

APPENDIX F

Range of Alternatives White Paper

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DATE: July 27, 2020

SUBJECT: SHFWY00079 – Final Range of Alternatives White Paper

The project team used a workshop format to bring together various engineering discipline experts to outline specific traffic management and geometric improvements that would address the project purpose and need, and to discuss combinations of treatments to create alternatives. The Alaska Department of Transportation and Public Facilities (DOT&PF) Statewide Environmental Office (SEO) is serving as the lead federal agency for reviewing the Planning and Environmental Linkages (PEL) study for this project. The SEO has provided concurrence of the development and evaluation process for the alternatives (June 12, 2020), stating that the process will provide many opportunities for public and agency involvement in the development and screening of alternatives and may streamline future National Environmental Policy Act (NEPA) requirements.

During the workshops (held April 8 and 15, 2020), the project team developed a list of treatments that were then combined to create alternatives. Comments received from the public, agencies, and stakeholders were considered in development of the alternatives. The initial list of treatments was preliminarily screened to identify reasonable alternatives that stay within project constraints while still addressing project purpose and need, resulting in the 15 build alternatives presented in this paper. The full list of treatments developed is described in Appendix A: Treatments Considered and includes the reasoning as to why each treatment was either incorporated into an alternative or rejected. Some treatments were identified as “compatible design elements,” meaning they do not stand alone as alternatives but can be combined with several of the identified build alternatives to help meet additional purpose and need elements or project goals.

This white paper presents descriptions of each of the 15 alternatives, including a sketch and description of each alternative, purpose and need elements that are expected to be met, and compatible design elements.

Alternative Types

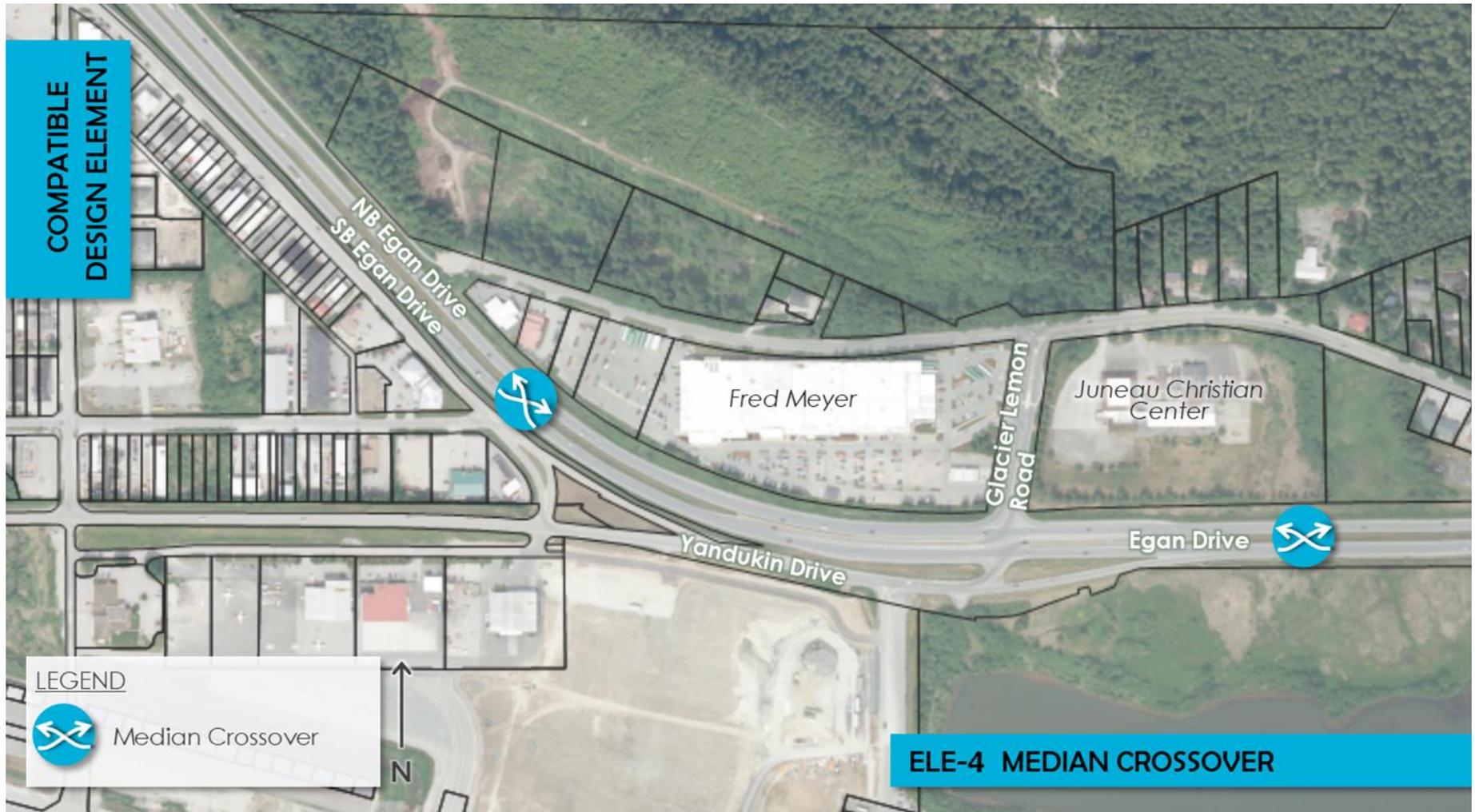
The descriptions are organized by alternative complexity (from least to most complex). The compatible design elements (ELE) can be used to supplement alternatives. The alternatives are categorized into three alternative types: closures (CLS), intersections (INT), and interchanges/overpasses (OVP).

Compatible Design Elements

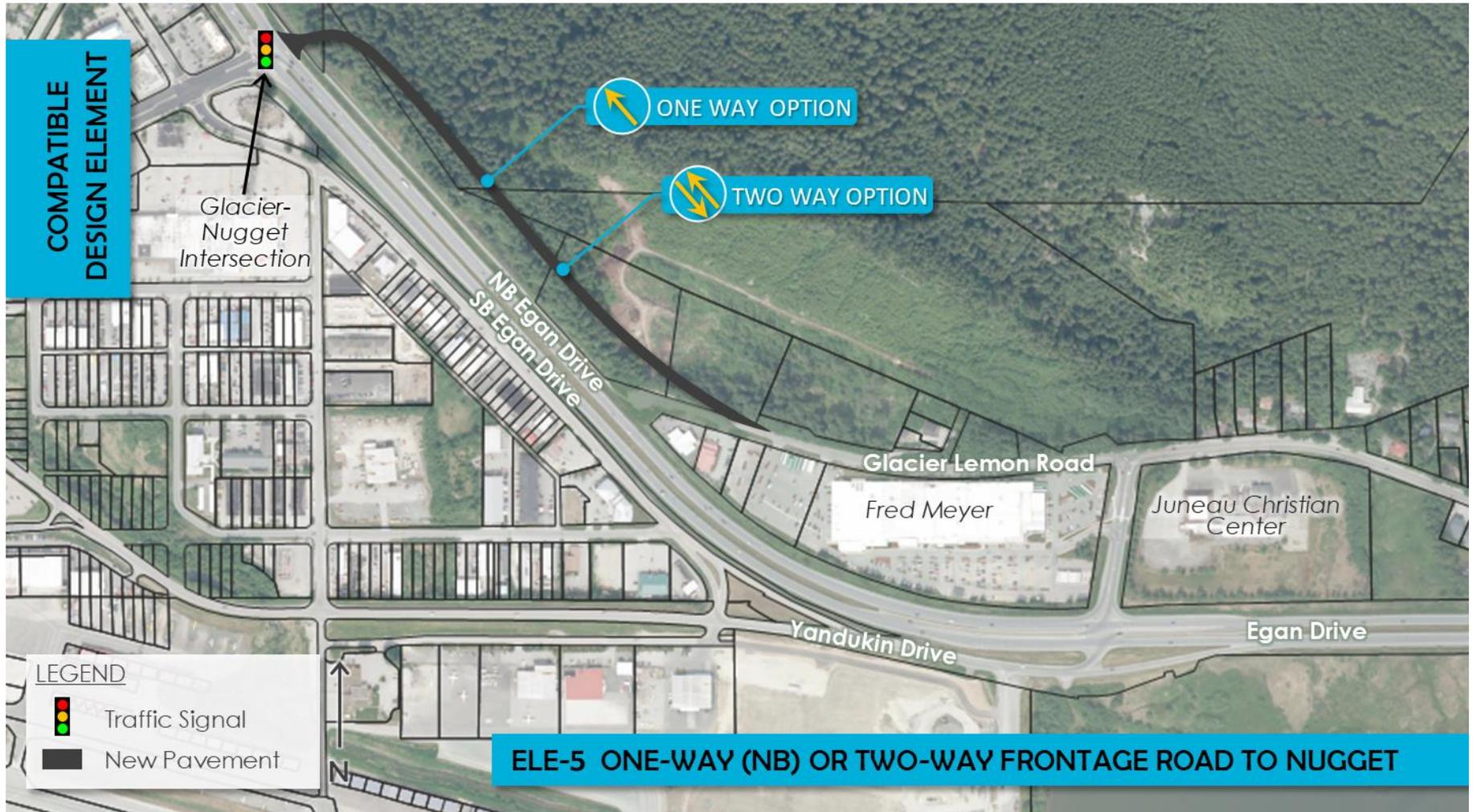
The description of the compatible design elements developed are as follows:

- ELE-1. Travel Demand Management (TDM)
 - TDM treatments could be implemented to reduce traffic volumes on Egan Drive, or to spread travel more evenly throughout the day. Some examples of TDM treatments include sharing education campaigns, closing medians seasonally or by time of day, encouraging time shifting of work to reduce peak hour volumes or teleworking, encouraging transit use, and using techniques to clear crashes quickly.
- ELE-2. Intelligent Transportation Systems (ITS)
 - ITS tools could be used to notify users of delay when a crash occurs. ITS tools include email and text messages, changeable message signs at strategic locations, and traffic cameras. Some ITS tools, such as speed feedback signs, could also improve safety.
- ELE-3. Flashing Intersection Ahead Sign or Signal Ahead Sign, as appropriate
 - Flashing intersection or signal ahead signs could be placed prior to reaching the Egan-Yandukin (E-Y) intersection to warn Egan Drive through-traffic of the presence of conflicting left-turn vehicles.
- ELE-4. Median Crossover
 - Sections of the grassy median on Egan Drive could be paved to allow traffic to cross over during a crash event on Egan Drive. If a crash blocks one direction of travel, then DOT&PF staff would respond to the crash site, set up traffic control devices to allow for two-way traffic on one side of Egan Drive, and vehicles would be diverted over the paved medians to the opposite direction lanes. This would allow traffic to continue moving on Egan Drive even if one direction of travel were closed due to a crash. (See ELE-4. Compatible Design Element: Median Crossover figure.)
- ELE-5. One-way (NB) or Two-way Frontage Road to Glacier-Nugget
 - The frontage road (Glacier-Lemon Road) could be extended to the Glacier-Nugget intersection for either one-way northbound-only traffic or two-way traffic to provide an alternate route along Egan Drive. (See ELE-5. Compatible Design Element: Frontage Road to Glacier-Nugget Road figure.)
- ELE-6. Grade Separated Connection between Yandukin Drive and Glacier-Lemon Road
 - To reduce the volume of conflicting traffic at the Glacier-Nugget intersection, Egan Drive could be raised up and a connection could be built under Egan Drive to connect Yandukin Drive and Glacier-Lemon Road. There would be no turns to or from Egan Drive at this location. (See ELE-6. Compatible Design Element: Grade Separated Connection figure.)

