

Alternatives Analysis Summary Memo

MEMORANDUM

DATE: December 3, 2019

SUBJECT: Steese Expressway/Johansen Expressway Interchange: Summary of Build Alternative Memos

The Alternatives Analysis Report for the Steese Expressway/Johansen Expressway Interchange project was completed in November 2018 and was presented to the public via several outlets, including an Open House (held December 6, 2018), an online survey that was open to the public from November 28, 2018 to January 4, 2019, and in one-on-one meetings with local businesses. The Alternatives Analysis Report compared 12 alternatives using screening criteria that had been developed with the project Steering Committee. Based on the results of the screening criteria analysis, as well as public comment, three build alternatives at the intersection were chosen to be included in the Environmental Assessment:

- **Tight Diamond Interchange:** The Tight Diamond Interchange will be grade separated with northbound and southbound traffic on the Steese Expressway crossing over the Johansen Expressway unimpeded. Movements along Johansen Expressway will be controlled by two signalized intersections located at the ramp terminals. (Figure 1)
- **Diverging Diamond Interchange:** The Diverging Diamond interchange will also grade separate Steese Expressway traffic over the Johansen Expressway, similar to the Tight Diamond, except that the ramp terminals will be controlled by two cross-over signalized intersections, allowing free-flow left and right turns at the ramp terminals. (Figure 2)
- **Echelon Interchange:** The Echelon Interchange consists of two grade separated signalized intersections, each one serving only one direction of traffic on the Steese Expressway and one direction of traffic on the Johansen Expressway. This allows high volume conflicting movements to travel through different intersections, providing more green time for all movements. (Figure 3)

In addition, the option to extend Farmers Loop Road Extension to connect Farmers Loop Road with the Johansen Expressway at Old Steese Highway is included in the Environmental Assessment. The new connection would offer traffic maintenance during construction, and would provide a secondary route in the case of an incident closing Steese Expressway that is expected to be lost with the closure of City Lights Boulevard. (Figure 4)

This memo summarizes additional design efforts and analyses completed to either address stakeholder concerns or provide information needed for the Environmental Assessment. This memo also reevaluates the three build alternatives against the screening criteria initially presented in the Alternatives Analysis Report.

Table 1 summarizes the alternative enhancements considered to address stakeholder concerns.

Table 1: Alternative Enhancement Matrix

Alternative Description	Enhancement Title	Enhancement Description	Advantages	Disadvantages	Incorporated?	Reason for Evaluating	See Discussion
All Interchanges	Bridge Clearance	Determine cost reasonable structure design height (18, 19, or 22-ft) for accommodating overheight traffic.	19-ft determined cost reasonable	22-ft cost prohibitive	Y	Trucking industry comment	on page 16
All Interchanges	Cemetery Internal Circulation	Resolve internal circulation issues at the Birch Hill Cemetery due to closure of City Lights Boulevard south of the northern entrance.	N/A	N/A	Y	Determine if curing ROW take impacts to the cemetery is feasible.	on page 15
All Interchanges	Dedicated Farmers Loop Ramp	Evaluate options to reduce weaving conflicts for traffic heading from Johansen Expressway to Farmers Loop Road.	Reduces weaving conflict for Farmers Loop bound Johansen traffic	Confusing to drivers, cost prohibitive, increases project footprint with no measurable capacity benefit	N	Public comment	on page 16
Diverging Diamond Interchange	City Lights Access	Provide continued City Lights Boulevard connection to Lazelle Road (one-way northbound).	Maintain current traffic pattern for regular users and emergency response time	Cemetery impacts, ramp weaving conflicts, cost	Y	Public comments, maintaining existing cemetery circulation	on page 11
Echelon Interchange	City Lights Access	Provide continued City Lights Boulevard connection to Lazelle Road.	Maintain current traffic pattern for regular users and emergency response time	Cemetery impacts	TBD	Public comments, maintaining existing cemetery circulation	on page 11
Echelon Interchange	D Street Connection	Evaluate options to provide access for properties using D Street for access to Lazelle Road.	Provides westbound access for D Street traffic, can accommodate future subdivision growth	Cost	Y	Minimize adverse traffic impacts to area properties	on page 11
Echelon Interchange	Echelon Swap	Reverse intersection legs on bridge structure (NB/WB elevated vs. SB/EB elevated)	Lowest cost, best car dealership visibility	Increased pedestrian crossing time	Y	Cost, visual impacts	on page 9
Tight Diamond Interchange	City Lights Access	Provide continued City Lights connection to Lazelle Road (one-way northbound).	Maintain current traffic pattern for regular users and emergency response time	Cemetery impacts, ramp weaving conflicts, cost	Y	Public comments, maintaining existing cemetery circulation	on page 11
Tight Diamond Interchange	Dual Lefts	Replace triple eastbound lefts with dual lefts at the Johansen/Steese Expressways ramp signal.	Familiar to local drivers	Will not meet required capacity needs	N	Public comment	on page 15
Tight Diamond Interchange	Roundabout Intersections	Replace signalized intersections with roundabouts.	Will meet capacity requirements without FTWW gate relocation traffic	Dual lane roundabouts required, will not meet capacity requirements if FTWW gate is relocated	N	Public comment	on page 15

