GALLATIN COUNTY INTERSECTION IMPROVEMENTS

APPENDIX D:

Phase 1 Evaluation

ALASKA RD S / CAMERON BRIDGE RD

D-1: Evaluation Summary

D-2: Supporting Analysis


ALASKA RD S / E VALLEY CENTER RD


LOVE LN / DURSTON RD

GALLATIN COUNTY INTERSECTION IMPROVEMENTS

APPENDIX D-1:

Evaluation Summary

ALASKA RD S / CAMERON BRIDGE RD

ALASKA RD S / E VALLEY CENTER RD

LOVE LN / DURSTON RD

ALTERNATIVES DEVELOPMENT & EVALUATION

DRAFT

A sequential approach will be used to identify, evaluate, and select a preferred alternative for each of the three project intersections (Love Lane/Durston Road, Alaska Road South/Cameron Bridge Road, Alaska Road South/East Valley Center Road). The approach was developed based on FHWA's *Intersection Control Evaluation (ICE)* process, but tailored to the needs of each location. The ICE process is a data-driven approach developed to objectively evaluate and screen alternatives to identify an optimal solution. For this project, the evaluation process will involve the following key steps.

1. **Alternatives Identification**: Identify all possible alternatives that may address concerns at the intersection.
2. Phase 1 Evaluation: Evaluate each alternative to determine fatal flaws that warrant elimination from further consideration.
3. Phase 2 Evaluation: Evaluate remaining alternatives in more detail to select a preferred alternative to address identified needs.

The Alternatives Identification and Phase 1 steps are complete and discussed in more detail in this document. After eliminating alternatives exhibiting fatal flaws and gathering feedback from stakeholders and the public, the planning team will move into Phase 2.

Alternatives Identification

An extensive list of improvement alternatives was developed for the Gallatin County Intersections. The alternatives include various improvements including changes to traffic control, geometric enhancements, and implementation of enhanced warning devices. The alternatives were identified with the intent to address identified operational and safety concerns. Due to the similarities between the three intersections, the same alternatives were identified and evaluated for each. The alternatives are presented in the table below.

ALTERNATIVE	DESCRIPTION
ALT 0: **No Action**	• A "do nothing" approach • Used as a baseline for comparison against other alternatives
ALT 1: All-Way Stop	• Provide stop control along all approach legs • Maintain existing alignment and intersection geometrics
ALT 2: Turn Lanes	• Provide additional lanes to accommodate turning vehicles • Maintain existing minor leg stop control • Enhance stop control through the addition of enhanced warning and visibility devices
ALT 3: **Traffic Signal**	• Use a traffic signal to direct and control traffic • Increase traffic handling capacity • Provide appropriate turn lanes and signal phasing
ALT 4: Roundabout	• Use a roundabout to direct and control traffic • Reduce total number of conflict points

Phase 1 Evaluation

An initial evaluation was conducted to screen the identified alternatives for each intersection and to eliminate those exhibiting fatal flaws. Four screening criteria were selected for the Phase 1 analysis. The criteria were identified based on the issues and concerns identified at the study intersections. The table below lists the screening criteria and a description of the elements and evaluation methodology for each, including both qualitative and quantitative components.

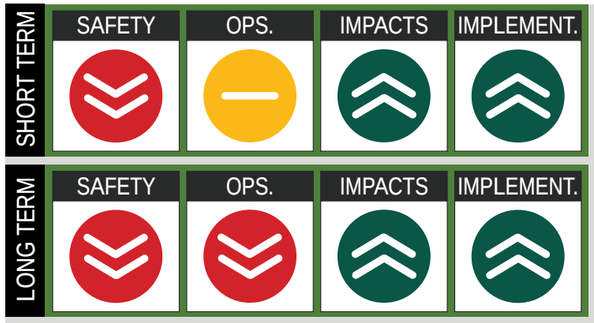
CRITERIA	DESCRIPTION	METHODOLOGY
SAFETY	• Provide adequate visibility and sight distance • Reduce vehicle conflicts • Address identified crash trends	• Used the FHWA *Safety Performance for Intersection Control Evaluation* (SPICE) tool to understand how changes in traffic control and roadway configuration may affect safety • Compared to the crashes that occurred between 2012 and 2021 within 750 feet of each intersection
OPERATIONS	• Improve intersection performance • Reduce vehicle delay • Accommodate all users	• Used the FHWA *Capacity Analysis for Planning of Junctions* (Cap-X) tool which offers a planning-level assessment of the overall performance of various intersection configurations based on the volume to capacity (V/C) ratio • Assessed conditions under short-term (2025) and long-term (2045) conditions using a 2.5% annual growth rate (as used in the *Greater Triangle Area Transportation Plan*) • Compared Cap-X results to a Level of Service (LOS) analysis conducted using traffic volumes collected during the Summer of 2023 • Performed a signal warrant analysis for each intersection using existing traffic volumes • Used the Cap-X tool to evaluate pedestrian and bicycle accommodations based on generalized information about traffic control and roadway configuration • Qualitatively assessed the ability of each alternative to accommodate large trucks
IMPACTS	• Minimize impacts to the environment • Minimize impacts to adjacent land • Minimize construction impacts	• Qualitatively assessed the impact of each alternative to the environment and adjacent land uses including the potential acquisition of right-of-way or conversion of open space to developed land • Considered the constructability and traffic impacts that may be experienced during construction
IMPLEMENTATION	• Balance improvements benefits and cost • Reasonable project delivery timeframe • Applicable for available funding	• Performed a generalized analysis of project implementation and maintenance costs to perform a high-level benefit-cost analysis • Considered overall project cost as a potentially prohibitive factor. High-cost projects may take a longer time to implement while low-cost improvements are generally easier to implement in the short term • Assessed the potential for alternative funding sources

ALT-0: No Action

DESCRIPTION:

Under the No Action scenario, the existing intersection configuration would remain the same. The existing configuration includes the following characteristics:

- The intersection is currently configured as a four-legged two-way stop-controlled intersection with stop control on the east and west approaches (Durston Road).
- All legs allow all turning movements with no dedicated turn lanes.
- The speed limit on all four legs is 45 mph.
- Durston Road approaches Love Lane from the east at a steep downgrade and continues west of the intersection into the Black Bull subdivision.
- Privately-owned agricultural and residential properties surround the intersection.



The intersection experiences long delays and has a history of crashes due to limited sight distances, steep approach grades, high travel speeds through the intersection, and generally high traffic volumes.

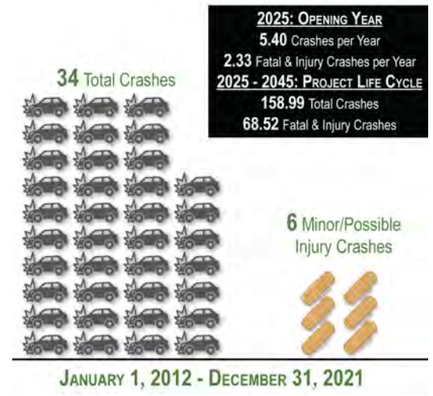
Recommended Action: Baseline Comparison

SAFETY:

The elevation of the approach legs and fences on adjacent properties limit sight distance at the intersection. Other safety concerns include high speeds and difficulty stopping under poor road conditions. The crashes that occurred at the Love Lane / Durston Road intersection over the 10-year analysis period exhibited the following trends:

- 50% of crashes were right angle crashes; 27% were rear-end crashes
- 82% of crashes occurred during daylight hours
- 32% of crashes occurred on snowy, icy, or frost-covered roads
- 20% of drivers involved in crashes failed to yield right-of-way; 16% were driving too fast for conditions
- 52% of vehicles involved in crashes were traveling on Love Lane; 45% were traveling westbound on Durston Road

32 Vehicle Conflict Points



OPERATIONS:

- The intersection currently operates at LOS F in the AM and LOS E in the PM peak hours. In the long-term, traffic volumes are expected to exceed available capacity with rapidly declining operations.
- Vehicles on the east and west approaches (Durston Road) currently experience about **51 seconds** of delay during the AM peak hour and **43 seconds** of delay during the PM peak hour and will continue to experience increasing amounts of delay as traffic volumes increase.
- There are no dedicated pedestrian or bicycle facilities at the intersection. Over a 24 hour period, 14 pedestrians and **17 bicyclists** were observed traveling through the intersection.
- Approximately 2% of vehicles traveling through the intersection were heavy vehicles including farming equipment, construction vehicles, buses, and other large trucks.

IMPACTS:

The no action option would not involve any improvements and therefore would not result in any impacts.

IMPLEMENTATION:

The no action option would not involve any improvements and therefore would not require any costs beyond any maintenance needs.

LOVE LANE / DURSTON ROAD

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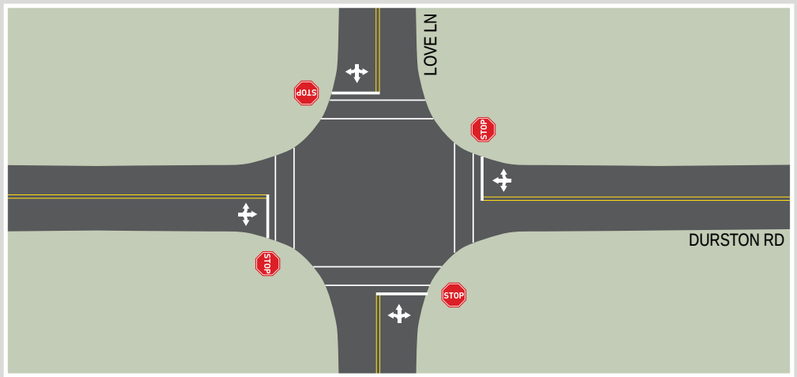
ALT-1: All-Way Stop



DESCRIPTION:

In Alt-1, the existing roadway configuration would remain the same, but stop signs would be installed on all legs. This option was installed at the Love Lane/Durston Road intersection in 2023 to mitigate traffic impacts from construction detours. The configuration includes the following characteristics:

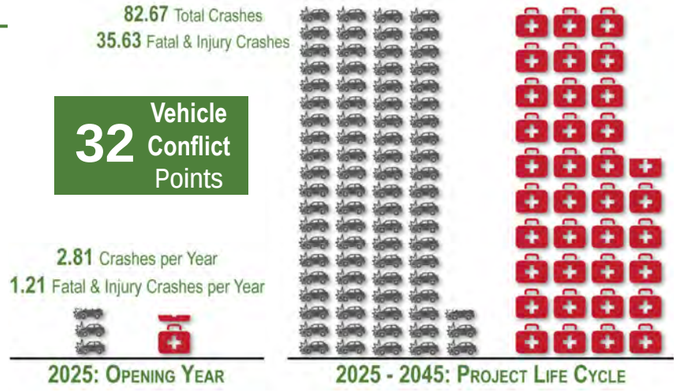
- All four legs are stop controlled. Enhanced warning devices could be installed to improve visibility of the intersection.
- All legs allow all turning movements with no dedicated turn lanes.
- The speed limit on all four legs is 45 mph.
- No modifications to approach grades.
- Crosswalks or additional adjoining non-motorized facilities could be installed.

Alt-1 is shown to operate with reasonable amounts of delay in the short-term but is projected to quickly reach capacity and will not meet long-term operational needs.

Recommended Action: **ADVANCE** *for Short-Term Consideration*

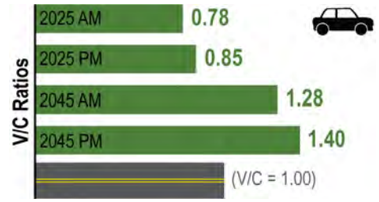
SAFETY:

Installation of an all-way stop would help slow travel speeds through the intersection from all directions. However, the stop control on the major approaches (Love Lane) can be unexpected, especially for drivers who are unfamiliar with the intersection traffic control configuration, potentially increasing the potential for rear-end conflicts or the probability of stop signs being ignored. The all-way stop also gives turning priority to one vehicle at a time, which could help reduce turning conflicts although the number of total vehicle conflict points remains the same.