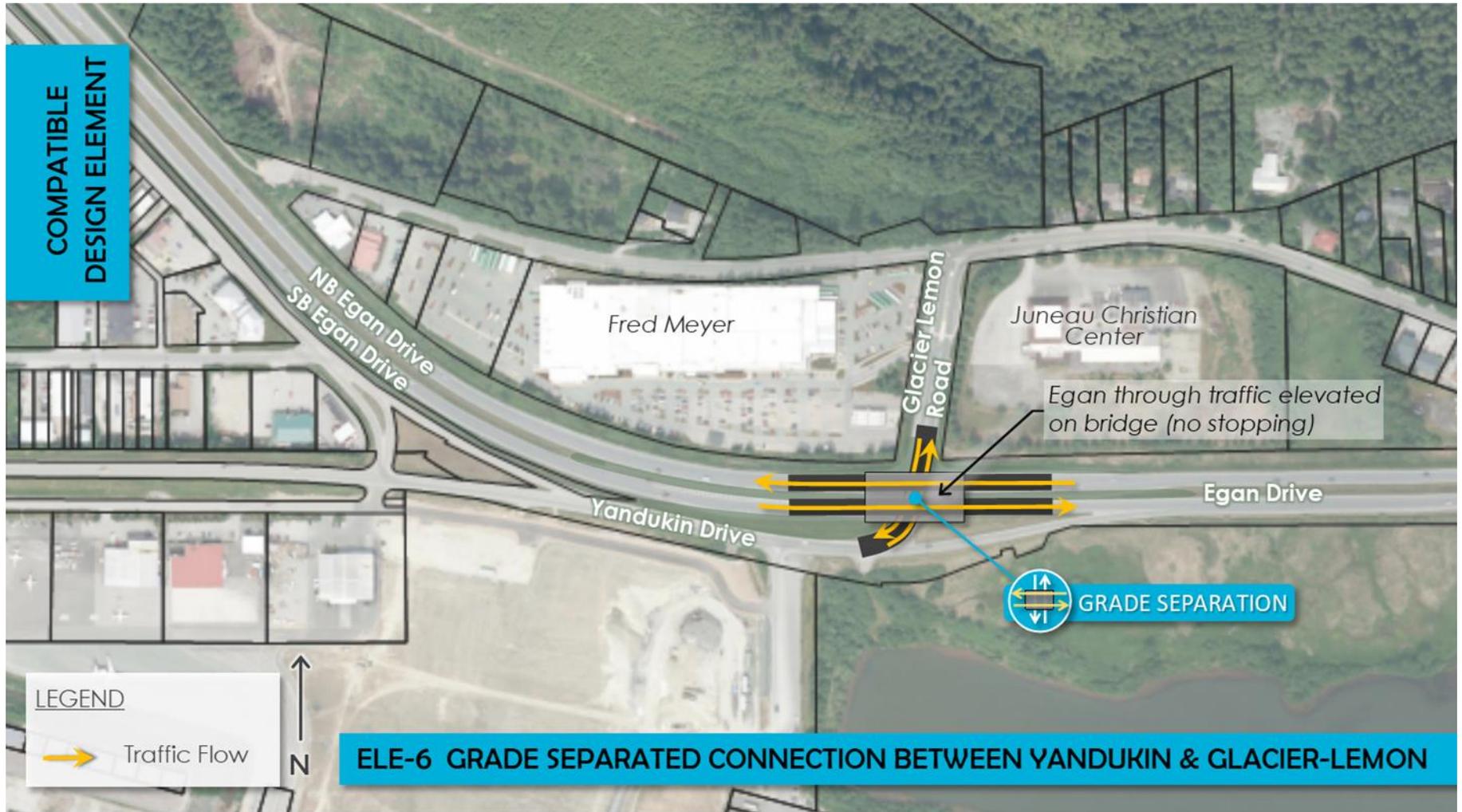
ELE-4. Compatible Design Element: Median Crossover



ELE-5. Compatible Design Element: Frontage Road to Glacier-Nugget Road



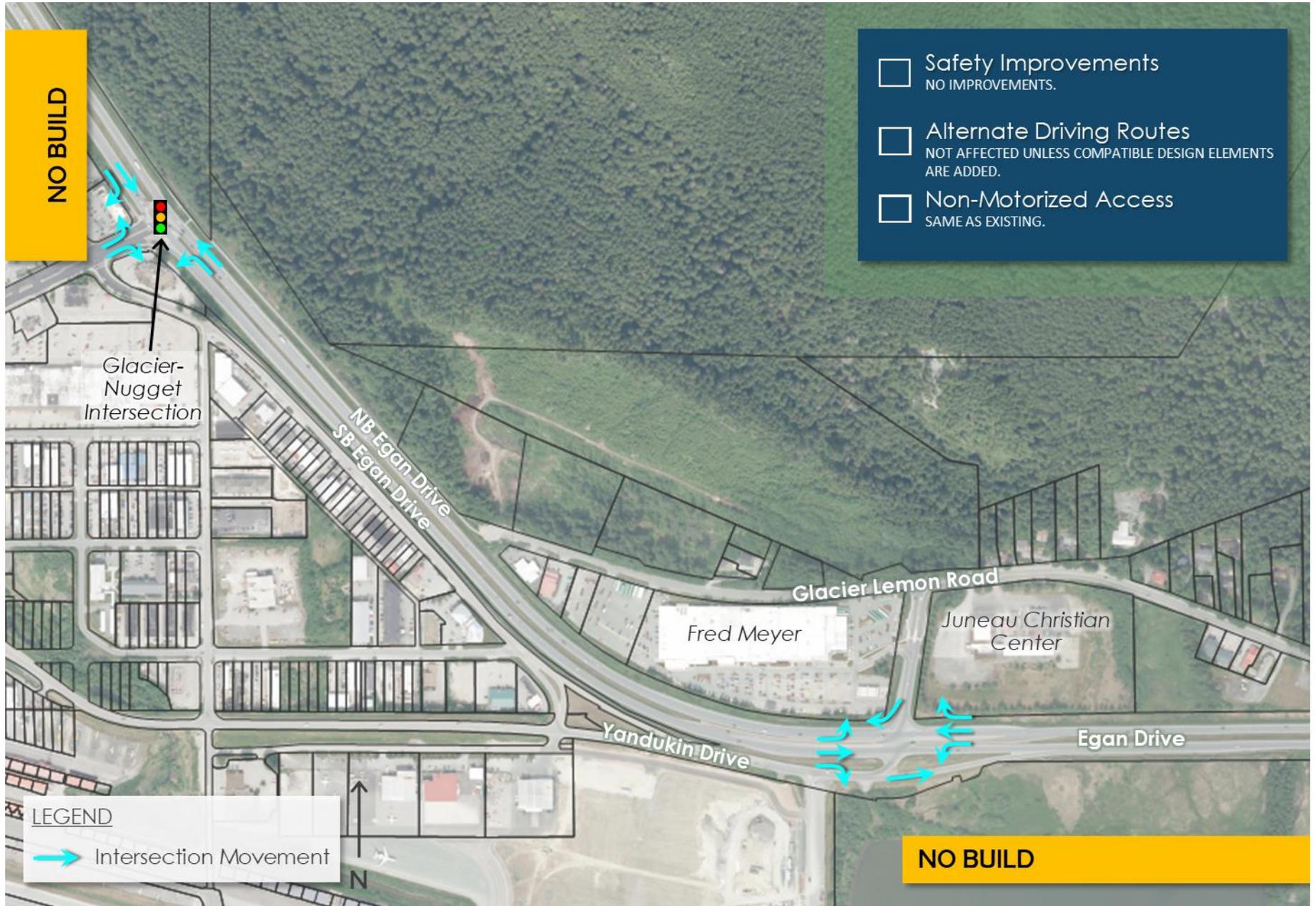
ELE-6. Compatible Design Element: Grade Separated Connection



No Build (Current Intersection)

One alternative for the E-Y intersection is to maintain the existing intersection configuration without any changes.

Three purpose and need components were identified for the project: improve intersection safety, provide alternate routes through the intersection in case of vehicle crashes and road closures, and provide non-motorized access for pedestrians and bicyclists to safely cross Egan Drive. The no build alternative makes no changes to the intersection, thus does not meet any purpose and need elements. The most recent draft Purpose and Need document for the project (May 27, 2020) is found in Appendix B: Purpose and Need.



Alternatives

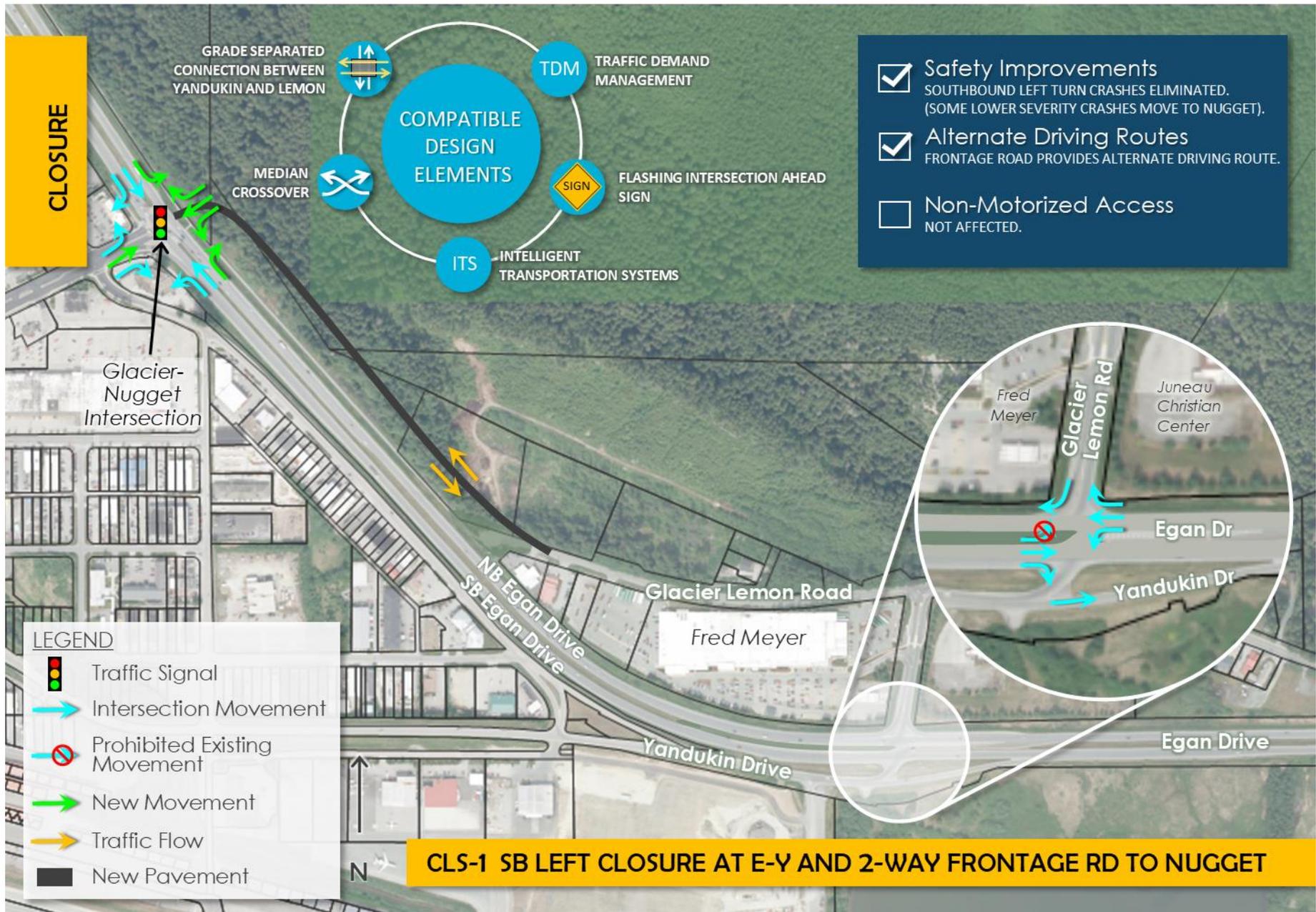
This section presents the descriptions of the 15 stand-alone build alternatives.

CLS-1. Southbound Left Closure at E-Y Intersection and Two-way Frontage Road to Glacier-Nugget

This alternative restricts southbound left vehicles from turning at the E-Y intersection and extends the two-way frontage road (Glacier-Lemon Road) to the Glacier Nugget intersection. Southbound left drivers would access Glacier-Lemon Road using the Glacier-Nugget intersection. All other movements currently allowed at the E-Y intersection would still be allowed.

