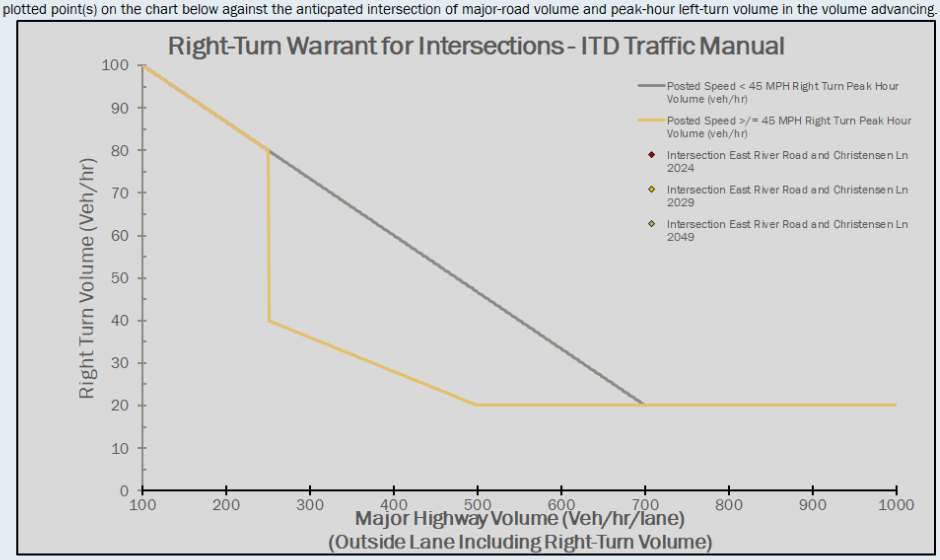
Intersection #REF! **Horizon Years**

1 Consult chart below and evaluate the type of intersection and the left-turn, peak-hour volume

Posted Speed < 45 MPH Highway Volume Outside Lane Only Including R-T Volume (Veh/hr/lane)	Posted Speed < 45 MPH Right Turn Peak Hour Volume (veh/hr)	Posted Speed >/= 45 MPH Right Turn Peak Hour Volume (veh/hr)
0	100	100
100	100	100
200	87	87
300	73	35
400	60	25
500	47	20
600	33	<20
700	20	<20
800	<20	<20
900	<20	<20
1000	<20	<20



2 Check the plotted point(s) on the chart below against the anticpated intersection of major-road volume and peak-hour left-turn volume in the volume advancing.



RIGHT-TURN WARRANTED **No**

Westbound Traffic with the Project

DESIGN CRITERIA (Input the following based on observation, historical data, and/or results of a site specific study)

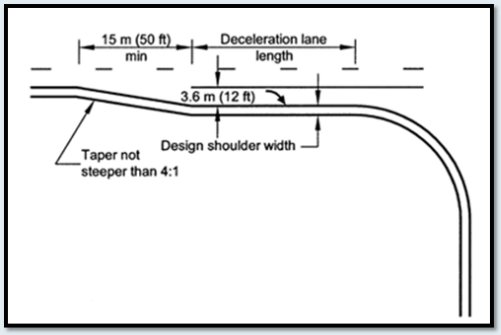
1	Jurisdiction	Bingham County	Horizon or Planning Year	2024	2029	2049	
2	Subdivision or Development Name	BJ Livestock Gravel Pit	Development Type	Rural	Rural	Rural	
3	Name of Major Roadway	East River Road	No. of lanes on the major	Two	Two	Two	
4	Name of Minor Roadway/Approach	Berggren Ln	Number of legs	Three	Three	Three	
5	Peak Hour	PM	Major roadway volume	21	22	31	(veh/hour/lane).
6	Posted Speed Limit (MPH)	50	Right-Turn, Peak Hour Vol	1	1	2	(veh/hour).

Analysis - Table and graph reproduced from NCHRP Report 745 (Axes on the graph are reversed from source)