OPERATIONS:

- The capacity analysis shows that this option operates with the highest overall V/C ratio in the short-term and with V/C ratios over 1.0 in the long-term. This indicates that the all-way stop may function well in the short-term, but it will quickly reach capacity.
- Alt-1 would operate with similar overall delay to the existing configuration but would distribute the delay more evenly between all legs (increasing delay for vehicles on Love Lane but decreasing delay for vehicles on Durston Road). Excessive delay is expected to occur in the long-term.
- This option does not specifically include the installation of pedestrian or bicycle facilities, however, they could be accommodated with additional improvements if desired. The all-way stop would improve crossing opportunities for both pedestrians and bicyclists by stopping all vehicles and crosswalks could help increase non-motorist visibility.
- An all-way stop would reduce the time required for a large truck to wait for an acceptable gap in traffic to execute a turning movement.



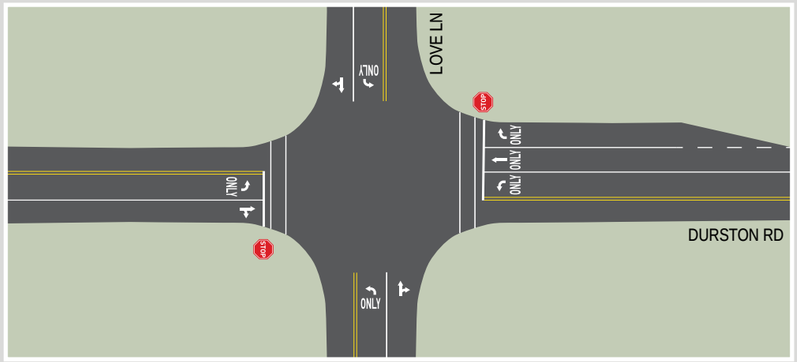
IMPACTS:

This option involves installation of new signage but otherwise would not involve any roadway improvements beyond maintenance. The impacts of sign installation are negligible.

IMPLEMENTATION:

A temporary all-way stop was installed at this intersection in 2023 as part of an adjacent construction detour. The intersection has been noted as operating with lower peak hour delay along the minor approach legs with the all-way stop. Advanced warning signage and other warning devices beyond standard stop signs are needed to alert drivers to the changed traffic control condition.

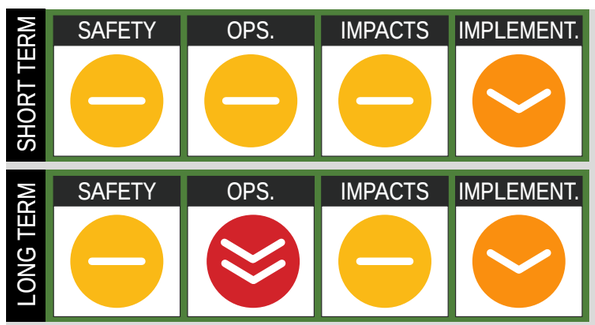
ALT-2: Turn Lanes



DESCRIPTION:

In Alt-2, the existing traffic control would remain the same, with stop signs on the minor approaches, but with additional turn bays to help increase capacity of the intersection. This alternative includes the following:

- The Durston Road approaches are stop controlled while the Love Lane approaches are allowed free-flow movements. Enhanced warning devices could be installed to improve visibility of the intersection.
- All legs have a dedicated left turn lane. The westbound movement also has a dedicated right turn lane.
- The speed limit on all four legs is 45 mph.
- The approach grade on the east leg may be modified during construction.
- Crosswalks or additional adjoining non-motorized facilities could be installed.

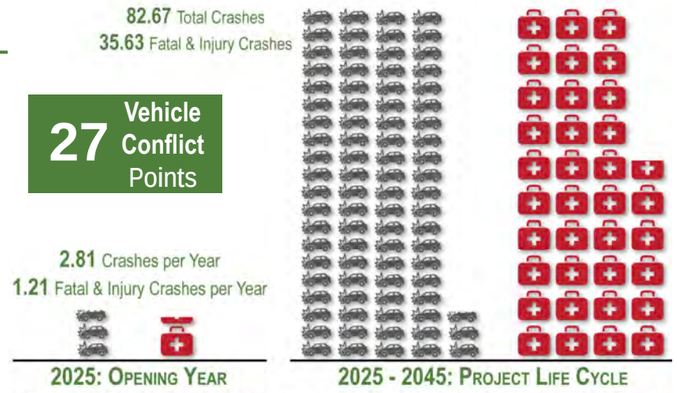


Although Alt-2 offers improved operations in the short-term and reduce conflicts overall, the additional capacity is not adequate in the long-term without additional traffic control.

Recommended Action: DO NOT ADVANCE

SAFETY:

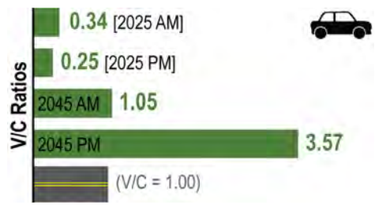
Installation of additional turn bays would reduce the number of total vehicle conflict points at the intersection. By reducing conflict points, it is anticipated that the number of crashes per year could be marginally reduced, though the chance of crashes causing injuries remains high with two-way stop control. The addition of left-turn lanes at intersections has been shown to reduce rear-end crashes. Inclusion of enhanced warning devices could also help improve safety by increasing driver awareness.



Note: Input traffic volumes exceed the range of data used to develop the safety performance function used for this analysis. Results should be used with caution.

OPERATIONS:

- The addition of turn lanes is anticipated to increase capacity of the intersection in the short-term, resulting in the lowest V/C ratio of all options considered. However, the two-way stop control configuration is shown to be inadequate for traffic volumes in the long-term, resulting in the second highest V/C ratio.
- The provision of turn lanes would reduce overall delay by separating turning movements so vehicles can proceed through the intersection without waiting for turning vehicles to find adequate gaps in traffic, however, the minor approaches will experience excessive delays in the long-term.
- This option does not specifically include the installation of pedestrian or bicycle facilities, however, they could be accommodated with additional improvements if desired. The addition of turn lanes would have little impact on bicyclists but would increase pedestrian crossing distances.
- With the addition of turn lanes, the intersection should be designed to ensure large trucks have adequate turning radii to be able to safely maneuver the intersection.



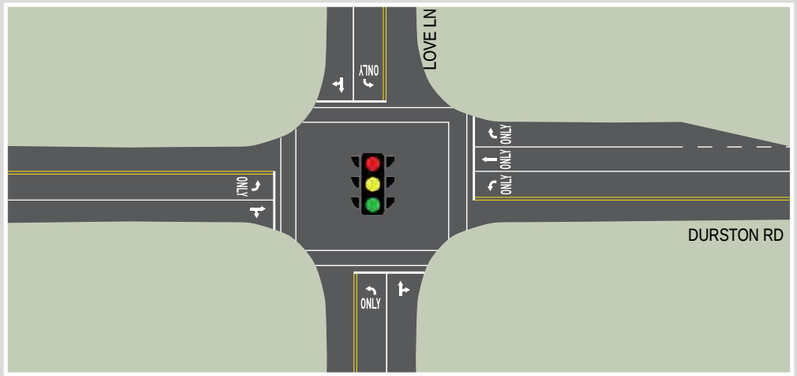
IMPACTS:

This option involves substantial reconstruction to widen and install turn bays on each approach leg. During construction on the east leg, the approach grade could be decreased to help improve safety and visibility of the intersection. However, decreasing the approach grade would require much larger construction limits. In general, widening the intersection would likely require the acquisition of some right-of-way from adjacent properties.

IMPLEMENTATION:

Reconstruction of the intersection to add turn bays would be a substantial expense for this option for relatively little safety or operational benefit over the life of the project. The low benefit-cost ratio of this option makes it unlikely to be cost-effective over the long-term.

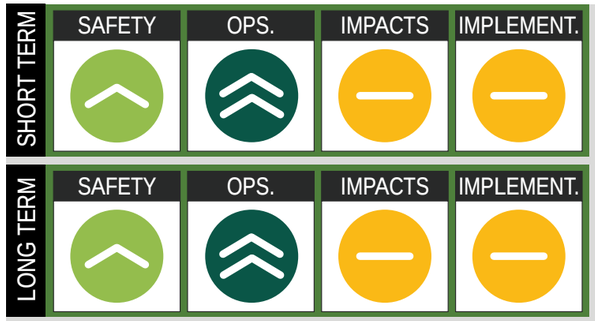
ALT-3: Traffic Signal



DESCRIPTION:

The lane configuration in Alt-3 is the same as in Alt-2, however, in this option a traffic signal would be installed at the intersection to control traffic. This option includes the following characteristics:

- All legs have a dedicated left turn lane. The westbound movement also has a dedicated right turn lane.
- The intersection is signalized.
- The speed limit on all four legs is 45 mph.
- The approach grade on the east leg could be modified during construction.
- Crosswalks or additional adjoining non-motorized facilities could be installed. Pedestrian signals could also be included.



Alt-3 is shown to improve operations and safety in both the short- and long-term.

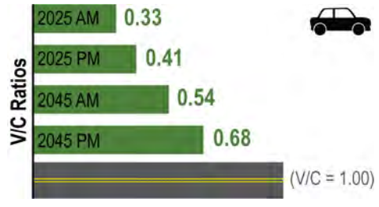
Recommended Action: **ADVANCE** *to Phase II*

SAFETY:

Installation of a traffic signal, in conjunction with additional turn lanes, is shown to provide a slight safety benefit by reducing the total number of crashes and fatal/ injury crashes compared to Alt-2. Traffic signals can help to reduce the frequency of right-angle crashes at high-volume intersections, but they can also result in an increased frequency of other crash types. Crashes involving left turning and opposing thru vehicles are also a concern at signalized intersections depending on the signal phasing (i.e., protected or permissive left-turns). Crashes as signalized intersections are often more severe due to red light running. Signalized intersections can, however, improve safety for pedestrians by providing dedicated walk phases.

OPERATIONS:

- In the short-term, traffic volumes barely meet signal warrants. In the long-term, the traffic signal is shown to operate well with adequate capacity.
- Traffic signals can improve intersection operations, but operate with the least amount of comparative delay when traffic volumes warrant signalization. Induced delay can occur on the major approaches.
- This option does not specifically include the installation of pedestrian or bicycle facilities, however, they could be accommodated with additional improvements if desired. Signalization can provide dedicated walk phases for pedestrians and allow bikes to cross the intersection more easily.
- A traffic signal can be beneficial for trucks by providing ample time to execute turning movements. Maneuverability of the intersection would be similar to Alt-2.



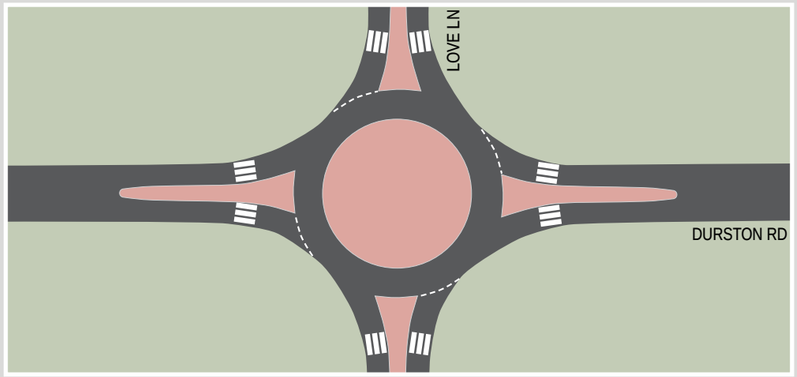
IMPACTS:

The footprint of this intersection would be similar to that of Alt-2. Installation of utilities would be required, however, and erection of a signal and possible associated lighting could have undesirable visual and environmental impacts.

IMPLEMENTATION:

A traffic signal provides operational and safety benefits which are likely to be commensurate with the associated costs and impacts, especially over the long-term. The favorable benefit-cost ratio of Alt-3 indicates it may be eligible for alternative funding sources.