Compatible design elements that can help address the project purpose, needs, and goals include:

- Travel Demand Management
- Intelligent Transportation Systems
- Flashing Intersection Ahead Sign
- Median Crossover
- Grade Separated Connection between Yandukin Drive and Glacier-Lemon Road

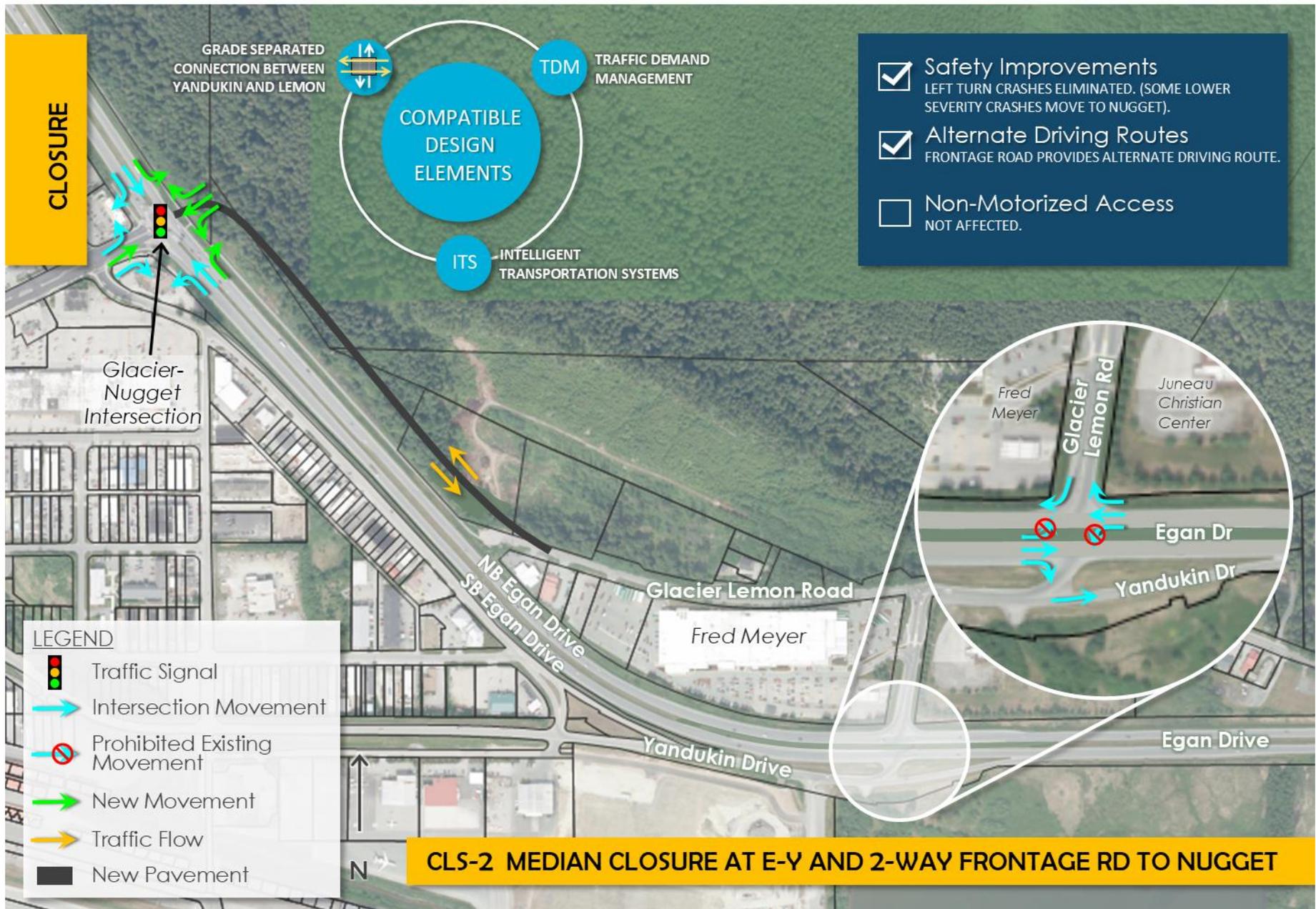


CLS-2. Median Closure at E-Y Intersection and Two-way Frontage Road to Glacier-Nugget

This alternative would close the median at the E-Y intersection, eliminating all left-turn movements, and extend the two-way frontage road (Glacier-Lemon Road) to the Glacier-Nugget intersection. All other movements currently allowed at the E-Y intersection would still be allowed. Turning drivers would turn at the Glacier-Nugget intersection.

Compatible design elements that can help address the project purpose, needs, and goals include:

- Travel Demand Management
- Intelligent Transportation Systems
- Grade Separated Connection between Yandukin Drive and Glacier-Lemon Road

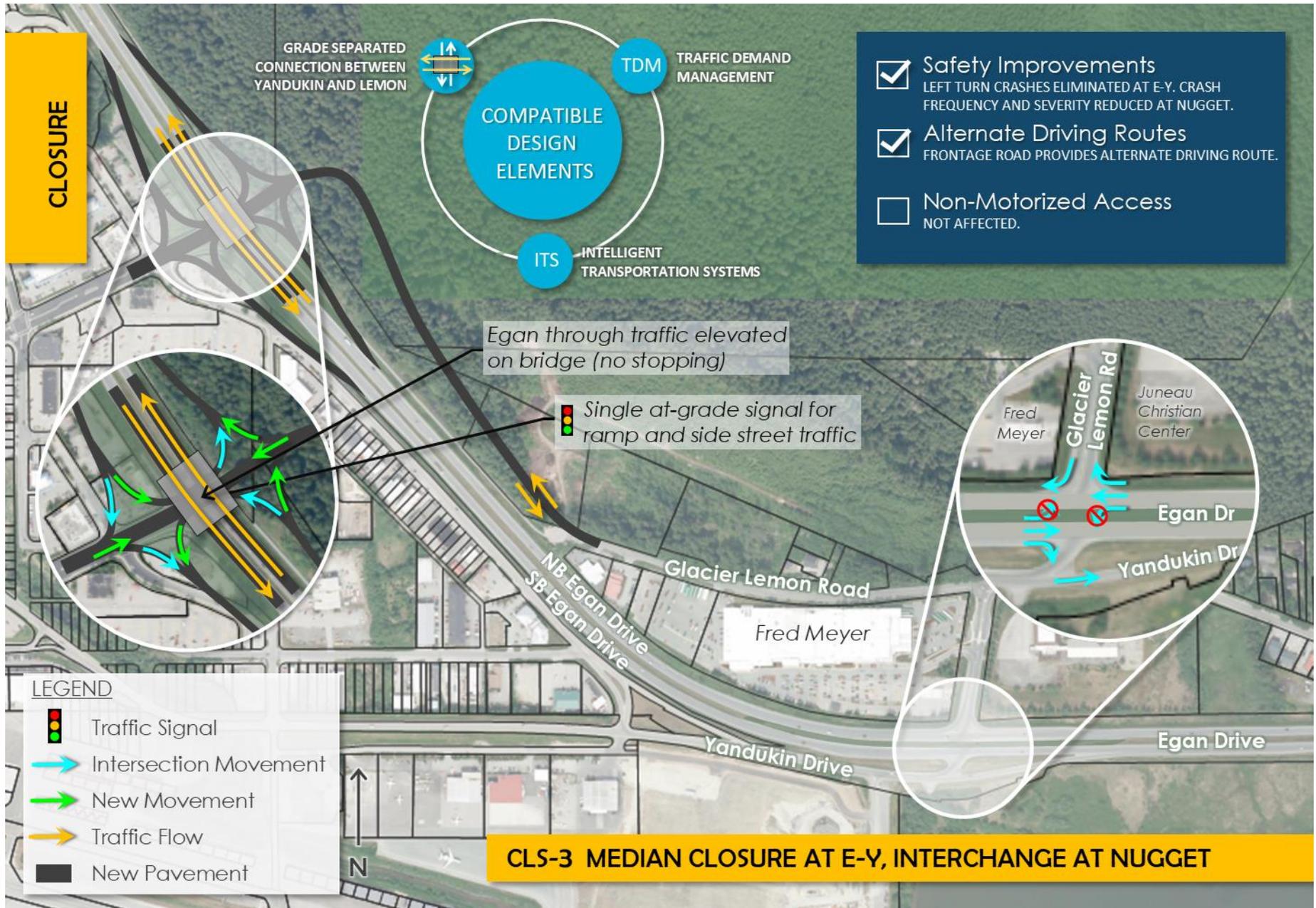


CLS-3. Median Closure at E-Y Intersection, Interchange at Glacier-Nugget Intersection

This alternative would close the median at the E-Y intersection, construct an interchange at the Glacier-Nugget intersection, and extend the two-way frontage road (Glacier-Lemon Road) to the new interchange. The median closure would eliminate all left-turn movements at the E-Y intersection, and left-turning drivers would turn at the Glacier-Nugget interchange. All other movements allowed at the E-Y intersection would still be allowed.

Compatible design elements that can help address the project purpose, needs, and goals include:

- Travel Demand Management
- Intelligent Transportation Systems
- Grade Separated Connection between Yandukin Drive and Glacier-Lemon Road

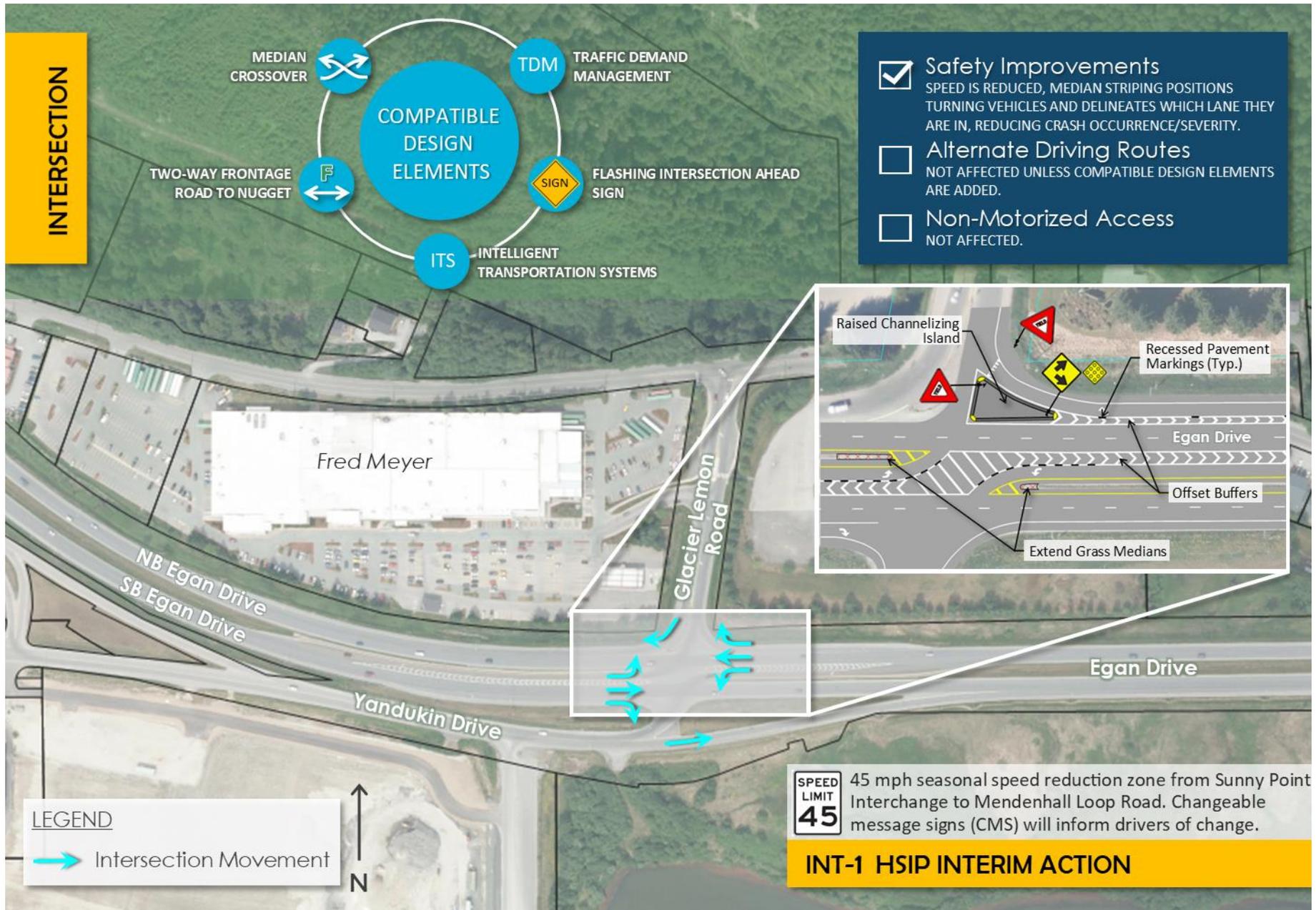


INT-1. HSIP Interim Action

A Highway Safety Improvement Program (HSIP) nomination is proposed for the E-Y intersection as an interim plan to help mitigate left-turn crash issues at the intersection. This alternative would implement the recommended interim action measures proposed in the nomination. This alternative would reduce the speed limit on Egan Drive from 55 miles per hour (mph) to 45 mph during winter months near the E-Y and Glacier-Nugget intersections, install left-turn median striping with recessed pavement markers, and offset the northbound right-turn lane with recessed pavement markers.