Summary of Changes to Proposed Alternative Designs

Based on the additional design efforts and analyses, the following changes were made to the design for the three build alternatives prior to including them in the Environmental Assessment document:

- For all three interchange alternatives, the minimum bridge clearance was raised from 18 feet to 19 feet to accommodate overheight vehicles, due to comments from the freight community.
- In recognition of the urban nature of the project, and to reduce ROW impacts, the proposed typical section for the Farmers Loop Road Extension was narrowed from 12-foot lanes with 8-foot shoulders (40-foot paved) to 11-foot lanes with 4-foot shoulders (30-foot paved).
- For the Echelon alternative, the elevated and at-grade intersections were swapped, so that the intersection with the smaller footprint is carried on the elevated bridge.
- For the Echelon alternative, the eastbound approach is designed with a channelized right turn lane. (In the Alternatives Analysis Report, the eastbound right turns are accommodated with a through-and-right turn lane.)

Several options for maintaining a connection to City Lights Boulevard were considered for the various alternatives:

- One-way connection from the northbound on ramp to City Lights Boulevard (Tight Diamond or Diverging Diamond Interchange)
- Left-in-left-out connection to and from the eastbound departure lanes on Lazelle Road (traveling under the westbound approach lanes – Echelon Interchange only)

Traffic Control Considerations during Construction

An analysis of the surrounding road network during construction, based on proposed detour routes, indicated that travel times would increase by as much as 30 minutes during the heaviest traffic periods under detoured traffic and led to proposed mitigations to implement during construction. Proposed mitigations, include:

- Construct Farmers Loop Road Extension prior to any construction at the Steese Expressway/Johansen Expressway intersection. Consider installing a 100-foot long right turn lane on Farmers Loop Road Extension for vehicles turning right onto Farmers Loop Road.
- Do not construct improvements planned for Old Steese Highway at the same time as the Steese-Jo intersection improvements.
- Install a temporary signal at the Farmers Loop Road/Farmers Loop Road Extension intersection.
- Install a temporary signal at the Northside Boulevard/Harold Bentley Avenue intersection.
- Consider changes to lane assignments to provide more capacity for heavy detour movements at some intersections.
- Install flashing yellow arrow for permitted left turns at impacted signalized intersections. Flashing yellow arrow is already planned for some of these intersections.
- Adjust signal timing.

By making the proposed mitigations during construction, travel times would only be 5 to 10 more minutes than it takes under existing conditions.

Build Alternative Impacts Memos

These four memos (attached) provide a description of the concept designs for the three build alternatives proposed for the Environmental Assessment, as well as design considerations for comparing the alternatives, including traffic management and constructability, drainage, maintenance, visibility to the car dealership, and access to the Birch Hill Cemetery. The memos also present the preliminary bridge designs, impacts to right-of-way (ROW), and a rough order of magnitude cost estimate to construct the alternatives. The referenced figures show the proposed designs.