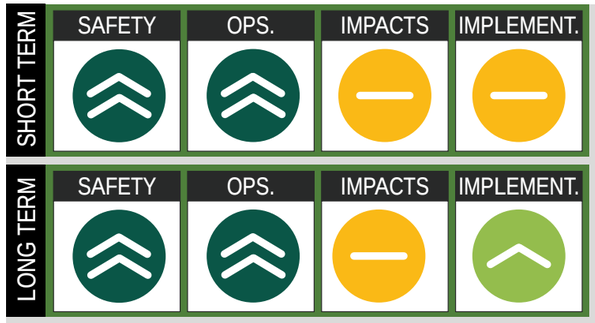
ALT-4: Roundabout



DESCRIPTION:

In Alt-4, a single-lane roundabout would be installed at the intersection. Drivers would yield at entry to traffic in the roundabout, then enter the intersection traveling counterclockwise around the center island then exiting at their desired street. The configuration includes the following characteristics:

- All vehicles entering the roundabout must yield to traffic in the roundabout.
- All legs allow all turning movements with no dedicated turn lanes.
- Traffic calming measures could be incorporated to lower approach speeds into the roundabout to <20 mph.
- The approach grade on the east leg would need to be flattened.
- Crosswalks or additional adjoining non-motorized facilities could be installed.



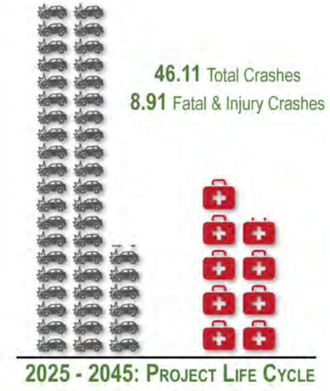
Alt-4 demonstrates the best safety performance, provides adequate capacity for existing and projected volumes, and supports a favorable benefit-cost comparison.

Recommended Action: **ADVANCE** *to Phase II*

SAFETY:

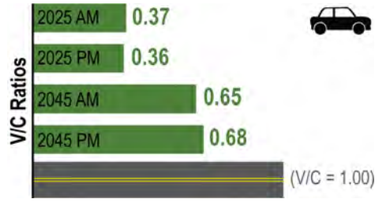
Roundabouts provide substantial safety benefits compared to other intersection types, most notably a reduction in severe crashes. When compared to Alt-0, a roundabout has 24 fewer conflict points. The channelized approaches and a center island of a roundabout help lower vehicle approach speeds and reduce the number of conflict points where vehicles cross paths, eliminating the potential for right-angle and head-on crashes. By promoting lower vehicle speeds, roundabouts also give drivers more time to react when conflicts occur and can enhance the comfort and safety of bicyclists in the travel lane. Since entering and exiting vehicles are separated, pedestrians only have to cross only one lane of traffic at a time.

8 Vehicle Conflict Points



OPERATIONS:

- This option is shown to operate with V/C ratios less than 1.0 in both the short- and long-term, providing acceptable operations overall.
- At roundabouts, entering traffic yields to vehicles already circulating, promoting a continuous flow of traffic, reducing stop delay, and improving operational performance.
- This option does not specifically include the installation of pedestrian or bicycle facilities, however, they could be accommodated with additional improvements if desired. A roundabout would improve crossing opportunities for non-motorists by slowing vehicle traffic and providing a two-stage crossing.
- Roundabouts can be designed for large trucks using features such as wider entry and exit lanes, mountable curbing for vehicles with a wide and/or long wheelbase, and curvature designed to allow trucks to easily make turning movements.



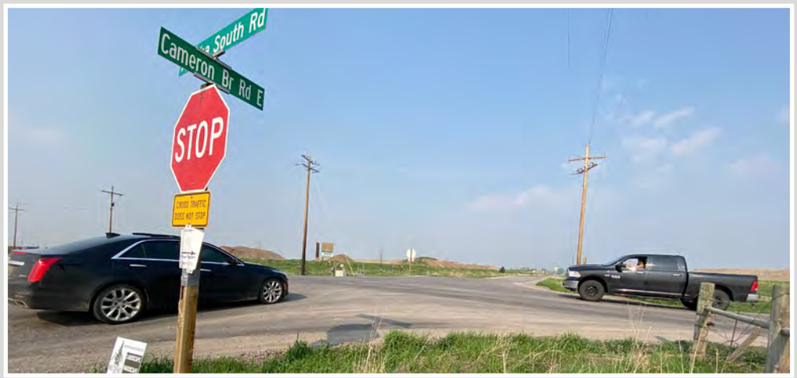
IMPACTS:

The footprint of a single-lane roundabout would be slightly larger than the footprint of Alt-2 and Alt-3 but potentially narrower further from the intersection due to the need for only a single entry lane. The approach grade of the east leg would need to be modified to ensure safe entry into the roundabout. Some new right-of-way will likely be needed at the intersection and along the east leg to accommodate the change in grade but additional utilities would not be required as in Alt-3.

IMPLEMENTATION:

Roundabouts typically have high benefit-cost ratios especially when implemented to address safety concerns. The favorable benefit-cost ratio of Alt-4 indicates that it is likely to be eligible for alternative funding programs.

ALT-0: No Action



DESCRIPTION:

Under the No Action scenario, the existing intersection configuration would remain the same. The existing configuration includes the following characteristics:

- The intersection is a four-legged two-way stop-controlled intersection with stop control on the east and west approaches (Cameron Bridge Road).
- All legs allow all turning movements with no dedicated turn lanes.
- The speed limit on Alaska Road South is 50 mph and the speed limit on Cameron Bridge Road is 35 mph.
- Gravel pits occupy the eastern quadrants of the intersection. Residential, light industrial, commercial, and agricultural land uses occupy the western quadrants.

The transitional nature of the intersection location, combined with heavy mainline traffic volumes, the presence of heavy trucks, high speeds, and rural infrastructure design contributes to severe safety concerns and poor operational performance.

Recommended Action: Baseline Comparison

SAFETY:

High travel speeds and traffic volumes on Alaska Road South can make it difficult for vehicles on Cameron Bridge Road to safely turn onto or cross Alaska Road South, especially during peak hours. The crashes that occurred at the Alaska Road South / Cameron Bridge Road intersection over the 10-year analysis period exhibited the following trends:

- 1 fatal rollover crash involving an impaired driver
- 26% of crashes were right angle crashes; 32% were left-turning crashes
- 31% of crashes occurred at night under dark lighting conditions
- 14% of vehicles involved in crashes were medium/heavy trucks
- 11% of drivers involved in crashes failed to yield right-of-way or made an improper turn; 37% of crashes involved a distracted driver

32 Vehicle Conflict Points

OPERATIONS:

- The intersection currently operates at LOS D in the AM and LOS D in the PM peak hours. In the long-term, traffic volumes are expected to exceed available capacity with rapidly declining operations.
- Vehicles on the east and west approaches (Cameron Bridge Road) currently experience about 26 **seconds** of delay during the AM peak hour and **30 seconds** of delay during the PM peak hour and will continue to experience increasing amounts of delay as traffic volumes increase.
- There are no dedicated pedestrian or bicycle facilities at the intersection. Over a 24 hour period, 1 pedestrian and **10 bicyclists** were observed traveling through the intersection.
- Approximately 11% of vehicles traveling through the intersection were heavy vehicles including farming equipment, construction vehicles, buses, and other large trucks.

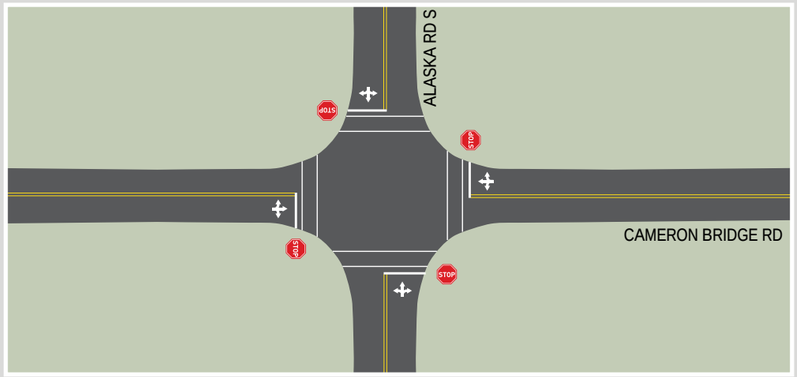
IMPACTS:

The Spain Ferris Fork Ditch, an irrigation canal, runs adjacent to east side of Alaska Road South. However, the no action option would not involve any improvements and therefore would not result in any impacts to the irrigation canal or otherwise.

IMPLEMENTATION:

The no action option would not involve any improvements and therefore would not require any costs beyond any maintenance needs.

ALT-1: All-Way Stop



DESCRIPTION:

In Alt-1, the existing roadway configuration would remain the same, but stop signs would be installed on all legs. The configuration includes the following characteristics:

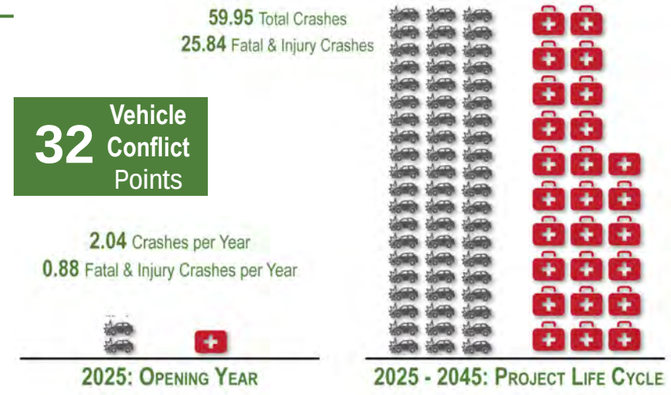
- All four legs are stop controlled. Enhanced warning devices could be installed to improve visibility of the intersection.
- All legs allow all turning movements with no dedicated turn lanes.
- The speed limit on Alaska Road South is 50 mph and the speed limit on Cameron Bridge Road is 35 mph.
- Crosswalks or additional adjoining non-motorized facilities could be installed.

Alt-1 is shown to provide improved operations and safety in the short-term with little capital investment or impacts. However, Alt-1 does not provide adequate capacity over the long-term.

Recommended Action: **ADVANCE** *for Short-Term Consideration*

SAFETY:

Installation of an all-way stop would not reduce the total number of vehicle conflict points but is predicted to improve safety compared to the existing intersection configuration. Stop control on the major approaches (Alaska Road South) can be unexpected on a high-speed rural facility, potentially increasing the potential for rear-end conflicts or the probability of stop signs being ignored and causing crossing conflicts. By stopping traffic in all directions, the all-way stop also improves safety for pedestrians crossing the intersection.



OPERATIONS:

- The capacity analysis shows that this option operates with the highest overall V/C ratio in the short-term. In the long-term, Alt-1 is shown to operate with V/C ratios over 1.0 during the AM and PM peak hours.
- Alt-1 would operate with similar overall delay to the existing configuration but would distribute the delay more evenly between all legs (increasing delay for vehicles on Alaska Road South but decreasing delay on Cameron Bridge Road).
- This option does not specifically include the installation of pedestrian or bicycle facilities, however, they could be accommodated with additional improvements if desired. The all-way stop would improve crossing opportunities for both pedestrians and bicyclists.
- An all-way stop would reduce the time required for a large truck to wait for an acceptable gap in traffic to execute a turning movement.

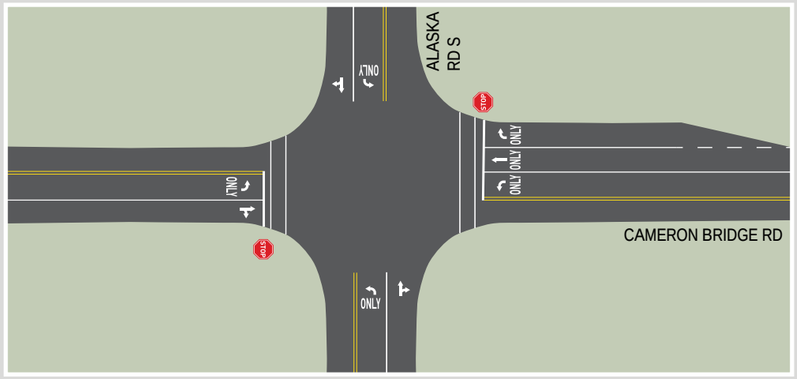
IMPACTS:

This option involves installation of new signage but otherwise does not require any roadway improvements aside from on-going maintenance. Spain Ferris Fork Ditch would not be impacted. The impacts of sign installation are negligible.