Compatible design elements that can help address the project purpose, needs, and goals include:

- Travel Demand Management
- Intelligent Transportation Systems
- Flashing Intersection Ahead Sign
- Median Crossover
- Two-way Frontage Road to Glacier-Nugget

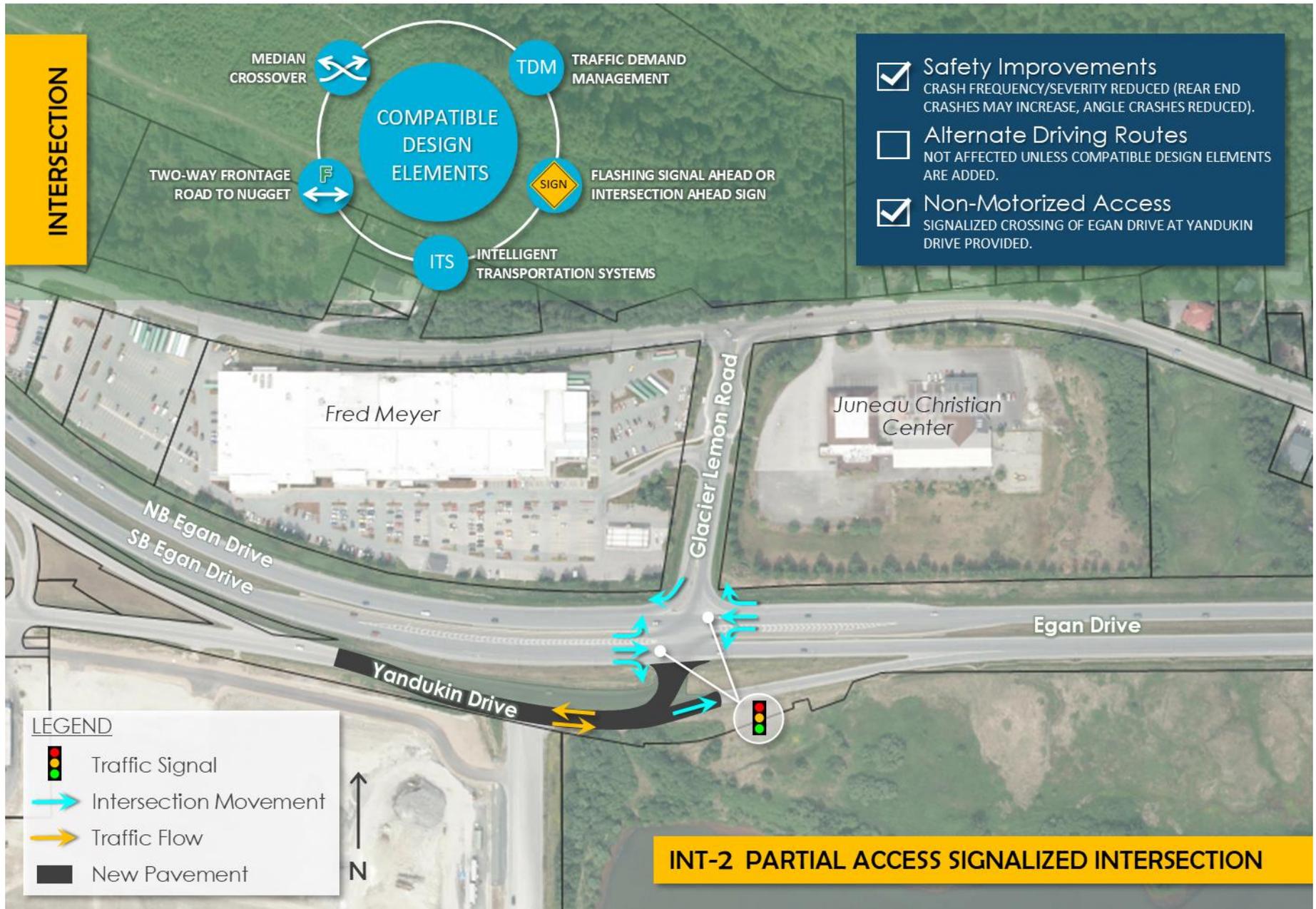


INT-2. Partial Access Signalized Intersection

This alternative signalizes the E-Y intersection and would only allow vehicle movements currently allowed at the E-Y intersection (no left turns from the side streets would be allowed). Signalized crossings would be provided for pedestrians and bicyclists to cross the E-Y intersection.

Compatible design elements that can help address the project purpose, needs, and goals include:

- Travel Demand Management
- Intelligent Transportation Systems
- Flashing Signal Ahead Sign
- Median Crossover
- Two-way Frontage Road to Glacier-Nugget

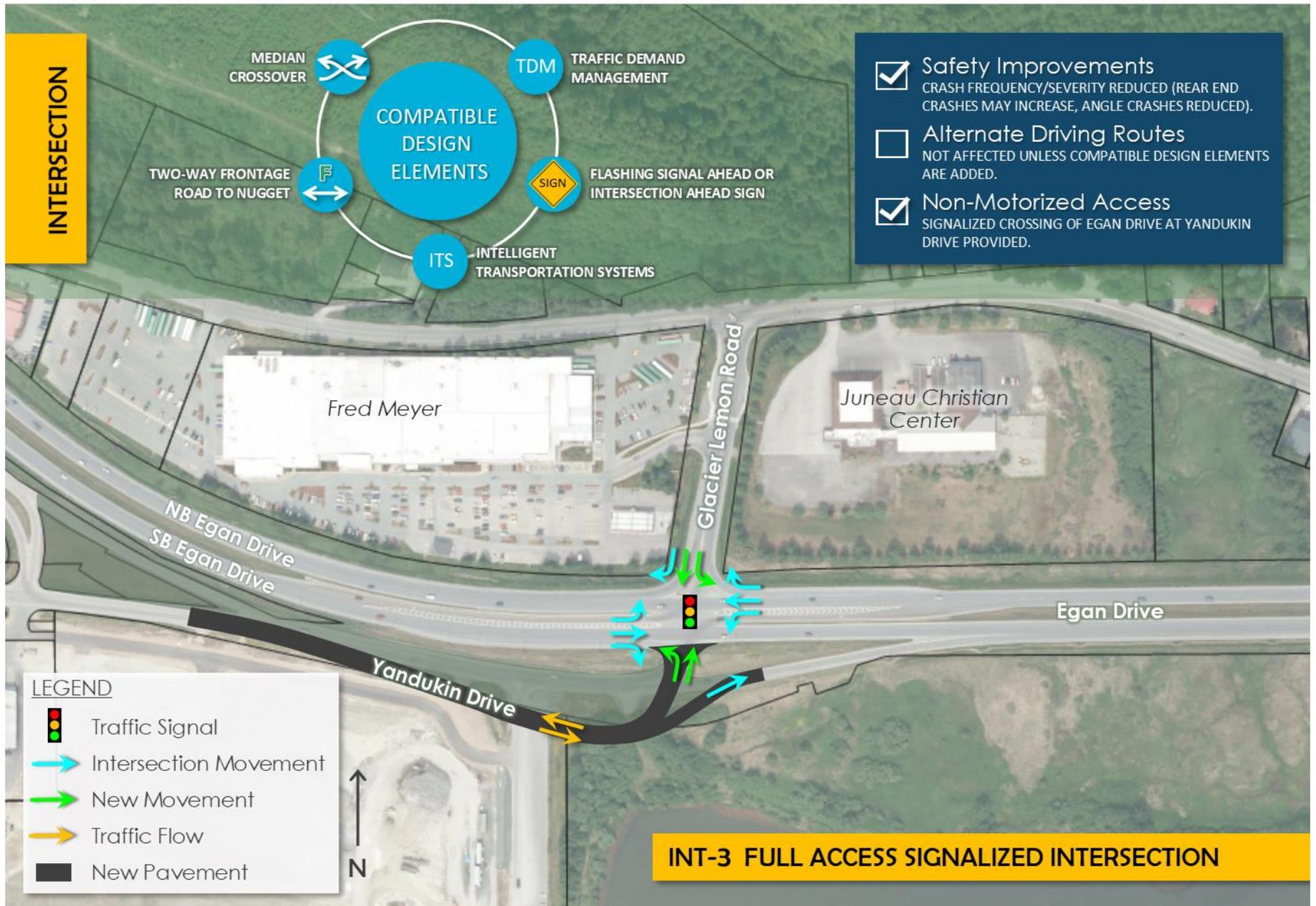


INT-3. Full Access Signalized Intersection

This alternative signalizes the E-Y intersection and would allow all vehicle movements at the intersection. Signalized crossings would be provided for pedestrians and bicyclists to cross the E-Y intersection.

Compatible design elements that can help address the project purpose, needs, and goals include:

- Travel Demand Management
- Intelligent Transportation Systems
- Flashing Signal Ahead Sign
- Median Crossover
- Two-way Frontage Road to Glacier-Nugget