Memo	Design Alternative	See Figure
BAI1	Tight Diamond Interchange	Figure 1
BAI2	Diverging Diamond Interchange	Figure 2
BAI3	Echelon Interchange	Figure 3
BAI4	Old Steese to Farmers Loop Road Connection	Figure 4

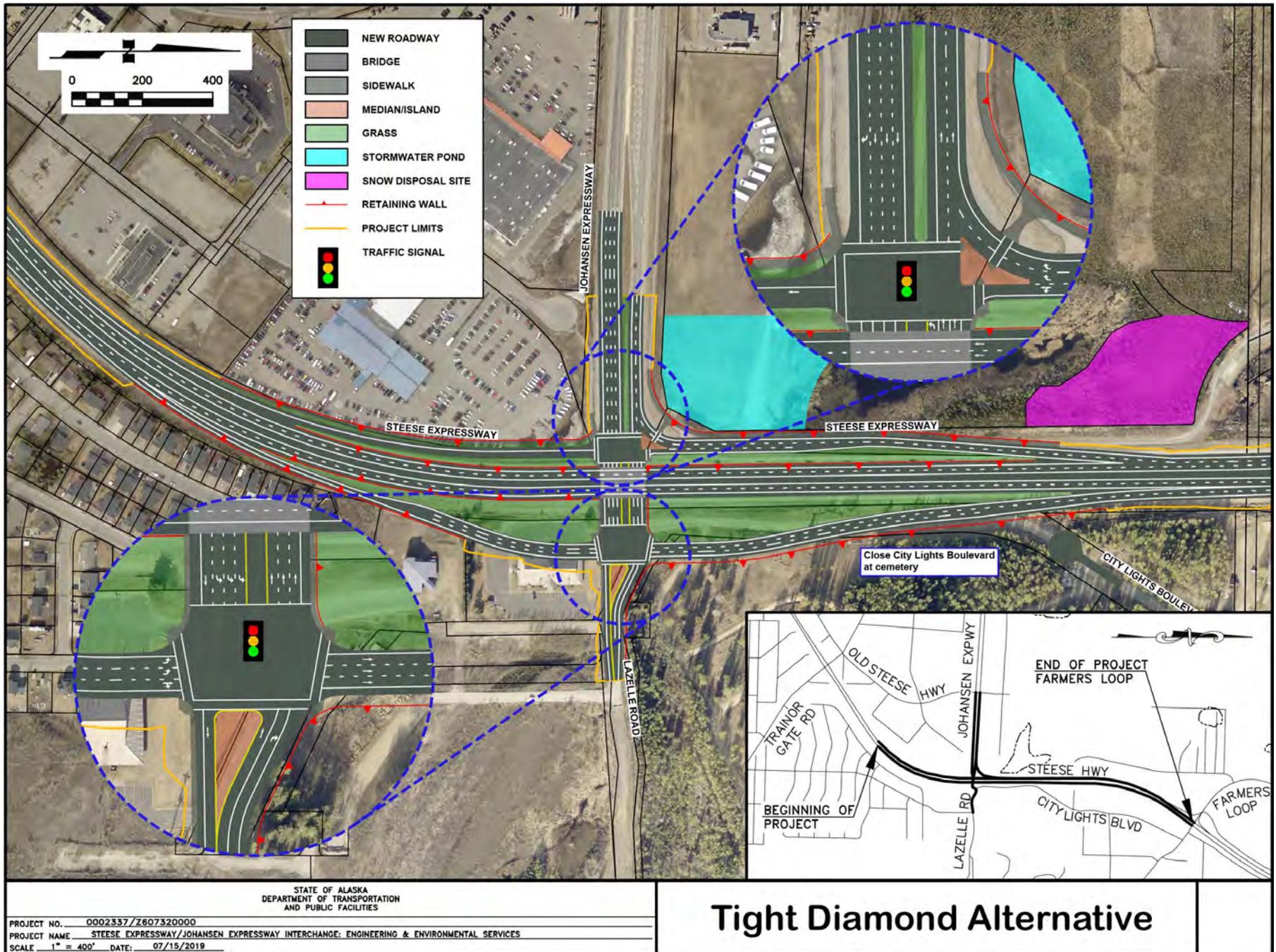