IMPLEMENTATION:

An all-way stop can be installed with little capital cost and essentially no construction time. The low cost, minimal impacts, and demonstrated safety and operational performance support a favorable benefit-cost relationship in the short-term.

ALT-2: Turn Lanes



DESCRIPTION:

In Alt-2, the existing traffic control would remain the same, with stop signs on the minor approaches, but additional turn bays would be installed to help increase capacity of the intersection. This alternative includes the following:

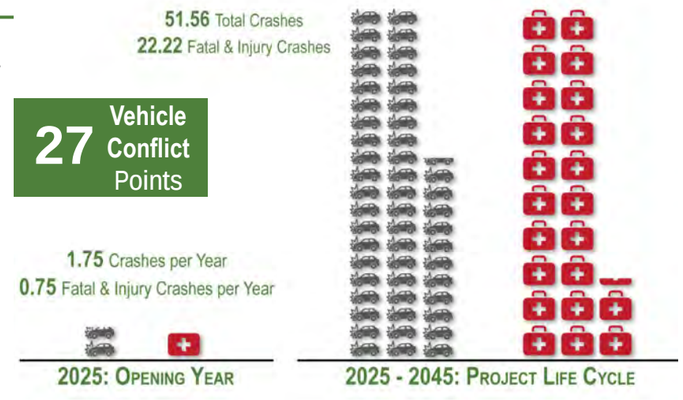
- The Cameron Bridge Road approaches are stop controlled while the Alaska Road South approaches are allowed free-flow movements. Enhanced warning devices could be installed to improve visibility of the intersection.
- All legs have a dedicated left turn lane. The westbound movement also has a dedicated right turn lane.
- The speed limit on Alaska Road South is 50 mph and the speed limit on Cameron Bridge Road is 35 mph.
- Crosswalks or additional adjoining non-motorized facilities could be installed.

Although Alt-2 increases capacity and provides safety benefits in the short-term, the intersection will continue to experience increasing delays over the long-term, reducing the overall benefit-cost ratio.

Recommended Action: DO NOT ADVANCE

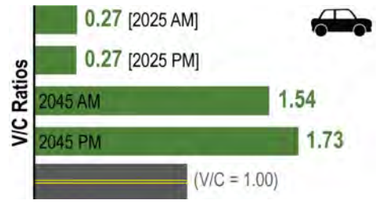
SAFETY:

Installation of additional turn bays would reduce the number of total vehicle conflict points at the intersection. By reducing conflict points, it is anticipated that the number of crashes per year could be marginally reduced, though the chance of crashes causing injuries remains high with two-way stop control. The addition of left-turn lanes at intersections has been shown to reduce rear-end crashes. Inclusion of enhanced warning devices could also help improve safety by increasing driver awareness on the upcoming intersection.



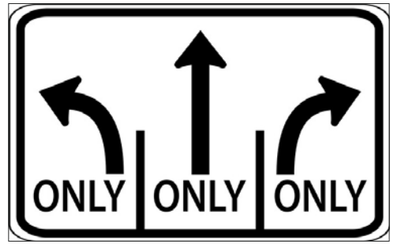
OPERATIONS:

- The addition of turn lanes is anticipated to increase capacity of the intersection in the short-term, resulting in the lowest V/C ratio of all options considered. However, the two-way stop control configuration is shown to be inadequate for traffic volumes in the long-term, resulting in the second highest V/C ratio.
- The provision of turn lanes would reduce overall delay in the short-term by separating turning movements so vehicles can proceed through the intersection without waiting for turning vehicles to find adequate gaps in traffic. However, traffic on the minor approaches will experience increasing delays as traffic volumes continue to increase.
- This option does not specifically include the installation of pedestrian or bicycle facilities, however, they could be accommodated with additional improvements if desired. The addition of turn lanes would have little impact on bicyclists but would increase pedestrian crossing distances.
- The addition of turn lanes on the east leg would give more space for trucks entering and exiting the adjacent gravel pits to maneuver the intersection.



IMPACTS:

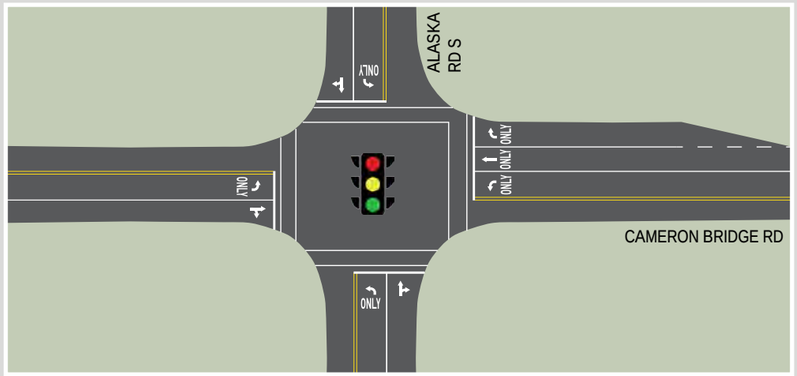
This option involves substantial reconstruction to widen and install turn bays on each approach leg. During construction on the Spain Ferris Fork Ditch would be impacted. In general, widening the intersection may require the acquisition of some right-of-way from adjacent properties.



IMPLEMENTATION:

Reconstruction of the intersection to add turn bays would be a substantial expense for this option for relatively little safety or operational benefit over the life of the project. The lack of substantial safety and operational benefits in comparison to impacts and costs from reconstruction reduces the cost-effectiveness of this option over the long-term.

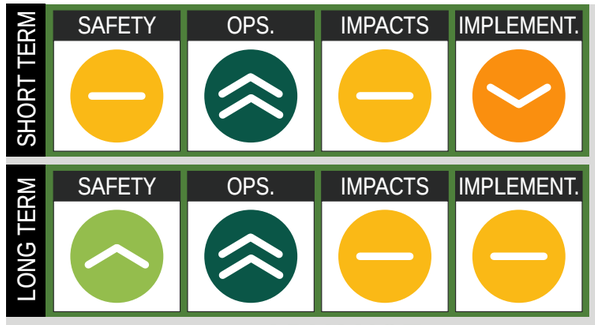
ALT-3: Traffic Signal



DESCRIPTION:

The lane configuration in Alt-3 is the same as in Alt-2, however, in this option a traffic signal would be installed at the intersection to control traffic. This option includes the following characteristics:

- All legs have a dedicated left turn lane. The westbound movement also has a dedicated right turn lane.
- The intersection is signalized.
- The speed limit on Alaska Road South is 50 mph and the speed limit on Cameron Bridge Road is 35 mph.
- Crosswalks or additional adjoining non-motorized facilities could be installed. Pedestrian signals could also be included.

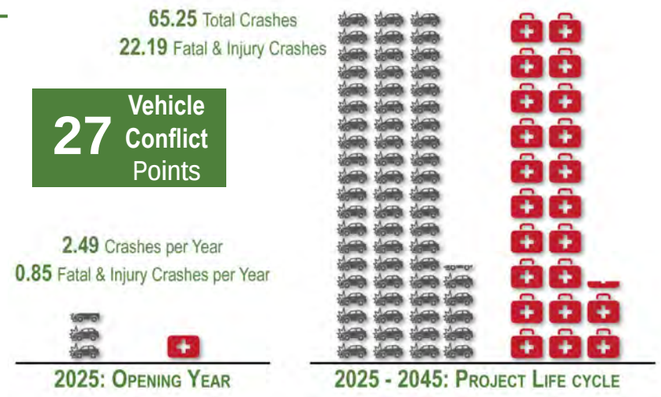


Alt-3 is shown to improve operations with moderate safety benefits in comparison to other options. Although Alt-3 is not warranted in the short-term, it is worth considering as a long-term investment.

Recommended Action: **ADVANCE** *to Phase II*

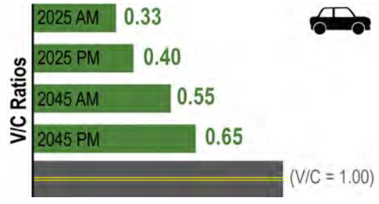
SAFETY:

Installation of a traffic signal, in conjunction with additional turn lanes, is predicted to result in the highest crash frequency given projected traffic volumes. A traffic signals could help reduce the frequency of right-angle crashes at the intersection and widening the approach legs could help address rollover crashes, like the fatal crash, by providing more forgiving shoulders.



OPERATIONS:

- In the short-term, traffic volumes do not meet signal warrants. In the long-term, a traffic signal is shown to provide the best capacity for forecasted traffic volumes.
- Traffic signals can improve intersection operations, but operate with the least amount of comparative delay when traffic volumes warrant signalization. Induced delay can occur on the major approaches.
- This option does not specifically include the installation of pedestrian or bicycle facilities, however, they could be accommodated with additional improvements if desired. Signalization can provide dedicated walk phases for pedestrians and allow bikes to cross the intersection more easily.
- A traffic signal can be beneficial for trucks by providing ample time to execute turning movements. Maneuverability of the intersection would be similar to Alt-2.



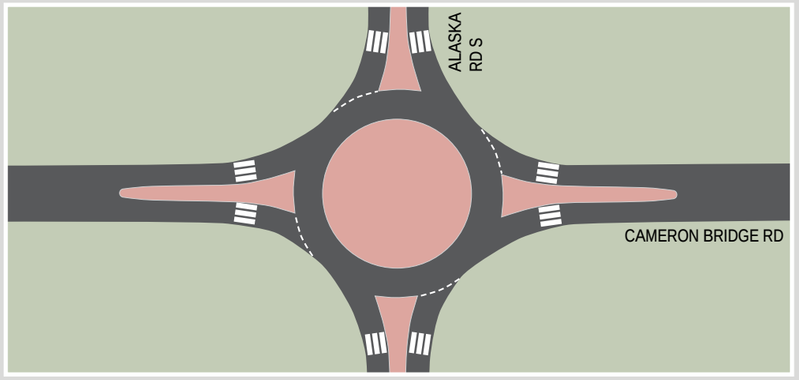
IMPACTS:

The footprint of this intersection would be similar to that of Alt-2 with impacts to the irrigation ditch and the potential acquisition of right-of-way. Installation of utilities would be required and erection of a signal and possible associated lighting could have undesirable visual and environmental impacts.

IMPLEMENTATION:

In the short-term, a traffic signal does not meet warrants. In the long-term, however, this option is shown to provide the most capacity and offer moderate safety benefits. The operational and safety benefits of this option are likely to be comparable to or potentially outweigh the associated costs and impacts.

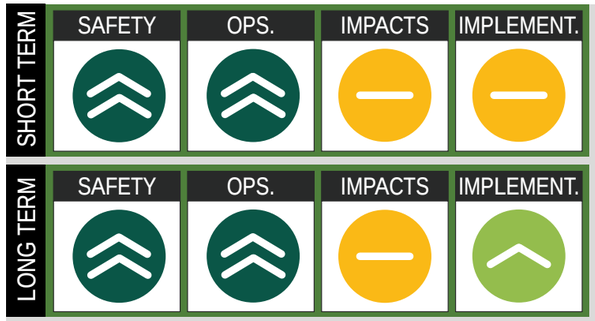
ALT-4: Roundabout



DESCRIPTION:

In Alt-4, a single-lane roundabout would be installed at the intersection. Drivers would yield at entry to traffic in the roundabout, then enter the intersection traveling counterclockwise around the center island then exiting at their desired street. The configuration includes the following characteristics:

- All vehicles entering the roundabout must yield to traffic in the roundabout.
- All legs allow all turning movements with no dedicated turn lanes.
- Traffic calming measures could be incorporated to lower approach speeds into the roundabout to <20 mph.
- Crosswalks or additional adjoining non-motorized facilities could be installed.