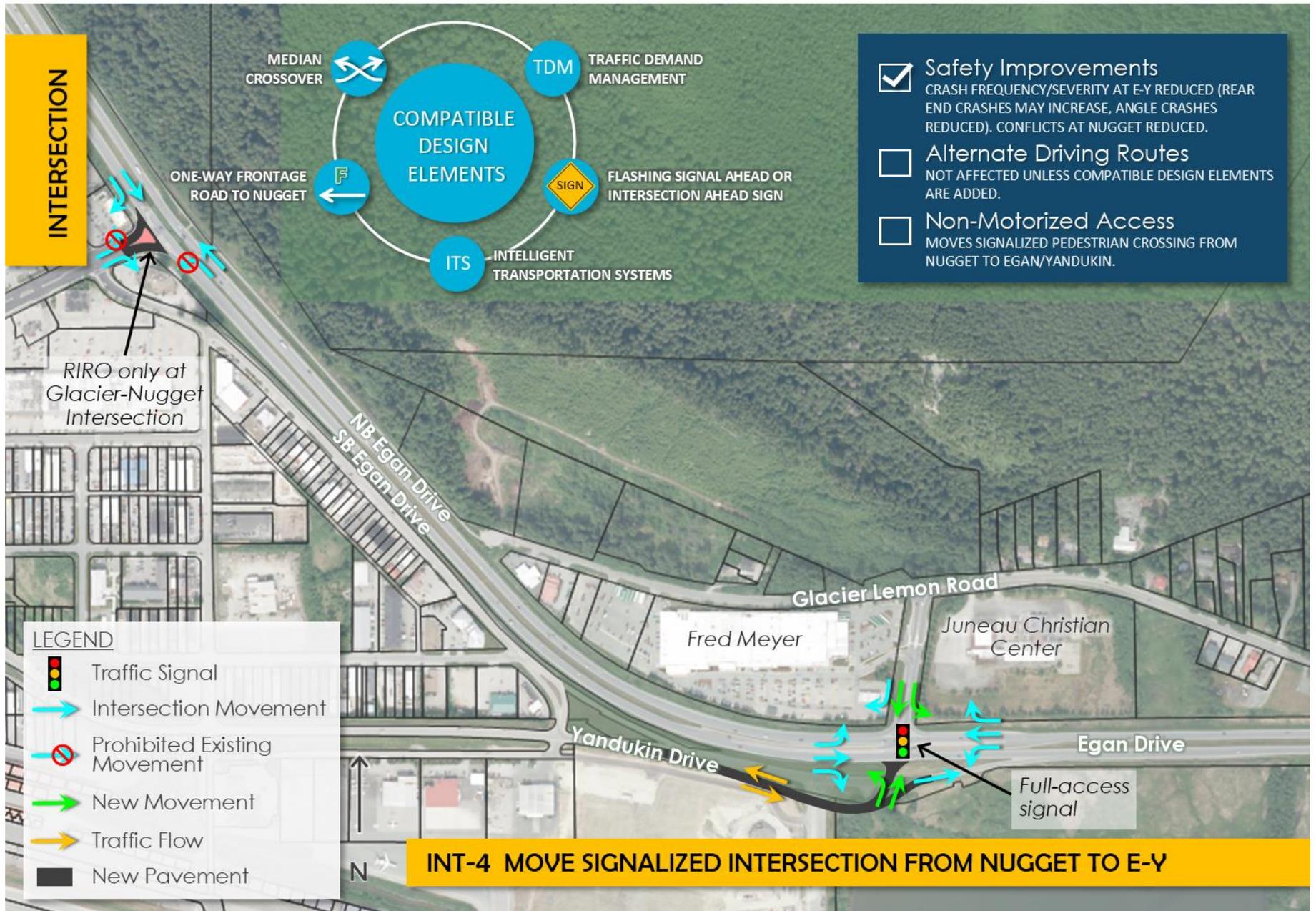


INT-4. Move Signalized Intersection from Glacier-Nugget to E-Y Intersection

This alternative moves the signal at the Glacier-Nugget intersection to the E-Y intersection. Vehicles at the Glacier-Nugget intersection would only allow Egan Drive through movements and right-in, right-out (RIRO) movements at the side streets, while all vehicle movements would be allowed at the E-Y signal. Signalized crossings would be provided for pedestrians and bicycles to cross the E-Y intersection.

Compatible design elements that can help address the project purpose, needs, and goals include:

- Travel Demand Management
- Intelligent Transportation Systems
- Flashing Signal Ahead Sign
- Median Crossover
- One-way Frontage Road to Glacier-Nugget

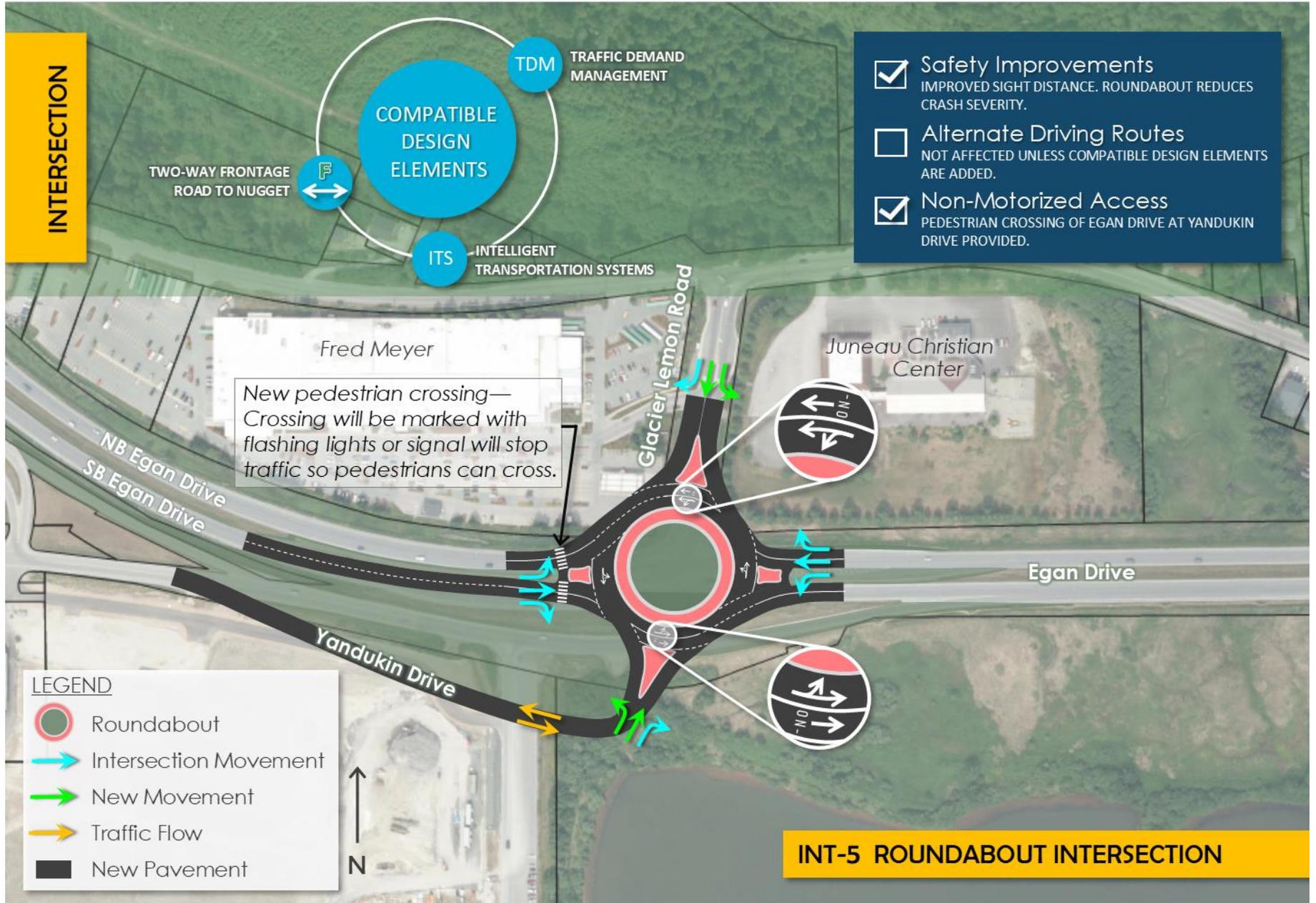


INT-5. Roundabout Intersection

This alternative converts the E-Y intersection to a roundabout intersection. Speeds would be reduced as vehicles approach and enter the roundabout. The alternative has the option to allow only the current movements or to allow all movements at the intersection. This alternative would provide a signalized crossing for pedestrians and bicycles to cross at the E-Y intersection.

Compatible design elements that can help address the project purpose, needs, and goals include:

- Travel Demand Management
- Intelligent Transportation Systems
- Two-way Frontage Road to Glacier-Nugget

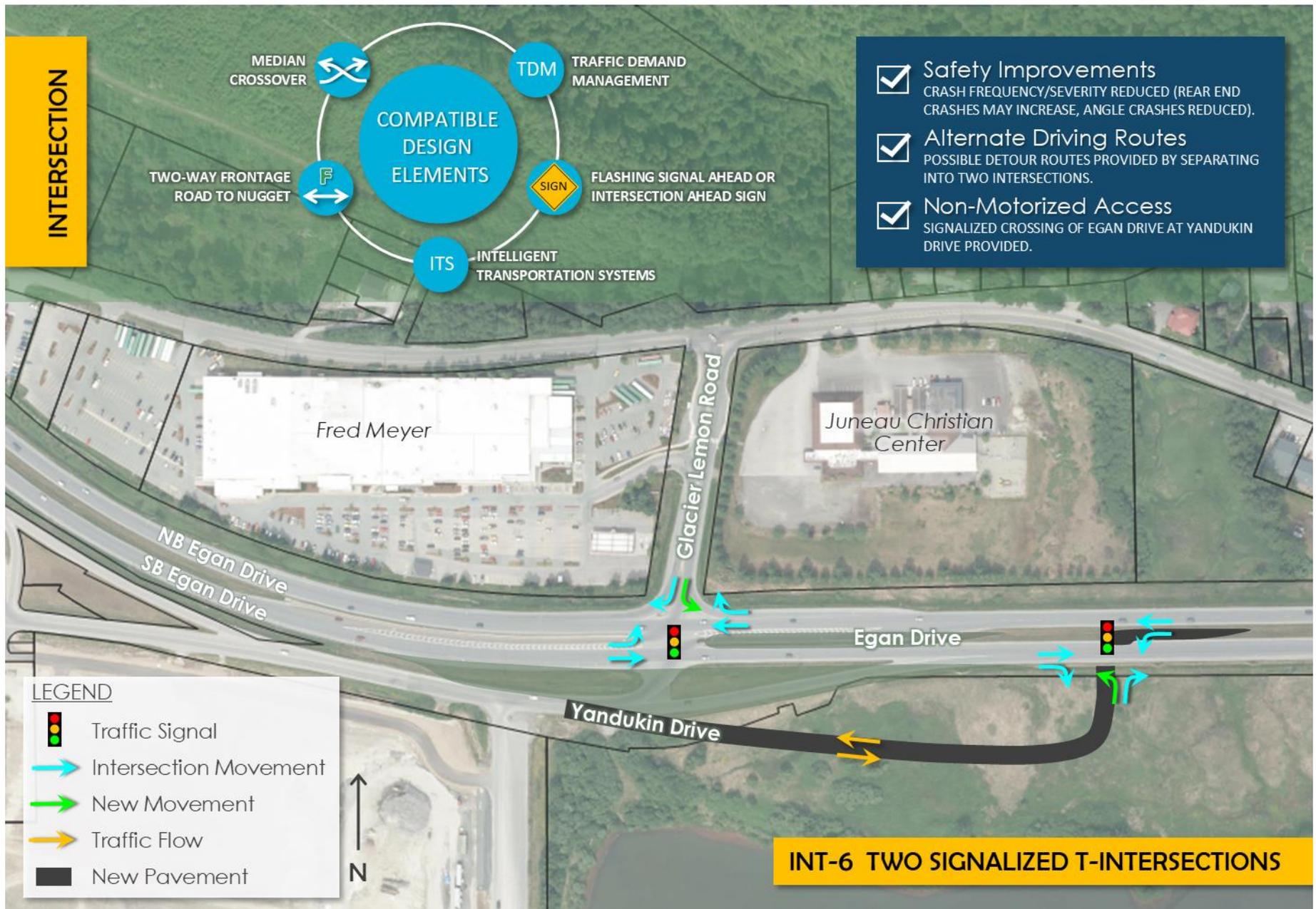


INT-6. Two Signalized T-Intersections

This alternative separates the E-Y intersection into two signalized T-intersections, with the Yandukin Drive intersection southeast of the church. The position of the intersections would improve sight distance for left-turn drivers. Separating the E-Y intersection into two intersections would provide possible detour routes.