Figure 1: Tight Diamond Interchange Proposed Design

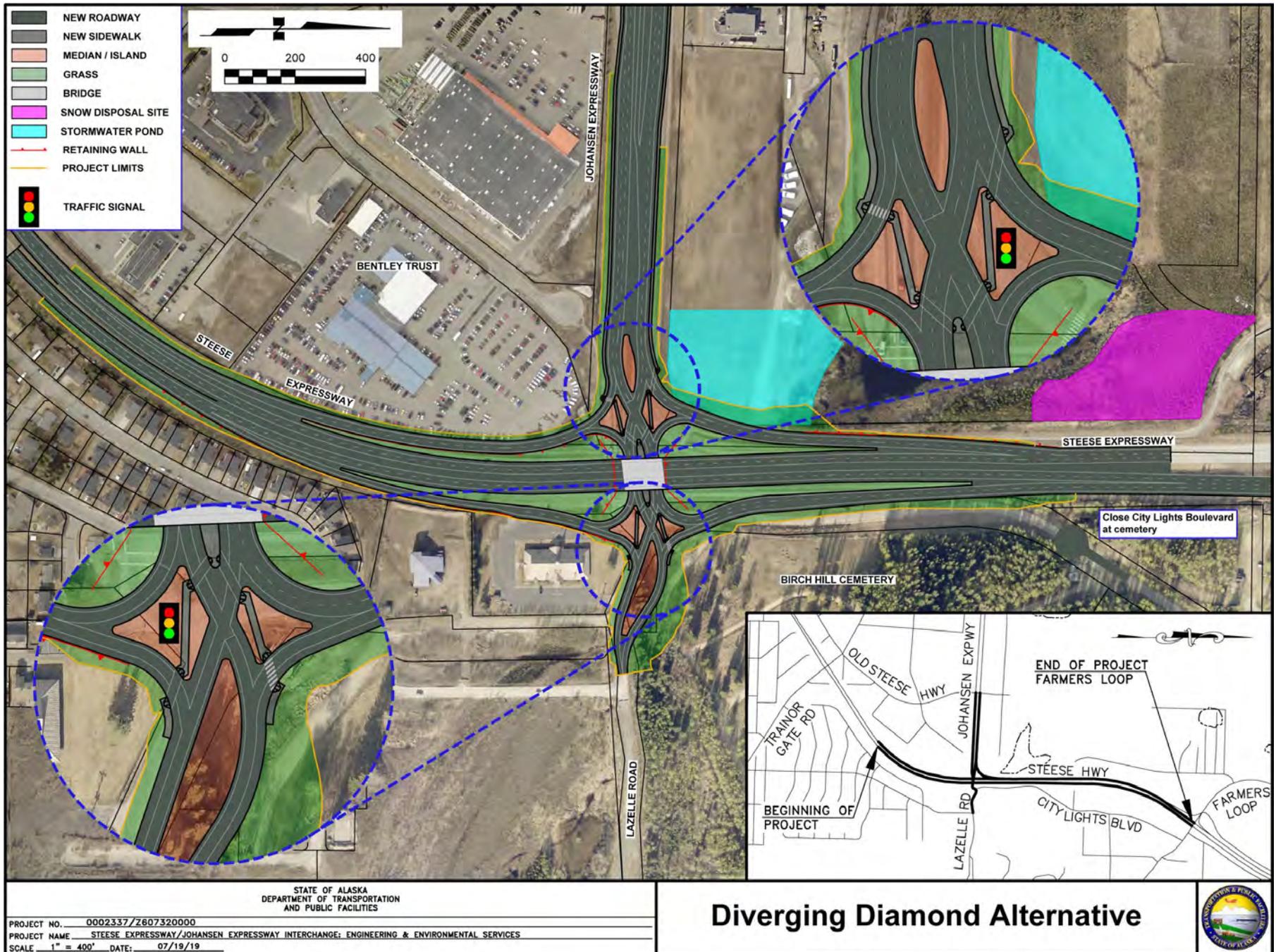
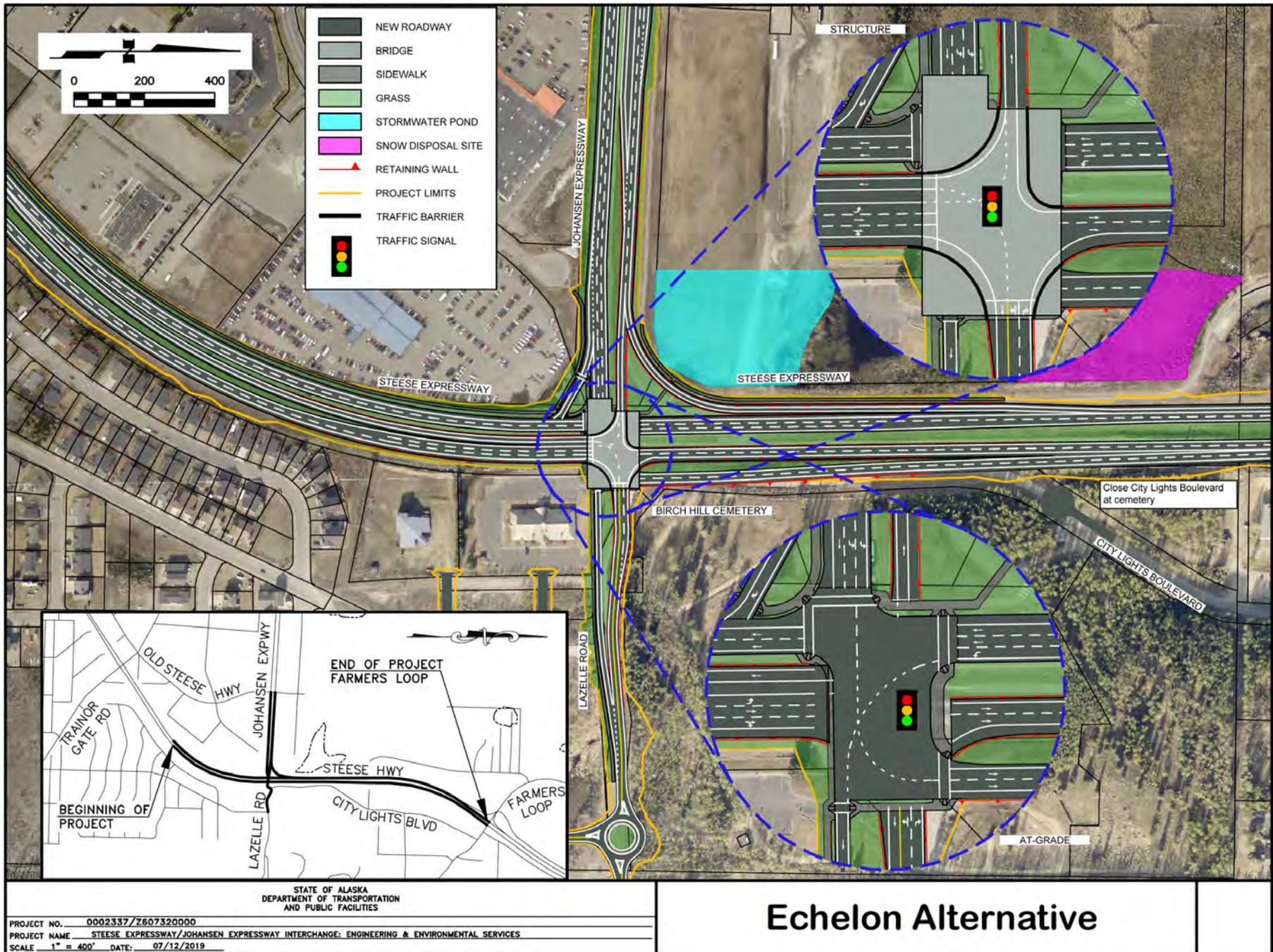