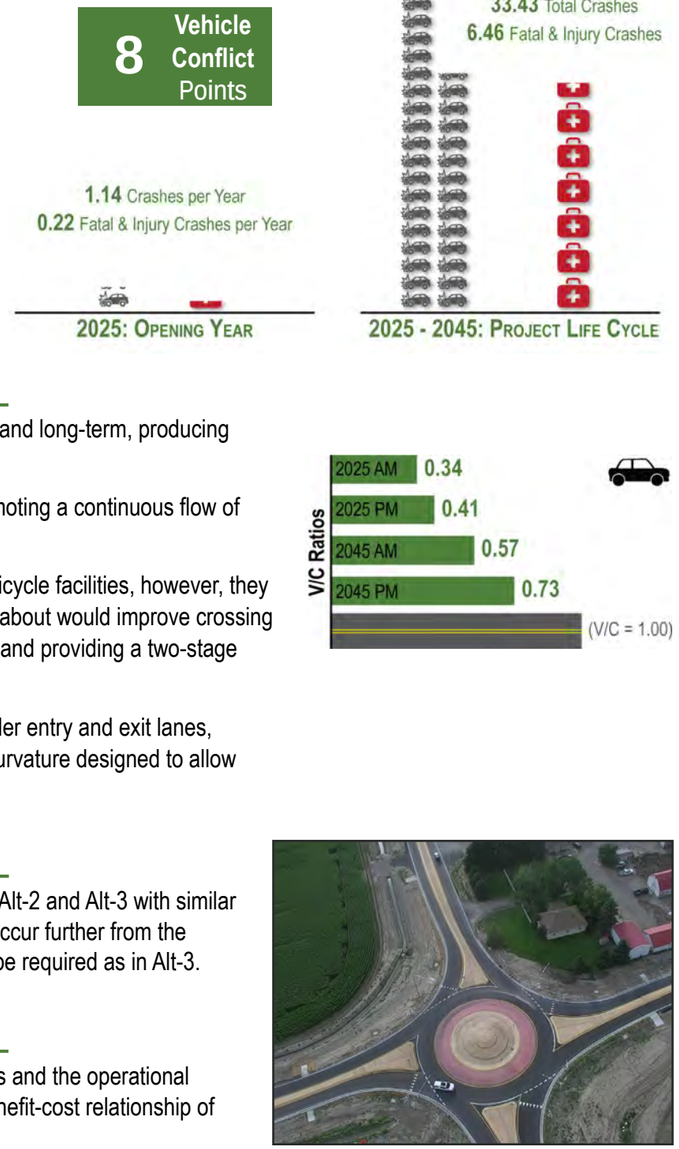


Alt-4 demonstrates the best safety performance, provides adequate capacity for existing and projected traffic volumes, and is likely to be cost-effective due to a favorable benefit-cost comparison.

Recommended Action: **ADVANCE** *to Phase II*

SAFETY:

A roundabout is shown to have the best safety performance of all potential alternatives. Roundabouts have the fewest number of total conflict points, eliminate crossing conflicts, and reduce travel speeds through the intersection, thereby substantially reducing the severity of crashes when they do occur. Roundabouts are shown to have the safest accommodations for bicyclists and pedestrians.



OPERATIONS:

- This option is shown to operate with V/C ratios less than 1.0 in the short- and long-term, producing similar V/C ratios as the traffic signal option.
- At roundabouts, entering traffic yields to vehicles already circulating, promoting a continuous flow of traffic, reducing stop delay, and improving operational performance.
- This option does not specifically include the installation of pedestrian or bicycle facilities, however, they could be accommodated with additional improvements if desired. A roundabout would improve crossing opportunities for both pedestrians and bicyclists by slowing vehicle traffic and providing a two-stage crossing.
- Roundabouts can be designed for large trucks using features such as wider entry and exit lanes, mountable curbing for vehicles with a wide and/or long wheelbase, and curvature designed to allow trucks to easily make turning movements.

IMPACTS:

The footprint of a single-lane roundabout would be slightly larger than the footprint of Alt-2 and Alt-3 with similar impacts to the irrigation ditch and adjacent properties. Less widening would need to occur further from the intersection due to the need for only a single entry lane. Additional utilities would not be required as in Alt-3.

IMPLEMENTATION:

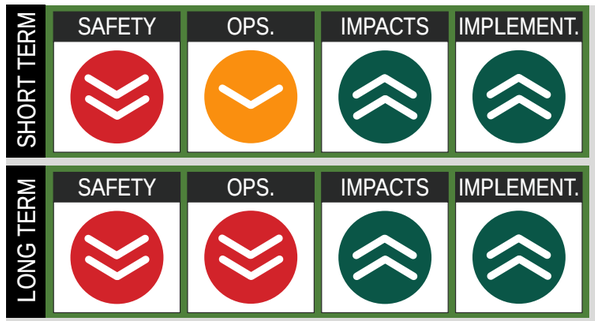
Roundabouts typically have high benefit-cost ratio when used as safety improvements and the operational benefits over the long-term are also substantial for this intersection. The favorable benefit-cost relationship of Alt-4 may support applications for alternative funding programs.

ALT-0: No Action

DESCRIPTION:

Under the No Action scenario, the existing intersection configuration would remain the same. The existing configuration includes the following characteristics:

- The intersection is a four-legged two-way stop-controlled intersection with stop control on the north and south approaches (Alaska Road South). All legs allow all turning movements with no dedicated turn lanes.
- The south leg is unpaved, ends approximately 0.5 miles south of the intersection, and carries low volumes.
- The speed limit on Alaska Road South is 50 mph and the speed limit on East Valley Center Road is 45 mph.
- Residential and agricultural land uses surround the intersection.
- A shared use path runs parallel to East Valley Center Road, crossing the south leg.



This intersection operates with long delays, especially during the PM peak hour. Congestion at this intersection contributes to a history of rear-end crashes and many near-miss crashes due to inadequate gaps in traffic.

Recommended Action: Baseline Comparison

SAFETY:

High traffic volumes on East Valley Center Road can make it difficult for vehicles to safely execute turns through the intersection, especially during peak hours. Drivers have been observed swerving around waiting vehicles and turning into inadequate gaps. The crashes that occurred at the Alaska Road South / East Valley Center Road intersection over the 10-year analysis period exhibited the following trends:

- 40% of crashes were rear-end crashes; 15% were right angle or left-turning crashes
- 25% of crashes occurred at night under dark lighting conditions
- 30% of crashes occurred on icy or frost-covered roads
- 52% of vehicles were traveling southbound on Alaska Road South
- 24% of drivers swerved, over-corrected, or ran off the roadway; 35% of crashes involved a distracted driver

32 Vehicle Conflict Points

OPERATIONS:

- The intersection currently operates at LOS F in the AM and LOS F in the PM peak hours. In the long-term, traffic volumes are expected to exceed available capacity with rapidly declining operations.
- Vehicles on the southbound approach (Alaska Road South) currently experience about **59 seconds** of delay during the AM peak hour and **106 seconds** of delay during the PM peak hour and will continue to experience increasing amounts of delay as traffic volumes increase.
- There is a shared use path along the south side of East Valley Center Road. Over a 24 hour period, 8 pedestrians and **9 bicyclists** were observed traveling through the intersection.
- Approximately 9% of vehicles traveling through the intersection were heavy vehicles including farming equipment, construction vehicles, buses, and other large trucks.

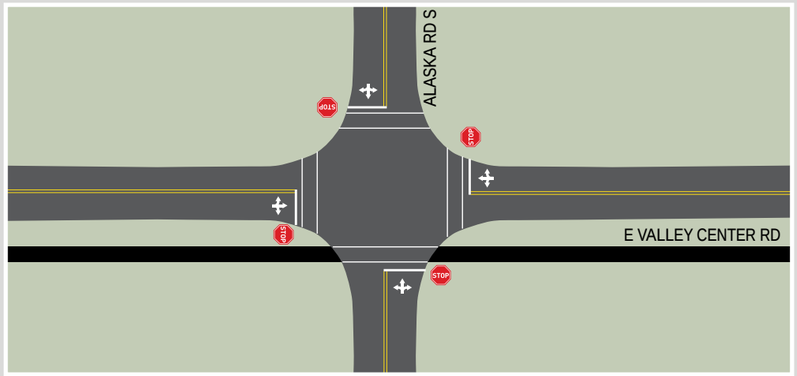
IMPACTS:

The Spain Ferris Ditch, an irrigation canal, crosses under the intersection from the southwest quadrant to the northeast quadrant. However, the no action option would not involve any improvements and therefore would not result in any impacts to the irrigation canal or otherwise.

IMPLEMENTATION:

The no action option would not involve any improvements and therefore would not require any costs beyond any maintenance needs.

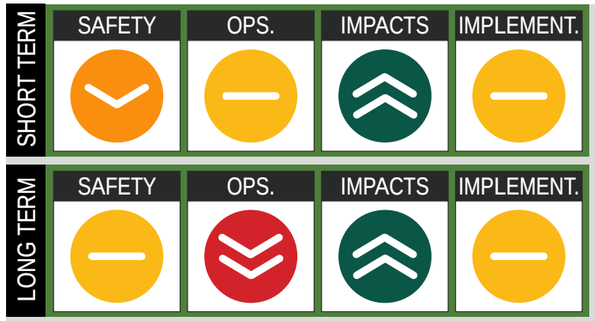
ALT-1: All-Way Stop



DESCRIPTION:

In Alt-1, the existing roadway configuration would remain the same, but stop signs would be installed on all legs. The configuration includes the following characteristics:

- All four legs are stop controlled. Enhanced warning devices could be installed to improve visibility of the intersection.
- All legs allow all turning movements with no dedicated turn lanes.
- The speed limit on Alaska Road South is 50 mph and the speed limit on East Valley Center Road is 45 mph.
- The shared use path would remain and crosswalks or additional adjoining non-motorized facilities could be installed.

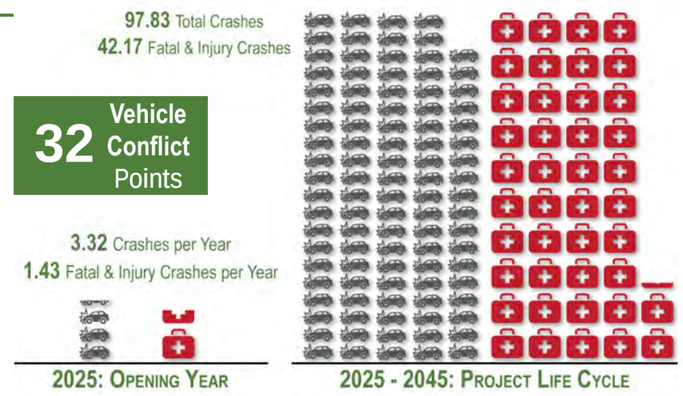


Alt-1 provides marginal safety and operational benefits in the short-term, but fails to offer adequate operations in the long-term. Alt-1 would negatively impact operations on Valley Center, which is an MDT Urban Route.

Recommended Action: DO NOT ADVANCE

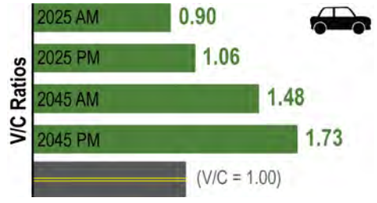
SAFETY:

Installation of an all-way stop would not reduce the total number of vehicle conflict points. The predictive safety analysis predicts that the number of crashes per year will increase but the number of fatal and injury crashes per year will be reduced. Stop control on the major approaches (East Valley Center Road) can be unexpected on a high-speed rural arterial, potentially increasing the potential for rear-end conflicts or the probability of stop signs being ignored and causing crossing conflicts. By stopping traffic in all directions, the all-way stop also improves safety for pedestrians crossing the intersection.



OPERATIONS:

- The capacity analysis shows that this option operates with the highest overall V/C ratio in the short-term. In the long-term, Alt-1 is shown to operate with V/C ratios over 1.0 during the AM and PM peak hours.
- Alt-1 would operate with similar overall delay in the short-term but would distribute the delay more evenly between all legs (increasing delay for vehicles on East Valley Center Road but decreasing delay on Alaska Road South). Increasing delays are expected over the long-term.
- This option will perpetuate the shared use path along East Valley Center Road and additional non-motorized facilities could be accommodated with additional improvements if desired. The all-way stop would improve opportunities for both pedestrians and bicyclists to cross East Valley Center Road.
- An all-way stop would reduce the time required for a large truck to wait for an acceptable gap in traffic to execute a turning movement.