Compatible design elements that can help address the project purpose, needs, and goals include:

- Travel Demand Management
- Intelligent Transportation Systems
- Flashing Signal Ahead Sign
- Median Crossover
- Two-way Frontage Road to Glacier-Nugget

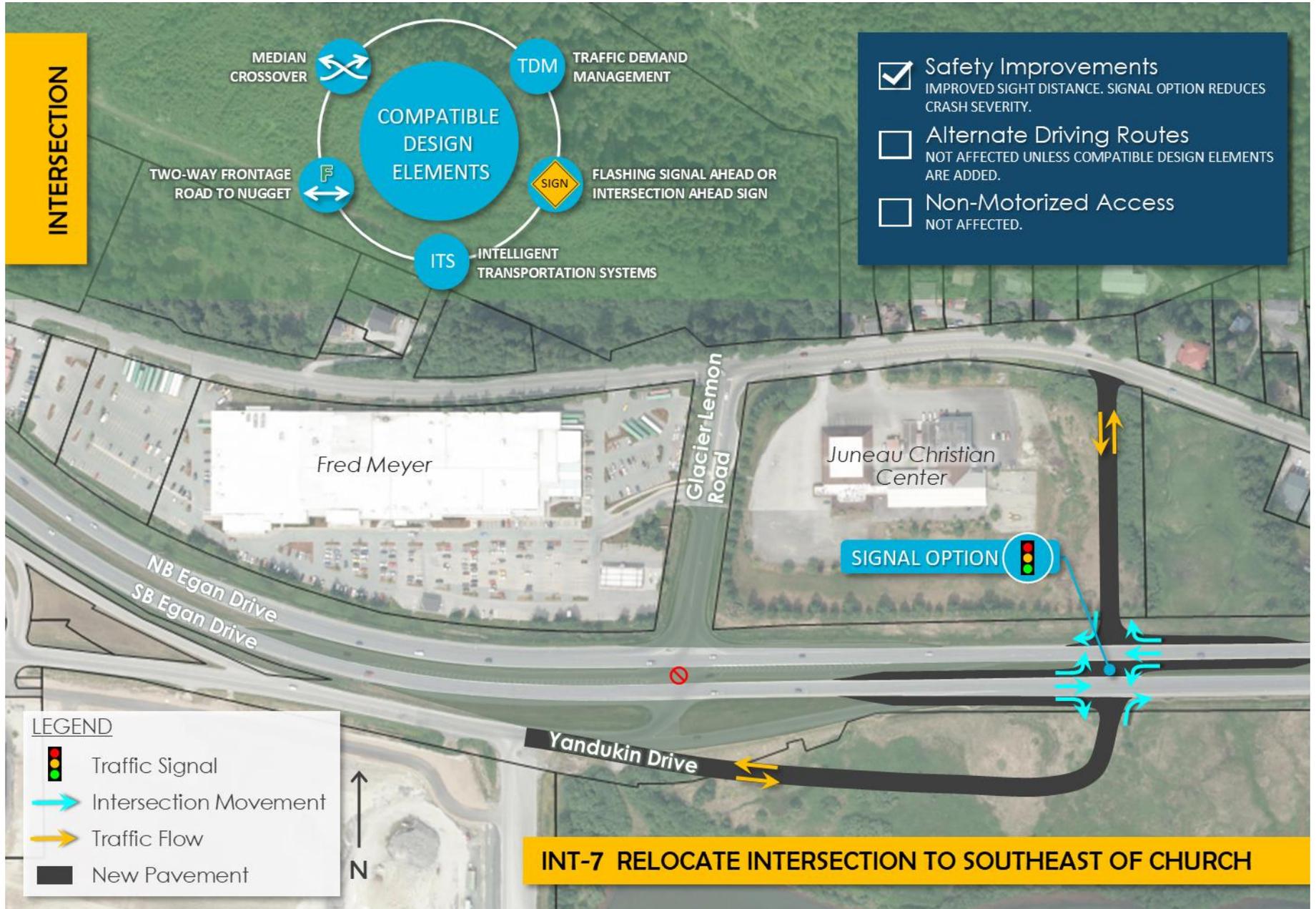


INT-7. Relocate Intersection to Southeast of Church

This alternative relocates the E-Y intersection southeast to the other side of the church and has the option of being signalized. Moving the intersection would improve sight distance for left-turning traffic by moving the intersection away from the horizontal curve between the E-Y intersection and the Glacier-Nugget intersection. The intersection could operate under the same type of control as the existing intersection, or a signal could be installed to control traffic movements.

Compatible design elements that can help address the project purpose, needs, and goals include:

- Travel Demand Management
- Intelligent Transportation Systems
- Flashing Intersection Ahead Sign or Signal Ahead Sign, as appropriate
- Median Crossover
- Two-way Frontage Road to Glacier-Nugget

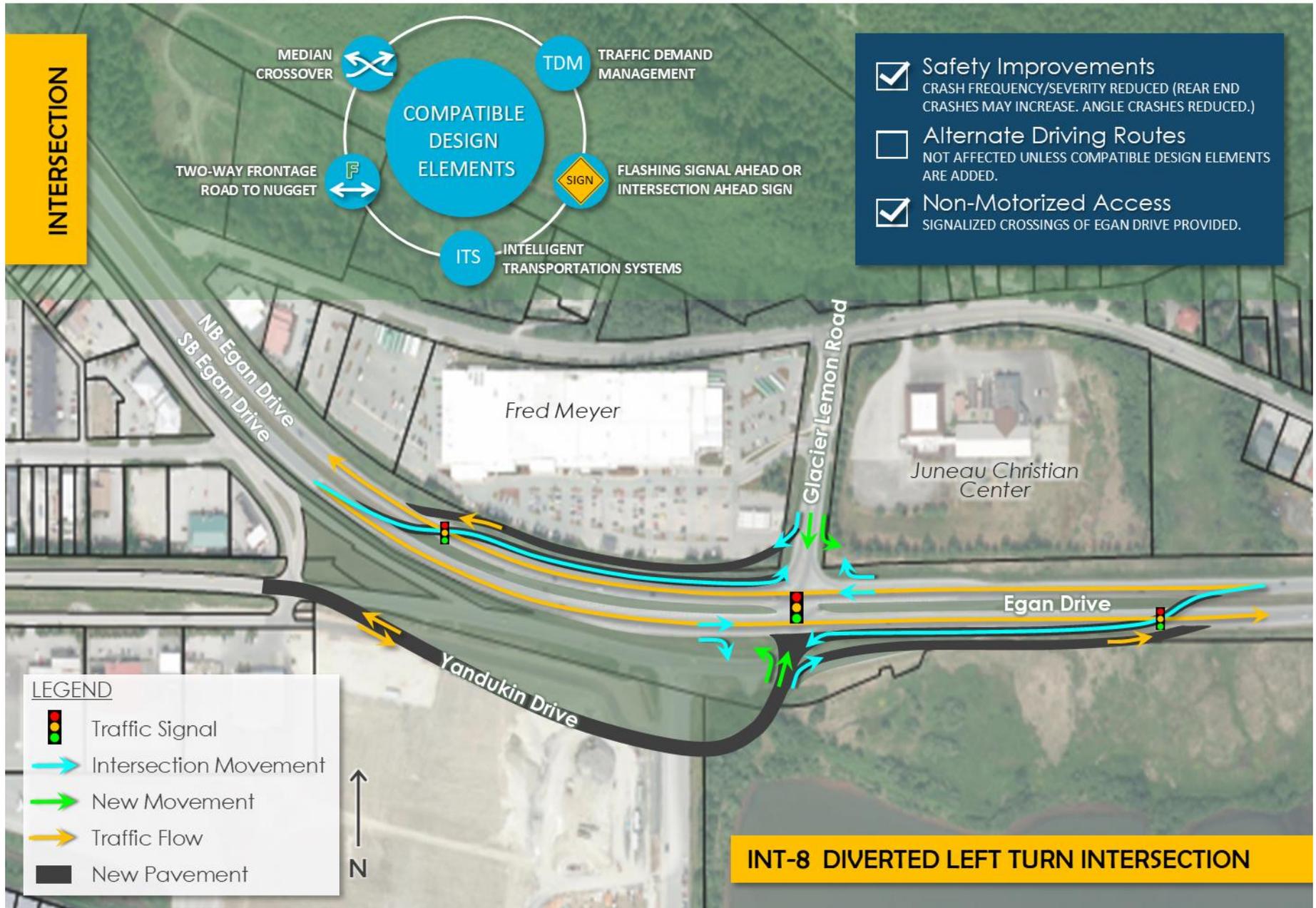


INT-8. Diverted Left Turn Intersection

This alternative would build an innovative, more efficient signal at the E-Y intersection. In addition, two crossover signals on Egan Drive (approximately 1,000 feet to either side of the E-Y intersection) would carry vehicles desiring to turn left at the E-Y intersection across opposing traffic, after which the left-turn traffic would travel to the E-Y signal. At the E-Y intersection, all traffic movements would be signalized, and (because left turns have already crossed over the oncoming through traffic) Egan Drive left turn and oncoming through vehicles would be able to enter the intersection at the same time.

Compatible design elements that can help address the project purpose, needs, and goals include:

- Travel Demand Management
- Intelligent Transportation Systems
- Flashing Signal Ahead Sign
- Median Crossover
- Two-way Frontage Road to Glacier-Nugget

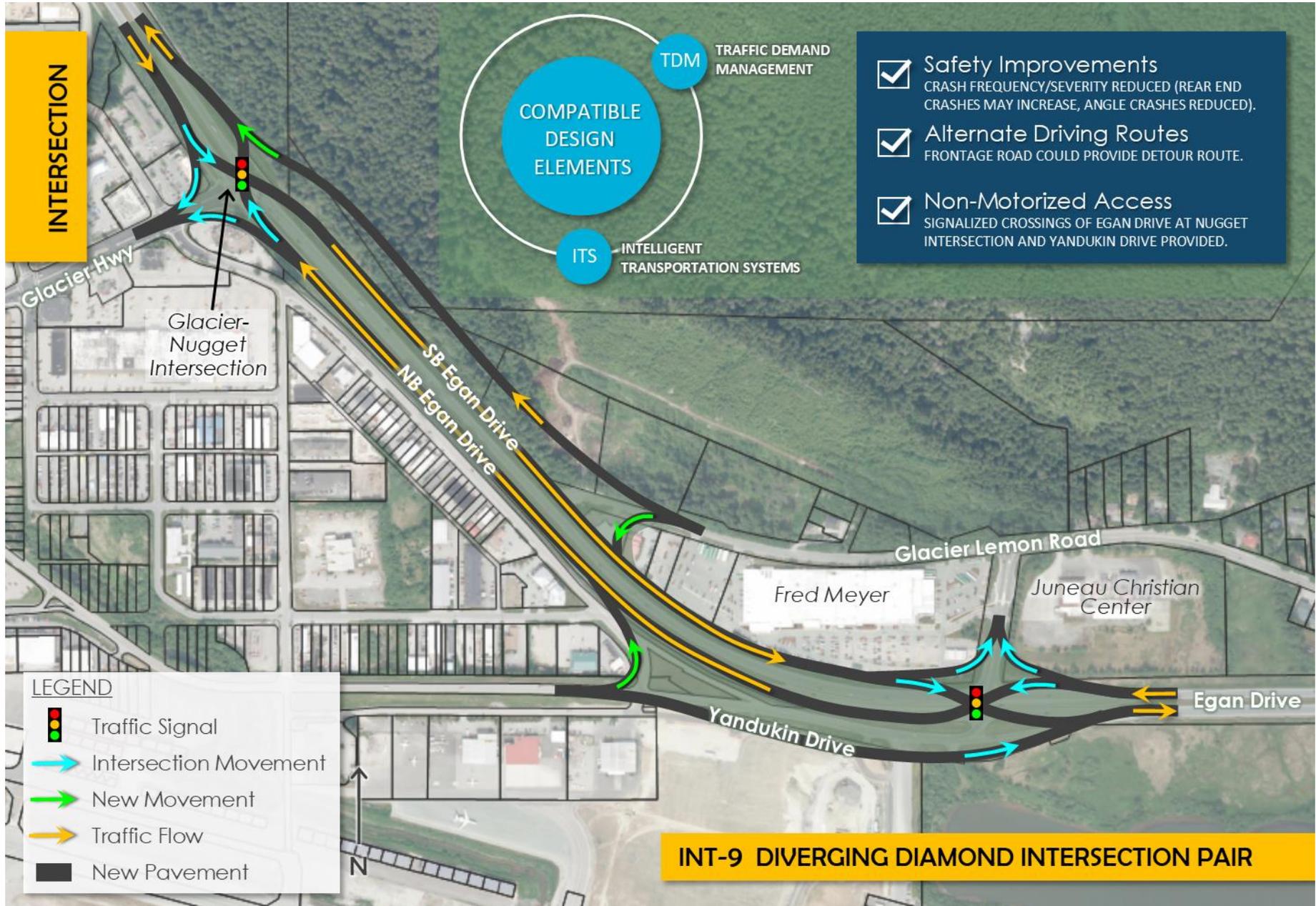


INT-9. Diverging Diamond Intersection Pair (Glacier-Nugget and Yandukin Intersections)

This alternative would build two crossover signals at the Glacier-Nugget and E-Y intersections. In between the two signals, through traffic would be traveling on the left side of opposing through traffic. The crossovers allow Egan Drive traffic to turn left onto Glacier-Nugget Road or onto Yandukin Drive or Glacier-Lemon Road without conflicting with high-speed Egan Drive through traffic. Pedestrian crossings would be provided at the signals.