Figure 2: Diverging Diamond Interchange Proposed Design



Echelon Alternative

Figure 3: Echelon Interchange Proposed Design

Build Alternative Evaluations

Eight memos (attached) were written to evaluate different aspects of the design and operations and to document design changes that were made. Table 2 summarizes the memos and their respective considerations. A summary of each memo is provided in the following sections.

Table 2: Design Considerations and the Referencing Build Alternatives Evaluation Memo

Memo	Build Alternatives Evaluation	Design Considerations	See Figure
BAE1	Comparative Analysis of Echelon with westbound/northbound lanes at-grade versus southbound/eastbound lanes at-grade and optional at-grade channelized right turns	Echelon: Exchange lanes entering at-grade intersection and lanes entering elevated intersection	Figure 5
		Echelon: Added channelized at-grade eastbound right turn lane	
BAE2	Modifications to D Street realignment to address replat and future subdivision	Echelon: Lazelle Road U-turn roundabout and D Street subdivision connection	Figure 6
BAE3	City Lights Boulevard and Birch Hill Cemetery Access	Echelon: City Lights Boulevard access to Lazelle Road	Figure 6
		Tight Diamond and Diverging Diamond: One-way connection from northbound on-ramp to City Lights Boulevard	Figure 7
		All Interchanges: Changes to cemetery access roads	Figure 9
BAE4	Dual Left Turns and Roundabouts at the Tight Diamond Interchange Ramp Intersections	Tight Diamond: Intersection traffic control was not changed	Figure 10
BAE5	Bridge Clearance Options Analysis	Minimum bridge clearance changed from 18 feet to 19 feet	N/A
BAE6	Dedicated ramp from Johansen to Farmers Loop	Dedicated eastbound left turn ramp to Farmers Loop Road not recommended	Figure 11
BAE7	Constructability Review	All Interchanges are constructable.	Figure 12
BAE8	Construction Detour Traffic Impacts	Farmers Loop Road Extension: Consider constructing 100-foot long northbound right turn lane.	Figure 13 through Figure 15

Echelon Interchange – Exchange at-grade and elevated intersections (see BAE1)

Figure 5 compares the Echelon design from the Alternatives Analysis Report and the proposed Echelon design for the Environmental Assessment. The design for the Echelon Interchange initially shows the intersection of the eastbound and southbound approaches elevated on a bridge, with the intersection of the westbound and northbound approaches at-grade. The BAE1 memo analyzes the Echelon with the eastbound-southbound intersection at-grade and westbound-northbound intersection elevated on a bridge structure. The memo compares the vehicle and pedestrian operations for both configurations. Because the westbound-northbound intersection has a smaller footprint, the bridge structure is smaller when the westbound-northbound intersection is elevated. While vehicle and pedestrian delay is not the same for both configurations, the delay is similar. Therefore, the changed configuration is recommended for the design shown in the Environmental Assessment.

Echelon Interchange – Channelized at-grade right turns (see BAE1)

For the Echelon Interchange design in the Alternatives Analysis Report, the right turn movements are accommodated in shared through-and-right lanes. (Except for the heavy southbound right turn movement, which is accommodated as a free right turn movement.) While the report indicates that the right turn volumes for these movements could be accommodated by the shared through-and-right design, the BAE1 memo looks at the operational benefit and design impacts of building separate right turn lanes for the westbound, northbound, and eastbound right turn movement. Based on the analysis, the eastbound right turn is recommended as a separated right turn channelized at-grade lane under yield control. This would provide increased capacity at the eastbound signal; pedestrians would cross the turn lane with acceptable delay (< 5 seconds per pedestrian); and minimal additional ROW would be needed. However, due to ROW impacts, separated channelized right turn lanes for the northbound and westbound movements are not recommended.