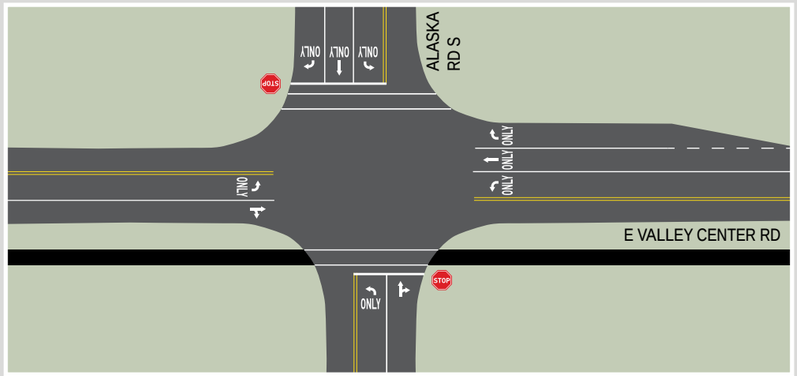
IMPACTS:

This option involves installation of new signage but otherwise does not require any roadway improvements aside from on-going maintenance. Spain Ferris Ditch would not be impacted. The impacts of sign installation are negligible.

IMPLEMENTATION:

An all-way stop can be installed with little capital cost and essentially no construction time. However, East Valley Center Road is an MDT Urban Route and coordination with MDT would need to occur with any improvements made at this intersection.

ALT-2: Turn Lanes



DESCRIPTION:

In Alt-2, the existing traffic control would remain the same, but additional turn bays would be installed to increase capacity of the intersection. This alternative includes:

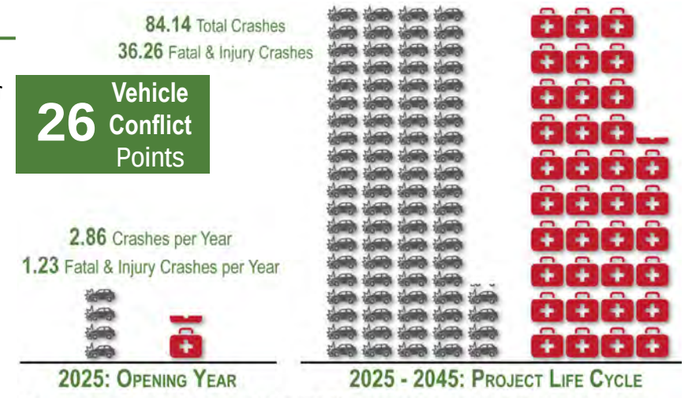
- The Alaska Road South approaches are stop controlled while the East Valley Center Road approaches are allowed free-flow movements. Enhanced warning devices could be installed to improve visibility of the intersection.
- All legs have a dedicated left turn lane. The west- and southbound movements also have dedicated right turn lanes.
- The speed limit on Alaska Road South is 50 mph and the speed limit on East Valley Center Road is 45 mph.
- The shared use path would remain and crosswalks or additional adjoining non-motorized facilities could be installed.

Alt-2 demonstrates reasonable operational and safety performance in the short-term but does not provide adequate capacity in the long-term, nor does it exhibit exceptional safety benefits relative to its impacts.

Recommended Action: **ADVANCE** *for Short-Term Consideration*

SAFETY:

Installation of additional turn bays would reduce the number of total vehicle conflict points at the intersection. By reducing conflict points, it is anticipated that the number of crashes per year could be marginally reduced, though the chance of crashes causing injuries remains high with two-way stop control. Inclusion of enhanced warning devices could also help improve safety by increasing driver awareness on the upcoming intersection.



Note: Input traffic volumes exceed the range of data used to develop the safety performance function used for this analysis. Results should be used with caution.

OPERATIONS:

- The addition of turn lanes is anticipated to increase capacity of the intersection in the short-term, but the intersection will quickly exceed capacity without additional traffic control.
- The provision of turn lanes would reduce overall delay in the short-term by separating turning movements so vehicles can proceed through the intersection without waiting for turning vehicles to find adequate gaps in traffic. Excessive delays are projected in the long-term.
- This option will perpetuate the shared use path along East Valley Center Road and additional non-motorized facilities could be accommodated with additional improvements if desired. The addition of turn lanes would have little impact on bicyclists but would increase pedestrian crossing distances.
- With the addition of turn lanes, the intersection should be designed to ensure large trucks have adequate turning radii to be able to safely maneuver the intersection.

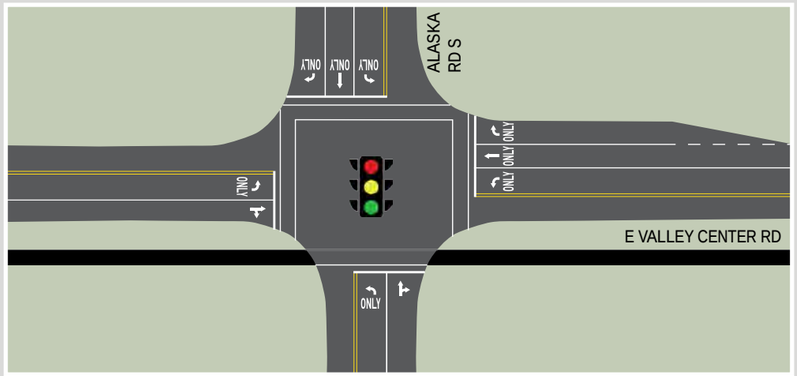
IMPACTS:

This option involves substantial reconstruction to widen and install turn bays on each approach leg. During construction, the Spain Ferris Ditch would be impacted. In general, widening the intersection may require the acquisition of some right-of-way from adjacent properties.

IMPLEMENTATION:

Reconstruction of the intersection to add turn bays would be a substantial expense for this option for relatively little safety or operational benefit over the life of the project. The lack of substantial safety and operational benefits combined with considerable costs and impacts decreases the cost-effectiveness of this option over the long-term. Coordination with MDT would be required.

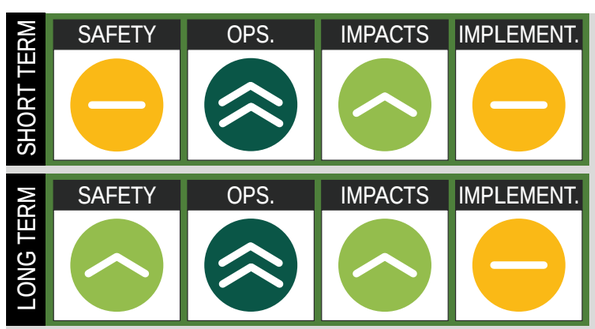
ALT-3: Traffic Signal



DESCRIPTION:

The lane configuration in Alt-3 is the same as in Alt-2, however, in this option a traffic signal would be installed at the intersection to control traffic. This option includes the following characteristics:

- All legs have a dedicated left turn lane. The westbound and southbound movements also have dedicated right turn lanes.
- The intersection is signalized.
- The speed limit on Alaska Road South is 50 mph and the speed limit on East Valley Center Road is 45 mph.
- The shared use path would remain and crosswalks or additional adjoining non-motorized facilities could be installed. Pedestrian signals could also be included.

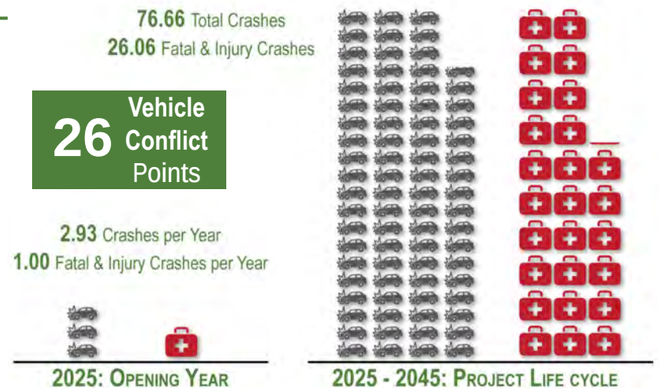


Alt-3 is shown to provide the best operational performance with reasonable safety benefits.

Recommended Action: **ADVANCE** *to Phase II*

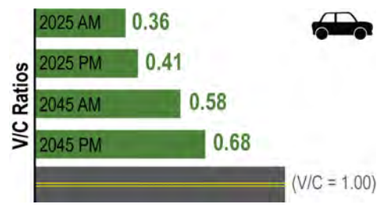
SAFETY:

Installation of a traffic signal, in conjunction with additional turn lanes, is predicted to result in the highest crash frequency given projected traffic volumes. By prioritizing one direction of traffic at a time, a traffic signal could help reduce the frequency of right-angle crashes at the intersection. Alt-3 is also predicted to reduce the number of fatal and injury crashes compared to Alt-2 which has the same lane configuration.



OPERATIONS:

- Traffic volumes at the intersection meet signal warrants in both the short- and long-term. The traffic signal is shown to operate with the lowest V/C ratio of all options in the long-term.
- Signalizing the intersection is expected to improve intersection operations and decrease delay overall, however, induced delay can occur on the major approaches (East Valley Center Road).
- This option will perpetuate the shared use path along East Valley Center Road and additional non-motorized facilities could be accommodated with additional improvements if desired. Signalization can provide dedicated walk phases for pedestrians and allow bikes to cross the intersection more easily.
- A traffic signal can be beneficial for trucks by providing ample time to execute turning movements. Maneuverability of the intersection would be similar to Alt-2.



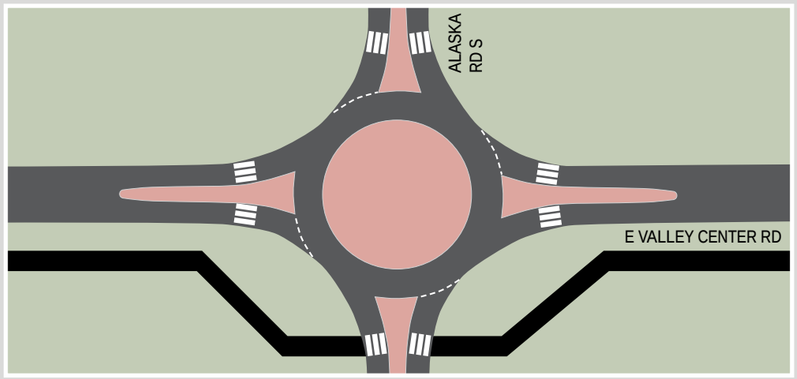
IMPACTS:

The footprint of this intersection would be similar to that of Alt-2 with impacts to the irrigation ditch and the potential acquisition of right-of-way. Installation of utilities would be required and erection of a signal and possible associated lighting could have undesirable visual and environmental impacts.

IMPLEMENTATION:

Alt-3 would cost more than Alt-2 but provides substantially more operational benefits and moderate safety benefits. Coordination with MDT would need to occur.

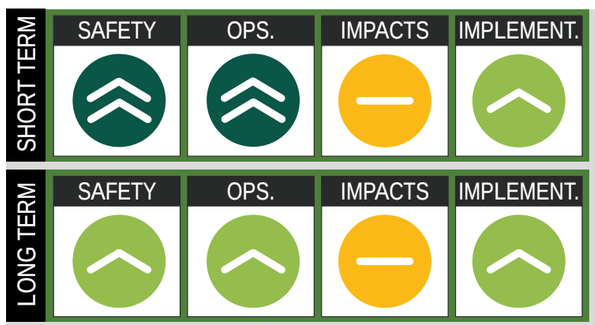
ALT-4: Roundabout



DESCRIPTION:

In Alt-4, a single-lane roundabout would be installed at the intersection. Drivers would yield at entry to traffic in the roundabout, then enter the intersection traveling counterclockwise around the center island then exiting at their desired street. The configuration includes the following characteristics:

- All vehicles entering the roundabout must yield to traffic in the roundabout.
- All legs allow all turning movements with no dedicated turn lanes.
- Traffic calming measures could be incorporated to lower approach speeds into the roundabout to <20 mph.
- The shared use path would remain although some change to the alignment may be necessary. Crosswalks or additional adjoining non-motorized facilities could also be installed.