Compatible design elements that can help address the project purpose, needs, and goals include:

- Travel Demand Management
- Intelligent Transportation Systems

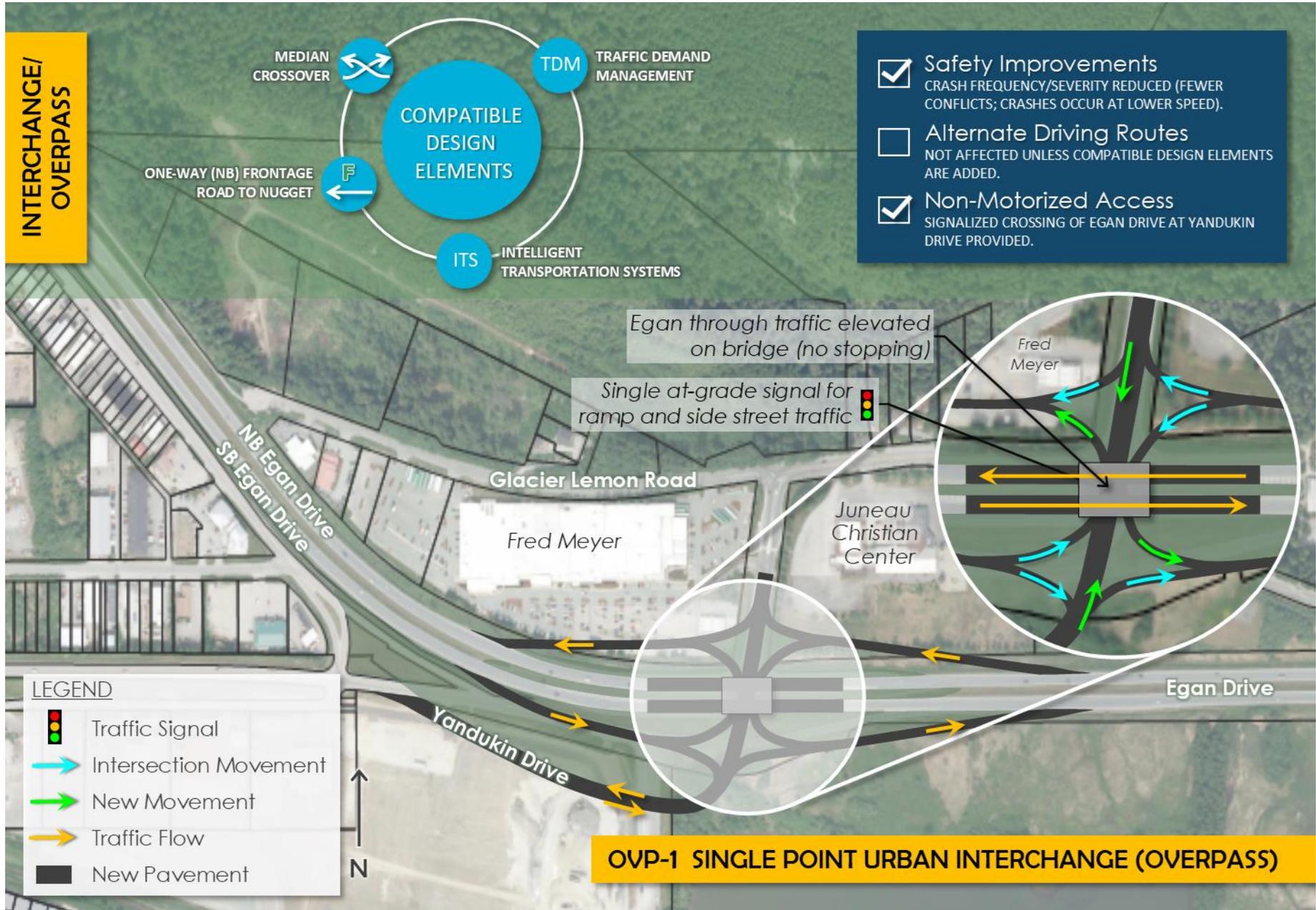


OVP-1. Single Point Urban Interchange (Overpass) at E-Y Intersection

This alternative would convert the E-Y intersection into a single point interchange (overpass). Egan Drive through traffic would be raised up and over the Yandukin intersection without stopping, while a single signal would control ramp and side street traffic. The interchange separates high-speed Egan Drive traffic from other movements. Signalized crossings would be provided for pedestrians to cross lower speed traffic.

Compatible design elements that can help address the project purpose, needs, and goals include:

- Travel Demand Management
- Intelligent Transportation Systems
- Median Crossover
- One-way Frontage Road to Glacier-Nugget

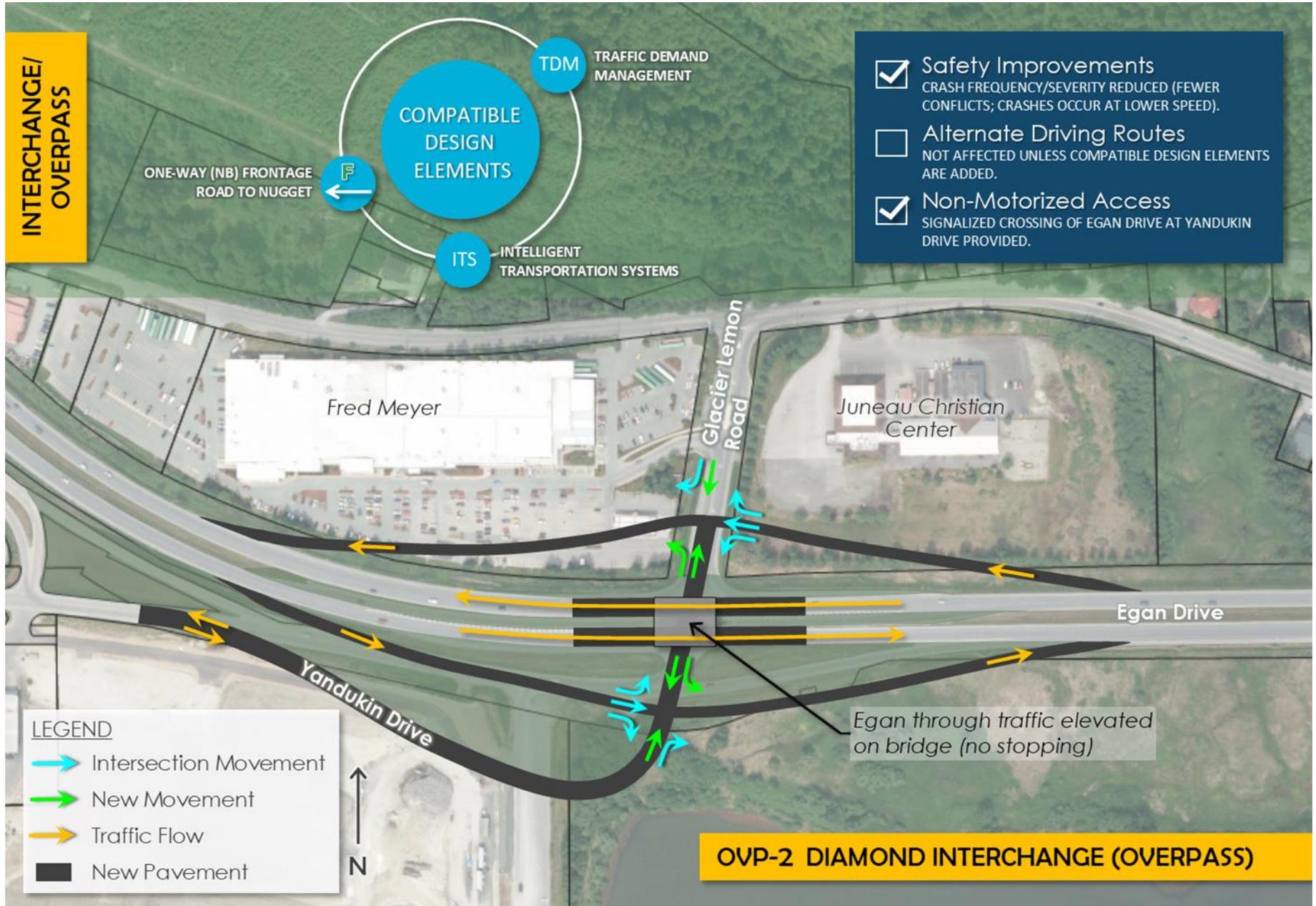


OVP-2. Diamond Interchange (Overpass) at E-Y Intersection

This alternative would convert the E-Y intersection into a diamond interchange. Egan Drive through traffic would be raised up and over the Yandukin intersection without stopping, while ramp and side street traffic would be controlled at two ramp intersections. The interchange separates high-speed Egan Drive traffic from other movements. Controlled crossings would be provided for pedestrians to cross lower speed traffic.

Compatible design elements that can help address the project purpose, needs, and goals include:

- Travel Demand Management
- Intelligent Transportation Systems
- One-way Frontage Road to Glacier-Nugget



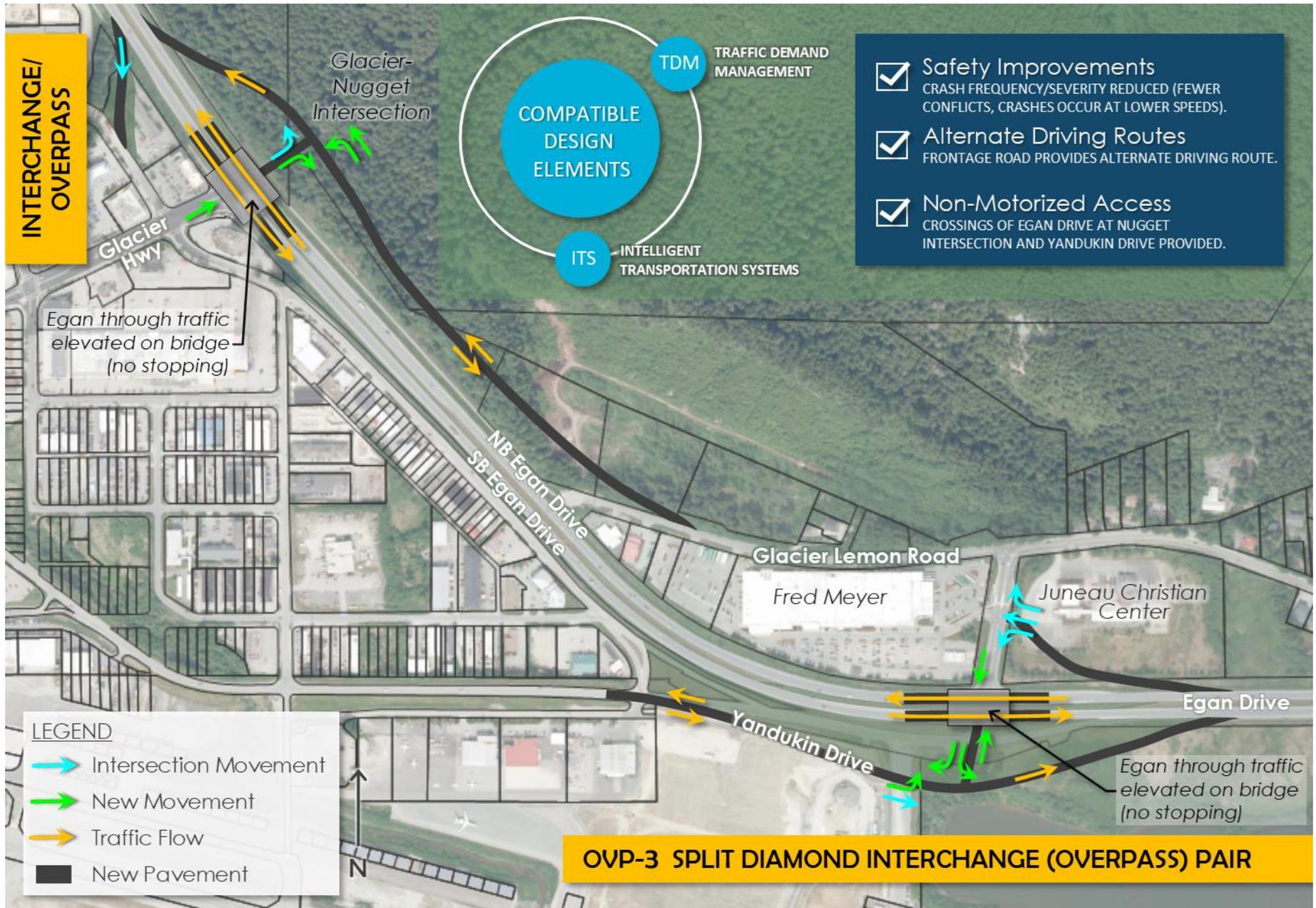
OVP-3. Split Diamond Interchange (Overpass) Pair (Glacier-Nugget and Yandukin Intersections)