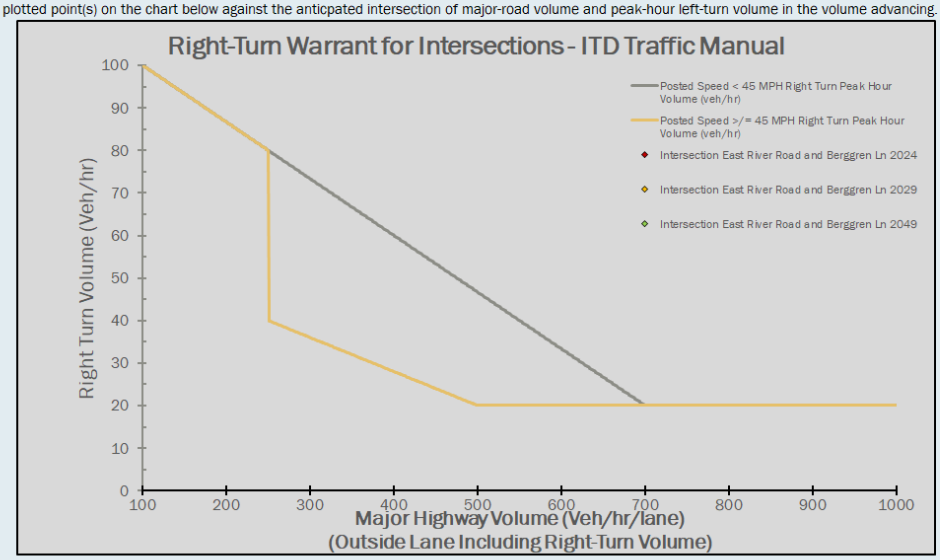
Intersection #REF! **Horizon Years**

1 Consult chart below and evaluate the type of intersection and the left-turn, peak-hour volume

Posted Speed < 45 MPH Highway Volume Outside Lane Only Including R-T Volume (Veh/hr/lane)	Posted Speed < 45 MPH Right Turn Peak Hour Volume (veh/hr)	Posted Speed >/= 45 MPH Right Turn Peak Hour Volume (veh/hr)
0	100	100
100	100	100
200	87	87
300	73	35
400	60	25
500	47	20
600	33	<20
700	20	<20
800	<20	<20
900	<20	<20
1000	<20	<20



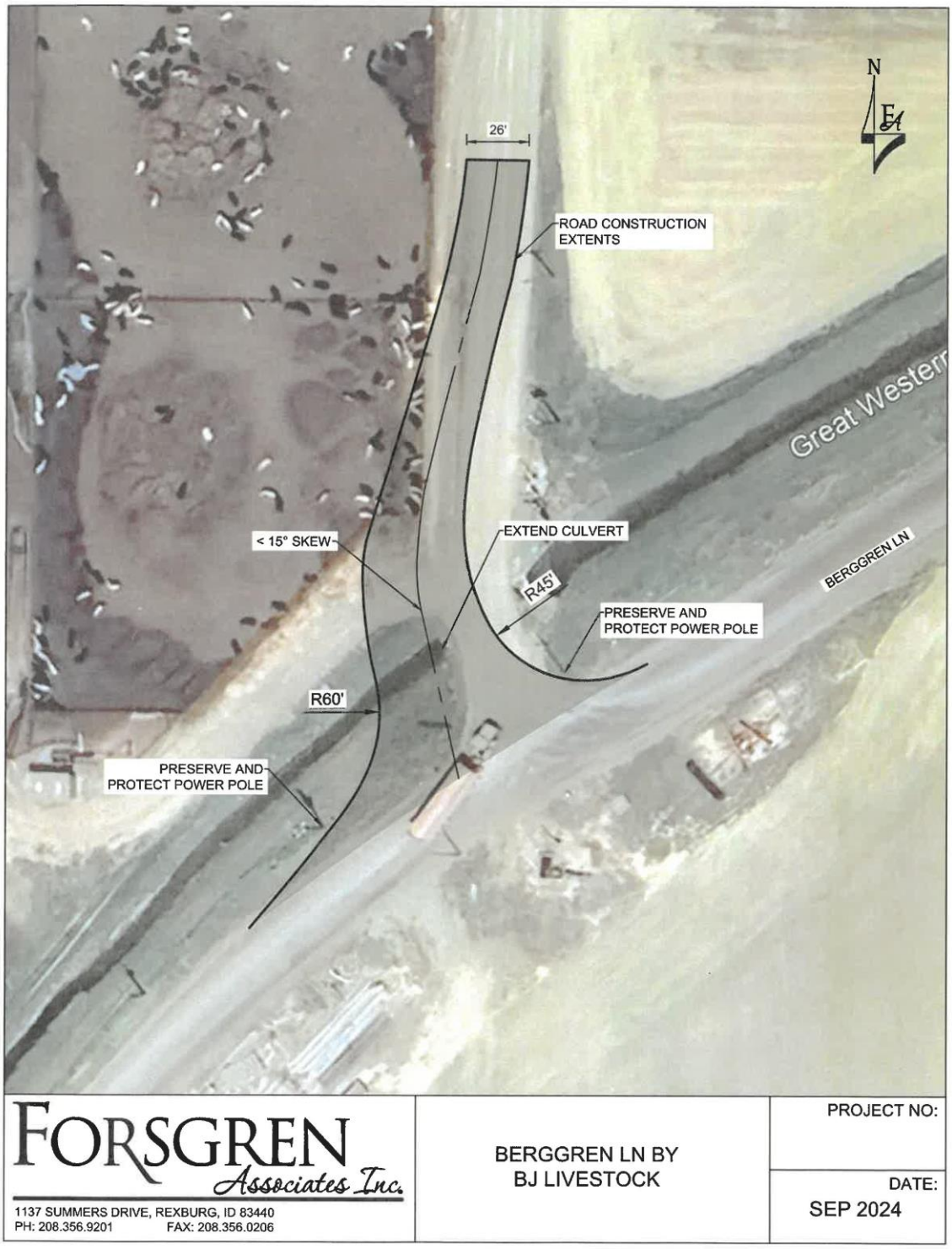
2 Check the plotted point(s) on the chart below against the anticpated intersection of major-road volume and peak-hour left-turn volume in the volume advancing.



RIGHT-TURN WARRANTED **No**

Appendix J: Intersection Geometry Analysis

Access Improvements – Turning Radius's



Intersection 1 Right Turn

Intersection 1 Left Turn

Intersection 2 Right Turn

CHRISTENSEN RD AND EAST RIVER INTERSECTION

Intersection 2 Left Turn