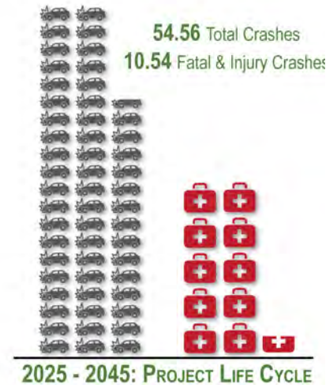


Alt-4 is shown to provide the best safety benefits with improved operational performance, however, traffic volumes are expected to approach capacity in the long-term.

Recommended Action: **ADVANCE** *to Phase II*

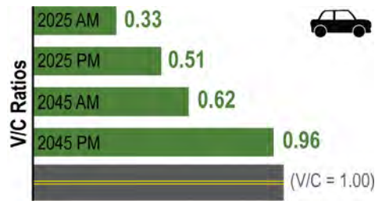
SAFETY:

A roundabout is shown to have the best safety performance of all potential alternatives. Roundabouts have the fewest number of total conflict points, eliminate crossing conflicts, and reduce travel speeds through the intersection, thereby substantially reducing the severity of crashes when they do occur. Roundabouts are shown to have the safest accommodations for bicyclists and pedestrians.



OPERATIONS:

- This option is shown to operate with V/C ratios less than 1.0 in the short- and long-term demonstrating the second lowest V/C ratios of all options. In the long-term, traffic volumes are expected to approach available capacity during the PM peak hour.
- At roundabouts, entering traffic yields to vehicles already circulating, promoting a continuous flow of traffic, reducing stop delay, and improving operational performance.
- This option will perpetuate the shared use path along East Valley Center Road and additional non-motorized facilities could be accommodated with additional improvements if desired. A roundabout would improve crossing opportunities for both pedestrians and bicyclists.
- Roundabouts can be designed for large trucks using features such as wider entry and exit lanes, mountable curbing for vehicles with a wide and/or long wheelbase, and curvature designed to allow trucks to easily make turning movements.



IMPACTS:

The footprint of a single-lane roundabout would be slightly larger than the footprint of Alt-2 and Alt-3 with similar impacts to the irrigation ditch and adjacent properties. Less widening would need to occur further from the intersection due to the need for only a single entry lane. Additional utilities would not be required as in Alt-3.

IMPLEMENTATION:

Roundabouts typically have high benefit-cost ratio when used to address safety concerns and the operational benefits are also substantial. The favorable benefit-cost ratio of Alt-4 supports the opportunity for alternative funding programs. Coordination with MDT would need to occur.

PHASE 1 SCORING SUMMARY

DRAFT

	ALTERNATIVE	SHORT-TERM SAFETY	SHORT-TERM OPS.	SHORT-TERM IMPACTS	SHORT-TERM IMPLEMENT.	LONG-TERM SAFETY	LONG-TERM OPS.	LONG-TERM IMPACTS	LONG-TERM IMPLEMENT.	SUMMARY	
LOVE LN / DURSTON RD	**ALT-0: No Action**	⩔	—	⩓	⩓	⩔	⩔	⩓	⩓	Baseline **Comparison**	The intersection experiences long delays and has a history of crashes due to limited sight distances, steep approach grades, high travel speeds through the intersection, and generally high traffic volumes.
	ALT-1: All-Way Stop	—	⩓	⩓	⩓	—	⩒	⩓	⩓	ADVANCE *for Short-Term Consideration*	Alt-1 is shown to operate with reasonable amounts of delay in the short-term but is projected to quickly reach capacity and will not meet long-term operational needs.
	ALT-2: Turn Lanes	—	—	—	⩒	—	⩔	—	⩒	DO NOT ADVANCE	Although Alt-2 offers improved operations in the short-term and reduce conflicts overall, the additional capacity is not adequate in the long-term without additional traffic control.
	ALT-3: Traffic Signal	⩓	⩓	—	—	⩓	⩓	—	—	ADVANCE *to Phase II*	Alt-3 is shown to improve operations and safety in both the short- and long-term.
	ALT-4: Roundabout	⩓	⩓	—	—	⩓	⩓	—	⩓	ADVANCE *to Phase II*	Alt-4 demonstrates the best safety performance, provides adequate capacity for existing and projected volumes, and supports a favorable benefit-cost comparison.
ALASKA RD S / CAMERON BRIDGE RD	**ALT-0: No Action**	⩒	—	⩓	⩓	⩒	⩔	⩓	⩓	Baseline **Comparison**	The transitional nature of the intersection location, combined with heavy mainline traffic volumes, the presence of heavy trucks, high speeds, and rural infrastructure design contributes to severe safety concerns and poor operational performance.
	ALT-1: All-Way Stop	⩓	⩓	⩓	⩓	⩓	⩒	⩓	⩓	ADVANCE *for Short-Term Consideration*	Alt-1 is shown to provide improved operations and safety in the short-term with little capital investment or impacts. However, Alt-1 does not provide adequate capacity over the long-term.
	ALT-2: Turn Lanes	⩓	—	—	⩒	⩓	⩔	—	⩒	DO NOT ADVANCE	Although Alt-2 increases capacity and provides safety benefits in the short-term, the intersection will continue to experience increasing delays over the long-term, reducing the overall benefit-cost ratio.
	ALT-3: Traffic Signal	—	⩓	—	⩒	⩓	⩓	—	—	ADVANCE *to Phase II*	Alt-3 is shown to improve operations with moderate safety benefits in comparison to other options. Although Alt-3 is not warranted in the short-term, it is worth considering as a long-term investment.
	ALT-4: Roundabout	⩓	⩓	—	—	⩓	⩓	—	⩓	ADVANCE *to Phase II*	Alt-4 demonstrates the best safety performance, provides adequate capacity for existing and projected traffic volumes, and is likely to be cost-effective due to a favorable benefit-cost comparison.
ALASKA RD S / E VALLEY CENTER RD	**ALT-0: No Action**	⩔	⩒	⩓	⩓	⩔	⩔	⩓	⩓	Baseline **Comparison**	This intersection operates with long delays, especially during the PM peak hour. Congestion at this intersection contributes to a history of rear-end crashes and many near-miss crashes due to inadequate gaps in traffic.
	ALT-1: All-Way Stop	⩒	—	⩓	—	—	⩔	⩓	—	DO NOT ADVANCE	Alt-1 provides marginal safety and operational benefits in the short-term, but fails to offer adequate operations in the long-term. Alt-1 would negatively impact operations on Valley Center, which is an MDT Urban Route.
	ALT-2: Turn Lanes	—	—	⩒	—	—	⩔	⩒	⩒	ADVANCE *for Short-Term Consideration*	Alt-2 demonstrates reasonable operational and safety performance in the short-term but does not provide adequate capacity in the long-term, nor does it exhibit exceptional safety benefits relative to its impacts.
	ALT-3: Traffic Signal	—	⩓	⩒	—	⩒	⩓	⩒	—	ADVANCE *to Phase II*	Alt-3 is shown to provide the best operational performance with reasonable safety benefits.
	ALT-4: Roundabout	⩓	⩓	—	⩒	⩒	⩒	—	⩒	ADVANCE *to Phase II*	Alt-4 is shown to provide the best safety benefits with improved operational performance, however, traffic volumes are expected to approach capacity in the long-term.

GALLATIN COUNTY INTERSECTION IMPROVEMENTS

APPENDIX D-2:

Supporting Analysis

ALASKA RD S / CAMERON BRIDGE RD

ALASKA RD S / E VALLEY CENTER RD

LOVE LN / DURSTON RD

Safety Performance for Intersection Control Evaluation Tool

Results

Summary of crash prediction results for each alternative

Project Information

Project Name:	Gallatin County Intersection Improvements	**Intersection Type**	At-Grade Intersections
Intersection:	Alaska Rd S/Cameron Bridge Rd	**Opening Year**	2025
Agency:	Gallatin County	**Design Year**	2045
Project Reference:	2023507	**Facility Type**	Rural 2-Lane Highway
City:	Gallatin County	**Number of Legs**	4-leg
State:	Montana		
Date:	10/25/2023		
Analyst:	Kerry Lynch (RPA)		

Crash Prediction Summary

Control Strategy	Crash Type	Opening Year	Design Year	Total Project Life Cycle	AADT Within Prediction Range?
ALT 0: No Action	Total	3.91	7.12	115.29	Yes
	Fatal & Injury	1.69	3.07	49.69	
ALT 1: All-Way Stop-Control	Total	2.04	3.70	59.95	N/A
	Fatal & Injury	0.88	1.59	25.84	
ALT 2: Turn Lanes	Total	1.75	3.18	51.56	Yes
	Fatal & Injury	0.75	1.37	22.22	
ALT 3: Traffic Signal	Total	2.49	3.70	65.25	Yes
	Fatal & Injury	0.85	1.26	22.19	
ALT 4: Roundabout	Total	1.14	2.06	33.43	N/A
	Fatal & Injury	0.22	0.40	6.46	

*If "No", the input AADT exceeds the range of the data used to develop one or more of the SPFs, and the resulting predictions should be used with caution

Capacity Analysis for Planning of Junctions

Summary Report

Project Name:	Gallatin County Intersection Improvements
Project Number:	23602.000
Location:	Alaska Rd S / Cameron Bridge Rd
Date:	Short Term 2025 - AM (PM)
Number of Intersection Legs:	4-leg
Major Street Direction	North-South

Traffic Volume Demand						
	Volume (Veh/hr)				Percent (%)	
	U-Turn	Left	Thru	Right	Heavy Vehicles	Volume Growth
Eastbound	0	62 (57)	29 (17)	8 (12)	6.3 (1.2)	5.06
Westbound	0	4 (8)	26 (16)	44 (44)	16.9 (3.1)	5.06
Southbound	0	38 (49)	271 (189)	101 (116)	9.5 (3.3)	5.06
Northbound	0	8 (15)	247 (456)	9 (11)	10.7 (3.3)	5.06
Adjustment	0.80	0.95		0.85		
Suggested	**0.80**	**0.95**		**0.85**		
Truck to PCE Factor				**Suggested = 2.00**	2.00	
Multimodal Activity Level			**Low**			
Critical Lane Volume Threshold	2-phase signal		**Suggested = 1800 (Urban), 1650 (Rural)**		**1650**	
	3-phase signal		**Suggested = 1750 (Urban), 1600 (Rural)**		**1600**	
	4-phase signal		**Suggested = 1700 (Urban), 1550 (Rural)**		**1550**	

TYPE OF INTERSECTION	Overall v/c Ratio	V/C Ranking	Pedestrian Accommodations	Bicycle Accommodations
ALT 0: No Action	**0.30 (0.32)**	**2**	**Fair**	**Poor**
ALT 1: All-Way Stop-Control	**0.78 (0.85)**	**5**	**Excellent**	**Poor**
ALT 2: Turn Lanes	**0.27 (0.27)**	**1**	**Fair**	**Poor**
ALT 3: Traffic Signal	**0.33 (0.40)**	**3**	**Good**	**Poor**
ALT 4: Roundabout	**0.34 (0.41)**	**4**	**Excellent**	**Good**

Capacity Analysis for Planning of Junctions

Summary Report

Project Name:	Gallatin County Intersection Improvements
Project Number:	23602.000
Location:	Alaska Rd S / Cameron Bridge Rd
Date:	Long Term 2045 - AM (PM)
Number of Intersection Legs:	4-leg
Major Street Direction	North-South

Traffic Volume Demand						
	Volume (Veh/hr)				Percent (%)	
	U-Turn	Left	Thru	Right	Heavy Vehicles	Volume Growth
Eastbound	0	102 (93)	48 (28)	14 (19)	6.3 (1.2)	72.16
Westbound	0	7 (14)	43 (26)	72 (72)	16.9 (3.1)	72.16
Southbound	0	62 (81)	444 (310)	165 (189)	9.5 (3.3)	72.16
Northbound	0	14 (24)	405 (747)	15 (17)	10.7 (3.3)	72.16
Adjustment	0.80	0.95		0.85		
Suggested	**0.80**	**0.95**		**0.85**		
Truck to PCE Factor				**Suggested = 2.00**	2.00	
Multimodal Activity Level			**Low**			
Critical Lane Volume Threshold	2-phase signal		**Suggested = 1800 (Urban), 1650 (Rural)**		**1650**	
	3-phase signal		**Suggested = 1750 (Urban), 1600 (Rural)**		**1600**	
	4-phase signal		**Suggested = 1700 (Urban), 1550 (Rural)**		**1550**	