This alternative would build half-diamond interchanges (overpasses) at the Glacier-Nugget and E-Y intersections. Egan Drive through traffic would be raised up and over both intersections without stopping, and signals would control ramp and side street traffic. The Glacier-Nugget interchange ramps would carry side street vehicles to and from the Mendenhall Valley, while the E-Y interchange ramps would carry side-street vehicles traveling to and from downtown. The alternative would also extend the frontage road (Glacier-Lemon Road) one way to the Glacier-Nugget intersection for northbound vehicles. Optionally, the frontage road could be built for two-way traffic. Dairy Road would serve as a frontage road on the opposite side of the highway.

The frontage road system (Glacier-Lemon Road and Old Dairy Road) would provide alternate routes along Egan Drive. Controlled crossings would be provided for pedestrians to cross lower speed traffic.

Compatible design elements that can help address the project purpose, needs, and goals include:

- Travel Demand Management
- Intelligent Transportation Systems



Appendix A: Treatments Considered

The project team considered all treatments suggested by the public, as well as additional possible treatments identified by the team. The goal of this exercise was to ensure that a wide range of alternatives was considered. The original list of possible treatments was refined to eliminate ideas that were unfeasible, or that were identified as having significantly more impacts compared to similar treatments without additional benefit.

lists treatments that were included in the alternatives described in this white paper.

Table 2 lists treatments that were not carried forward into the alternatives for further consideration and the reasons for rejecting them.

A STOP control analysis for the northbound right-turn lane (from Egan Drive onto Glacier Lemon) is included on page 42.

Table 1. Treatments Included in Alternatives

	Treatment Description	Public Input
ELE-1	Initiate an education campaign to encourage safe driving	2 comments
	Encourage employers to time shift workers to reduce the peak traffic volumes	1 comment
	Encourage teleworking to reduce peak traffic volumes	
	Encourage use of transit to reduce peak traffic volumes	
	Use techniques for clearing crashes more quickly	
ELE-2	Reduce speed	8 comments
	Use speed feedback signs	2 comments
	Email/text message crash warning and travel time (like 511 or Nixle alert)	
	Use changeable message sign with crash warning and travel time	
	Use traffic cameras at E-Y intersection	
	Use traffic calming measures	
ELE-3	Use warning signs and lights	4 comments
ELE-4	Build median crossover points to keep traffic moving after crash	
ELE-5	Extend Glacier-Lemon to Nugget (close median at E-Y); can be 1-way or 2-way	34 comments
ELE-6	Build side street connection under Egan	1 comment
CLS-1 & CLS-2	Close median (Glacier-Lemon Extension to Nugget)	15 comments
CLS-3	Build interchange at Nugget, with Glacier-Lemon Extension	4 comments
INT-1	Build HSIP interim alternative (separate northbound right turn from through traffic, adjust median geometry, reduce speeds seasonally)	3 comments
	Extend length of northbound right-turn lane	2 comments
INT-2	Use partial access signal (no lefts out)	
INT-3	Use full access signal (all movements)	17 comments for signalization in general
INT-4	Close Nugget and signalize E-Y	1 comment
INT-5	Build roundabout (partial access or full access)	
INT-6	Split intersection to form two T-intersections to improve sight distance	
	Split intersection to form two T-intersections and signalize	
INT-7	Move intersection to improve sight distance (e.g., other side of church)	2 comments
INT-8	Build continuous flow or diverted left intersection	
INT-9	Build diverging diamond intersection pair	
OVP-1	Build single point interchange	11 comments for interchanges in general
OVP-2	Build diamond interchange (ramp terminal stop, signal, or roundabout control)	
OVP-3	Build half-diamond intersection at both Nugget and Yandukin	

Table 2. Treatments Considered and Rejected

Treatment Description	Public Input	Reasons for Rejecting
Close median by time of day or seasonally	3 comments	Turning prohibitions tend to be ignored without something that actually blocks vehicles from turning. Installing physical barriers either by time of day or seasonally would be a significant Maintenance and Operations burden. In addition, the irregularity of a closure may result in drivers slowing to determine if the median is closed, which could increase the chance of accidents.
Use dynamic feature that helps drivers assess safe gaps for left turns	3 comments	A dynamic feedback feature that would tell left-turn drivers when it is safe to cross has not been commercialized and is not readily available.
Use speed enforcement cameras and a ticketing lottery incentive program	1 comment	Neither one of these treatments has been used elsewhere in the state, so their use would require education and public support. Both suggestions are related to drivers speeding, which is a problem on Egan Drive in the study area. These treatments would not be effective as a stand-alone alternative.
Use intersection lighting	2 comments	Intersection lighting is currently installed and operating as planned.
Extend merge length turning from Glacier-Lemon to the north	2 comments	This treatment could allow turning vehicles more time to reach highway speeds before entering the highway. It is not a stand-alone treatment but could be considered in design.
Use stop control for northbound right-turn lane (see explanation on page 42)	2 comments	Stop control is not justified at this location due to national standards.
Adjust signal timing at upstream intersections to provide more gaps	1 comment	This was evaluated in development of interim solutions and dismissed because analysis showed no improvement in the number of gaps available for making left turns.
Extend Glacier-Lemon to Mendenhall Loop (similar to WEDCOR study alternative)		Analysis of this extension is outside of this project's study area. ELE-5 and several alternatives include extending Glacier-Lemon to the Glacier-Nugget intersection.
Build frontage system on airport side		This does not improve any purpose or need elements because there is already a parallel route to Egan Drive in this segment, and traffic patterns suggest that few vehicles would benefit from this additional parallel route. This also encroaches on airport property.

Treatment Description	Public Input	Reasons for Rejecting
Build half clover interchange (see figure on page 43)		This type of interchange has substantial right-of-way impacts. OVP-1 and OVP-2 are interchange types that will have similar operational and safety benefits compared to this type of interchange. Thus, this is not a reasonable alternative due to much higher impacts for no added project benefit.
Signalize two T-intersections to connect to Glacier-Lemon (one to the north and one to the south) (see figure on page 44)		This alternative is similar to INT-6 in that it adds two fully signalized intersections on Egan Drive. However, it does not provide a detour route in case of an accident at either signal, while INT-6 does provide a detour route under those conditions. This is not a reasonable alternative due to increased delay with less benefit when compared to INT-6.
Build at-grade diamond or “New Jersey left” intersection		This type of interchange has substantial right-of-way impacts without any expected benefit to safety or operations over other intersection alternatives. This is not a reasonable alternative due to much higher impacts (including to the wetland in the southwest quadrant of the intersection) for no added project benefit. INT-8 has similar operational characteristics with fewer conflicts and fewer right-of-way impacts.

Stop Control for Northbound Right-turn Lane

The 2009 *Manual on Uniform Traffic Control Devices for Streets and Highways* (MUTCD) offers the following guidance regarding the use of STOP signs.

Section 2B.06 STOP Sign Applications

Guidance
01 <i>The use of STOP signs on the minor-street approaches should be considered if engineering judgement indicates that a stop is always required because of one or more of the following conditions:</i>

The northbound right turning movement only conflicts with the southbound left turning movement; and therefore, the southbound left-turn traffic acts as the crossing through traffic for the northbound right-turn movement.

Condition	Met or Not Met?	Explanation
A. <i>The vehicular traffic volumes on the through street or highway exceed 6,000 vehicles per day;</i>	Condition Not Met	There are approximately 3,000 southbound left-turn vehicles per day, well below the 6,000 vehicle per day threshold.
B. <i>A restricted view exists that requires road user to stop in order to adequately observe conflicting traffic on the through street or highway;</i>	Condition Not Met	Views from the northbound right-turn lane to view southbound left-turn vehicles are not restricted.
C. <i>Crash records indicate that three or more crashes that are susceptible to correction by the installation of a STOP sign have been reported within a 12-month period, or that five or more such crashes have been reported within a 2-year period. Such crashes include right-angle collisions involving road users on the minor-street approach failing to yield to the right-of-way to traffic on the through street or highway.</i>	Condition Not Met	Crashes mitigated by STOP signs would involve conflicts between southbound left-turning vehicles and northbound right-turning vehicles. A detailed examination of crashes at the intersection between 2005 and 2017 found only two crashes between southbound left-turn vehicles and northbound right-turn vehicles, one in 2013 and one in 2016. As such, this condition is not met.

Half Cloverleaf Interchange



Signalized T-Intersections to Glacier-Lemon



Appendix B: Purpose and Need

DRAFT

Egan / Yandukin Intersection Improvements Project - SFHWY00079

Purpose and Need

Purpose

The purpose of the Egan and Yandukin Intersection Planning and Environmental Linkages (PEL) Study is to identify ways to improve transportation safety for all users. The secondary purposes are to identify ways to improve mobility and route diversity in the transportation grid, improve access and mobility for pedestrian and bicyclists, and maintain traffic capacity and flow through the Egan Drive and Yandukin Drive intersection and the surrounding area.

Need

Transportation improvements will address the following needs:

- **Safety** – The traveling public has expressed concerns regarding intersection safety. Crash frequency at this intersection is similar to the statewide average for similar intersections. Data show that out of a total of 86 crashes between 2005 and 2017, seven involved major injuries. While there have been no fatalities at the intersection, nearly 48% of all crashes involved some sort of injury.
- **Alternate Driving Routes** – Motorists traveling between the Mendenhall Valley and downtown are limited to using a single roadway, Egan Drive, for travel. Juneau businesses rely on the intersection as a vital component of the connection between downtown, Juneau International Airport, Mendenhall Valley and points further out the road. When an accident occurs on Egan Drive, the lack of an alternate route directly affects travel time reliability, particularly during peak travel times. The lack of an alternate route results in area-wide congestion and traffic delays when collisions occur, and increases overall perception of the crash rate and severity at the intersection.
- **Non-Motorized Access** – The nearest controlled crossing of Egan Drive for pedestrians and bicyclists is 3/4 miles north from the Egan Drive and Yandukin Drive intersection. Bicyclists and pedestrians unwilling to follow the lengthy, circuitous path often cross Egan Drive at Yandukin Drive, which is illegal and unsafe.

Additional Goals

- Provide improvements which are consistent with approved land use plans and ordinances.
- Consider designs that maintain or improve access to and visibility of businesses.
- Transportation improvements should support opportunities for economic development and support planned future land uses.
- Seek to minimize increases in vehicle delay, especially during the peak morning and evening commuting time periods, to maintain the high mobility function of the corridor.

05-27-2020