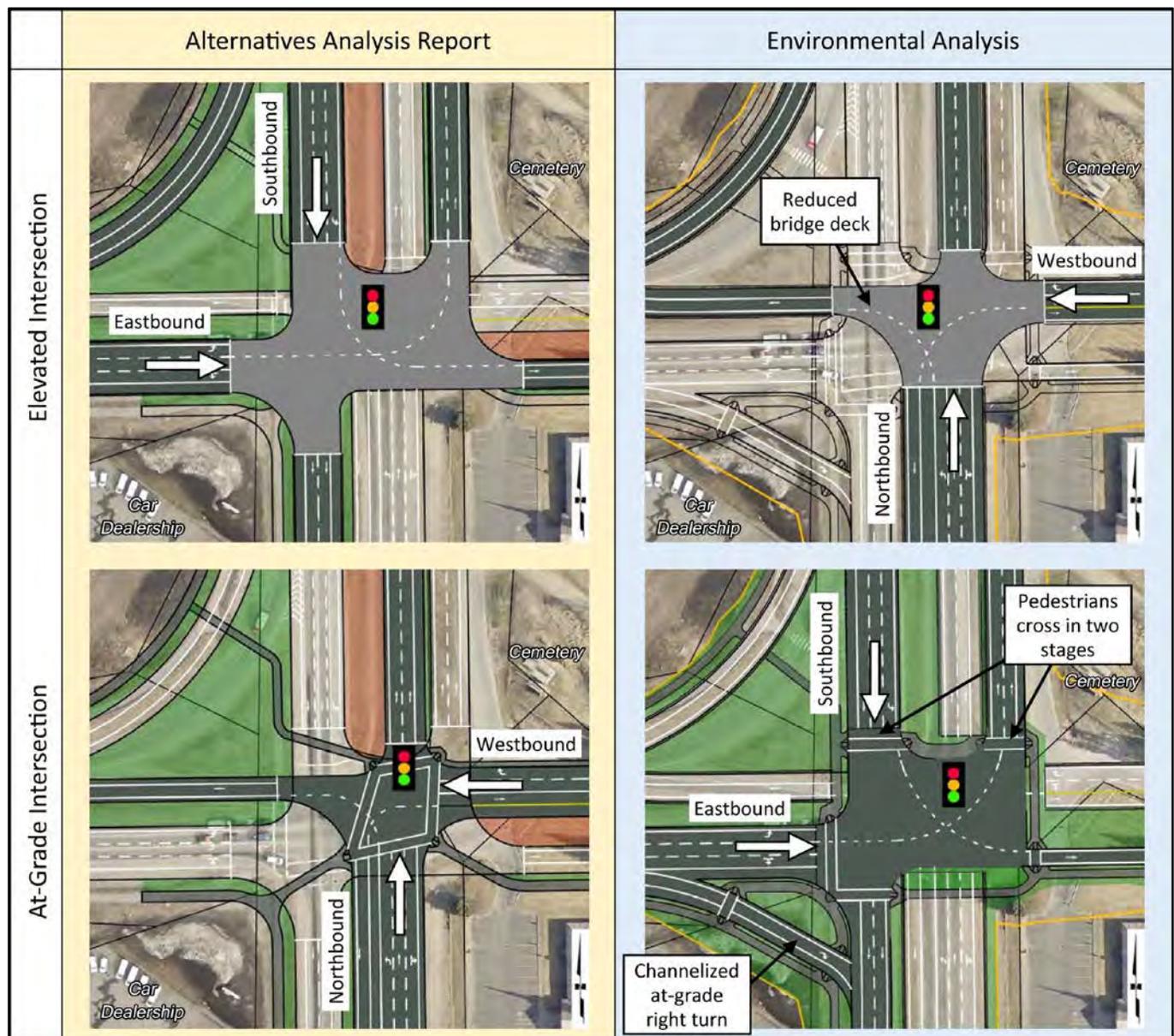


Figure 5: Changes in Echelon Design from Alternatives Analysis Report to Environmental Assessment Document

Echelon Interchange – U-turn roundabout and D St Subdivision (see BAE2)

Figure 6 shows the Lazelle Road leg of the Echelon Interchange. Under this alternative, the westbound approach lanes of Lazelle Road are elevated and the eastbound departure lane is at-grade. This limits vehicle movements at driveways or side streets to right-in-right-out (or left-in-left-out) only. A roundabout on Lazelle Road would allow U-turn movements, providing for additional movements like accessing the Steese Expressway/Johansen Expressway echelon from the churches through a right turn followed by a U-turn. The memo analyzes a U-turn roundabout along Lazelle Road, as well as another option to connect the roundabout to a platted road in the Lazelle Estates Subdivision. Both roundabouts operated similarly with less than 10 seconds of delay per vehicle in the PM peak (the highest volume time period). A roundabout is recommended as part of the Echelon alternative, including a connection to the Lazelle Estates Subdivision. Figure 6 shows the proposed roundabout design.



Figure 6: Design Options for Lazelle Road and City Lights Boulevard with Echelon Alternative

Access to City Lights Boulevard (see BAE3)

Under the Echelon alternative, City Lights Boulevard could be brought under the elevated westbound lanes on Lazelle Road and connect to the eastbound departure lane, allowing left-in-left-out movements only (see Figure 6). Because the Echelon alternative expands the Steese Highway footprint to the east, a section of City Lights Boulevard would have to be reconstructed and there would be impacts to the cemetery's winter storage building. Additionally, the new road would either impact 500 feet of electrical transmission line or several gravesites. Plan and profile concept design for this option can be found in the BAE3 memo.

Under the Tight Diamond or Diverging Diamond alternatives, access to City Lights Boulevard is only feasible as a one-way ramp from the northbound Steese Expressway on-ramp to City Lights Boulevard. This is because the signalized intersection for the northbound off- and on-ramps overlaps City Lights Boulevard in its existing location and the steep slopes in the northeast quadrant make it impractical to move City Lights Boulevard far enough east to be outside of the proposed footprint. Figure 7 shows the potential one-way access ramp to City Lights Boulevard for each of these alternatives. A one-way access ramp is also possible for the Echelon

interchange, shown in Figure 8. Note that for the Diverging Diamond and Echelon alternatives, only eastbound, westbound, and southbound traffic can access this ramp.