TYPE OF INTERSECTION	Overall v/c Ratio	V/C Ranking	Pedestrian Accommodations	Bicycle Accommodations
ALT 0: No Action	**1.86 (2.36)**	**5**	**Fair**	**Poor**
ALT 1: All-Way Stop-Control	**1.28 (1.40)**	**3**	**Excellent**	**Poor**
ALT 2: Turn Lanes	**1.54 (1.73)**	**4**	**Fair**	**Poor**
ALT 3: Traffic Signal	**0.55 (0.65)**	**1**	**Good**	**Poor**
ALT 4: Roundabout	**0.57 (0.73)**	**2**	**Excellent**	**Good**

Safety Performance for Intersection Control Evaluation Tool

Results

Summary of crash prediction results for each alternative

Project Information

Project Name:	Gallatin County Intersection Improvements	**Intersection Type**	At-Grade Intersections
Intersection:	Alaska Rd S/E Valley Center Rd	**Opening Year**	2025
Agency:	Gallatin County	**Design Year**	2045
Project Reference:	2023507	**Facility Type**	Rural 2-Lane Highway
City:	Gallatin County	**Number of Legs**	4-leg
State:	Montana		
Date:	10/25/2023		
Analyst:	Kerry Lynch (RPA)		

Crash Prediction Summary

Control Strategy	Crash Type	Opening Year	Design Year	Total Project Life Cycle	AADT Within Prediction Range?
ALT 0: No Action	Total	6.39	11.61	188.14	No
	Fatal & Injury	2.75	5.01	81.09	
ALT 1: All-Way Stop-Control	Total	3.32	6.04	97.83	N/A
	Fatal & Injury	1.43	2.60	42.17	
ALT 2: Turn Lanes	Total	2.86	5.19	84.14	No
	Fatal & Injury	1.23	2.24	36.26	
ALT 3: Traffic Signal	Total	2.93	4.35	76.66	Yes
	Fatal & Injury	1.00	1.48	26.06	
ALT 4: Roundabout	Total	1.85	3.37	54.56	N/A
	Fatal & Injury	0.36	0.65	10.54	

*If "No", the input AADT exceeds the range of the data used to develop one or more of the SPFs, and the resulting predictions should be used with caution

Capacity Analysis for Planning of Junctions

Summary Report

Project Name:	Gallatin County Intersection Improvements
Project Number:	23602.000
Location:	Alaska Rd S / Valley Center Rd
Date:	Short Term 2025 - AM (PM)
Number of Intersection Legs:	4-leg
Major Street Direction	East-West

Traffic Volume Demand						
	Volume (Veh/hr)				Percent (%)	
	U-Turn	Left	Thru	Right	Heavy Vehicles	Volume Growth
Eastbound	0	83 (187)	245 (272)	1 (1)	7.6 (5.7)	5.06
Westbound	0	3 (0)	185 (269)	173 (295)	8.2 (2.6)	5.06
Southbound	0	207 (132)	1 (0)	86 (59)	12.1 (6)	5.06
Northbound	0	2 (1)	1 (0)	1 (2)	25 (33.3)	5.06
Adjustment	0.80	0.95		0.85		
Suggested	**0.80**	**0.95**		**0.85**		
Truck to PCE Factor				**Suggested = 2.00**	2.00	
Multimodal Activity Level			**Low**			
Critical Lane Volume Threshold	2-phase signal		**Suggested = 1800 (Urban), 1650 (Rural)**		**1650**	
	3-phase signal		**Suggested = 1750 (Urban), 1600 (Rural)**		**1600**	
	4-phase signal		**Suggested = 1700 (Urban), 1550 (Rural)**		**1550**	

TYPE OF INTERSECTION	Overall v/c Ratio	V/C Ranking	Pedestrian Accommodations	Bicycle Accommodations
ALT 0: No Action	**0.84 (1.01)**	**4**	**Fair**	**Fair**
ALT 1: All-Way Stop-Control	**0.90 (1.06)**	**5**	**Excellent**	**Fair**
ALT 2: Turn Lanes	**0.69 (xx)**	**3**	**Fair**	**Fair**
ALT 3: Traffic Signal	**0.36 (0.41)**	**1**	**Good**	**Fair**
ALT 4: Roundabout	**0.33 (0.51)**	**2**	**Excellent**	**Good**

Capacity Analysis for Planning of Junctions

Summary Report

Project Name:	Gallatin County Intersection Improvements
Project Number:	23602.000
Location:	Alaska Rd S / Valley Center Rd
Date:	Long Term 2045 - AM (PM)
Number of Intersection Legs:	4-leg
Major Street Direction	East-West

Traffic Volume Demand						
	Volume (Veh/hr)				Percent (%)	
	U-Turn	Left	Thru	Right	Heavy Vehicles	Volume Growth
Eastbound	0	136 (306)	401 (446)	2 (2)	7.6 (5.7)	72.16
Westbound	0	5 (0)	303 (441)	284 (484)	8.2 (2.6)	72.16
Southbound	0	339 (217)	2 (0)	141 (96)	12.1 (6)	72.16
Northbound	0	3 (2)	2 (0)	2 (3)	25 (33.3)	72.16
Adjustment	0.80	0.95		0.85		
Suggested	**0.80**	**0.95**		**0.85**		
Truck to PCE Factor				**Suggested = 2.00**	2.00	
Multimodal Activity Level			**Low**			
Critical Lane Volume Threshold	2-phase signal		**Suggested = 1800 (Urban), 1650 (Rural)**		**1650**	
	3-phase signal		**Suggested = 1750 (Urban), 1600 (Rural)**		**1600**	
	4-phase signal		**Suggested = 1700 (Urban), 1550 (Rural)**		**1550**	

TYPE OF INTERSECTION	Overall v/c Ratio	V/C Ranking	Pedestrian Accommodations	Bicycle Accommodations
ALT 0: No Action	**3.59 (10.78)**	**5**	**Fair**	**Fair**
ALT 1: All-Way Stop-Control	**1.48 (1.73)**	**3**	**Excellent**	**Fair**
ALT 2: Turn Lanes	**2.46 (xx)**	**4**	**Fair**	**Fair**
ALT 3: Traffic Signal	**0.58 (0.68)**	**1**	**Good**	**Fair**
ALT 4: Roundabout	**0.62 (0.96)**	**2**	**Excellent**	**Good**

Safety Performance for Intersection Control Evaluation Tool

Results

Summary of crash prediction results for each alternative

Project Information

Project Name:	Gallatin County Intersection Improvements	**Intersection Type**	At-Grade Intersections
Intersection:	Love Ln/Durston Rd	**Opening Year**	2025
Agency:	Gallatin County	**Design Year**	2045
Project Reference:	2023507	**Facility Type**	Rural 2-Lane Highway
City:	Gallatin County	**Number of Legs**	4-leg
State:	Montana		
Date:	10/25/2023		
Analyst:	Kerry Lynch (RPA)		

Crash Prediction Summary

Control Strategy	Crash Type	Opening Year	Design Year	Total Project Life Cycle	AADT Within Prediction Range?*
ALT 0: No Action	Total	5.40	9.81	158.99	No
	Fatal & Injury	2.33	4.23	68.52	
ALT 1: All-Way Stop-Control	Total	2.81	5.10	82.67	N/A
	Fatal & Injury	1.21	2.20	35.63	
ALT 2: Turn Lanes	Total	2.81	5.10	82.67	No
	Fatal & Injury	1.21	2.20	35.63	
ALT 3: Traffic Signal	Total	2.51	3.73	65.75	Yes
	Fatal & Injury	0.85	1.27	22.36	
ALT 4: Roundabout	Total	1.57	2.85	46.11	N/A
	Fatal & Injury	0.30	0.55	8.91	

*If "No", the input AADT exceeds the range of the data used to develop one or more of the SPFs, and the resulting predictions should be used with caution

Capacity Analysis for Planning of Junctions

Summary Report

Project Name:	Gallatin County Intersection Improvements
Project Number:	23602.000
Location:	Love Ln / Durston Rd
Date:	Short Term 2025 - AM (PM)
Number of Intersection Legs:	4-leg
Major Street Direction	North-South

Traffic Volume Demand						
	Volume (Veh/hr)				Percent (%)	
	U-Turn	Left	Thru	Right	Heavy Vehicles	Volume Growth
Eastbound	0	12 (21)	75 (49)	13 (25)	1.1 (0)	5.06
Westbound	0	58 (34)	45 (37)	145 (169)	0.4 (2.6)	5.06
Southbound	0	190 (139)	242 (146)	15 (17)	1.2 (1)	5.06
Northbound	0	12 (22)	104 (327)	33 (46)	7.1 (1.3)	5.06
Adjustment	0.80	0.95		0.85		
Suggested	**0.80**	**0.95**		**0.85**		
Truck to PCE Factor				**Suggested = 2.00**	2.00	
Multimodal Activity Level			**Low**			
Critical Lane Volume Threshold	2-phase signal		**Suggested = 1800 (Urban), 1650 (Rural)**		**1650**	
	3-phase signal		**Suggested = 1750 (Urban), 1600 (Rural)**		**1600**	
	4-phase signal		**Suggested = 1700 (Urban), 1550 (Rural)**		**1550**	

TYPE OF INTERSECTION	Overall v/c Ratio	V/C Ranking	Pedestrian Accommodations	Bicycle Accommodations
ALT 0: No Action	**0.47 (0.20)**	**2**	**Fair**	**Poor**
ALT 1: All-Way Stop-Control	**0.78 (0.85)**	**5**	**Excellent**	**Poor**
ALT 2: Turn Lanes	**0.34 (0.25)**	**1**	**Fair**	**Poor**
ALT 3: Traffic Signal	**0.33 (0.41)**	**4**	**Good**	**Poor**
ALT 4: Roundabout	**0.37 (0.36)**	**3**	**Excellent**	**Good**

Capacity Analysis for Planning of Junctions

Summary Report

Project Name:	Gallatin County Intersection Improvements
Project Number:	23602.000
Location:	Love Ln / Durston Rd
Date:	Long Term 2045 - AM (PM)
Number of Intersection Legs:	4-leg
Major Street Direction	North-South

Traffic Volume Demand						
	Volume (Veh/hr)				Percent (%)	
	U-Turn	Left	Thru	Right	Heavy Vehicles	Volume Growth
Eastbound	0	19 (34)	122 (81)	21 (41)	1.1 (0)	72.16
Westbound	0	95 (55)	74 (60)	238 (277)	0.4 (2.6)	72.16
Southbound	0	312 (227)	396 (239)	24 (28)	1.2 (1)	72.16
Northbound	0	19 (36)	170 (535)	53 (76)	7.1 (1.3)	72.16
Adjustment	0.80	0.95		0.85		
Suggested	**0.80**	**0.95**		**0.85**		
Truck to PCE Factor				**Suggested = 2.00**	2.00	
Multimodal Activity Level				**Low**		
Critical Lane Volume Threshold	2-phase signal			**Suggested = 1800 (Urban), 1650 (Rural)**	**1650**	
	3-phase signal			**Suggested = 1750 (Urban), 1600 (Rural)**	**1600**	
	4-phase signal			**Suggested = 1700 (Urban), 1550 (Rural)**	**1550**	

TYPE OF INTERSECTION	Overall v/c Ratio	V/C Ranking	Pedestrian Accommodations	Bicycle Accommodations
ALT 0: No Action	**10.5 (6.77)**	**5**	**Fair**	**Poor**
ALT 1: All-Way Stop-Control	**1.28 (1.40)**	**3**	**Excellent**	**Poor**
ALT 2: Turn Lanes	**1.05 (3.57)**	**4**	**Fair**	**Poor**
ALT 3: Traffic Signal	**0.54 (0.68)**	**1**	**Good**	**Poor**
ALT 4: Roundabout	**0.65 (0.68)**	**2**	**Excellent**	**Good**