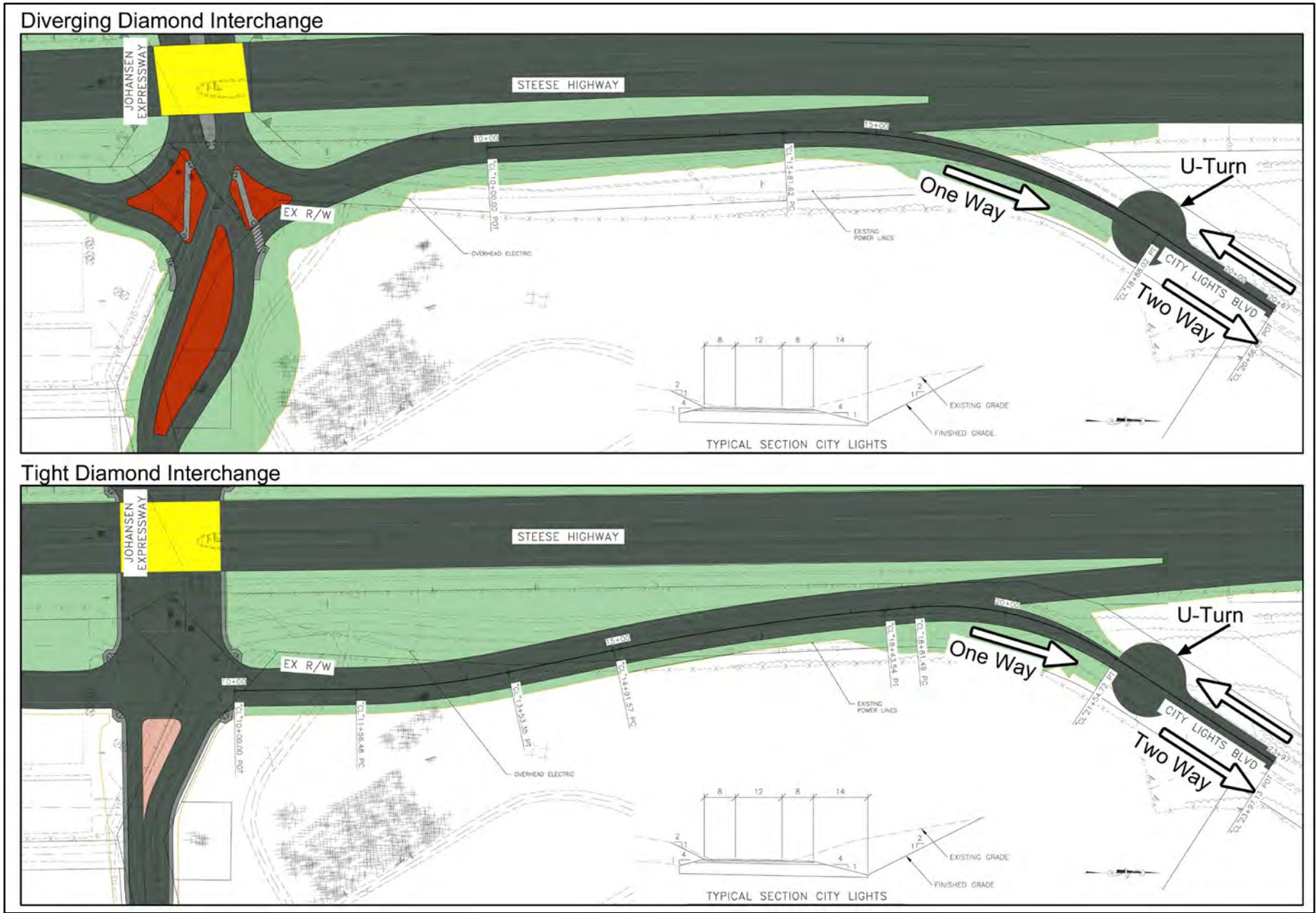


Figure 7: Design Options for City Lights Boulevard with Diverging Diamond and Tight Diamond Alternatives

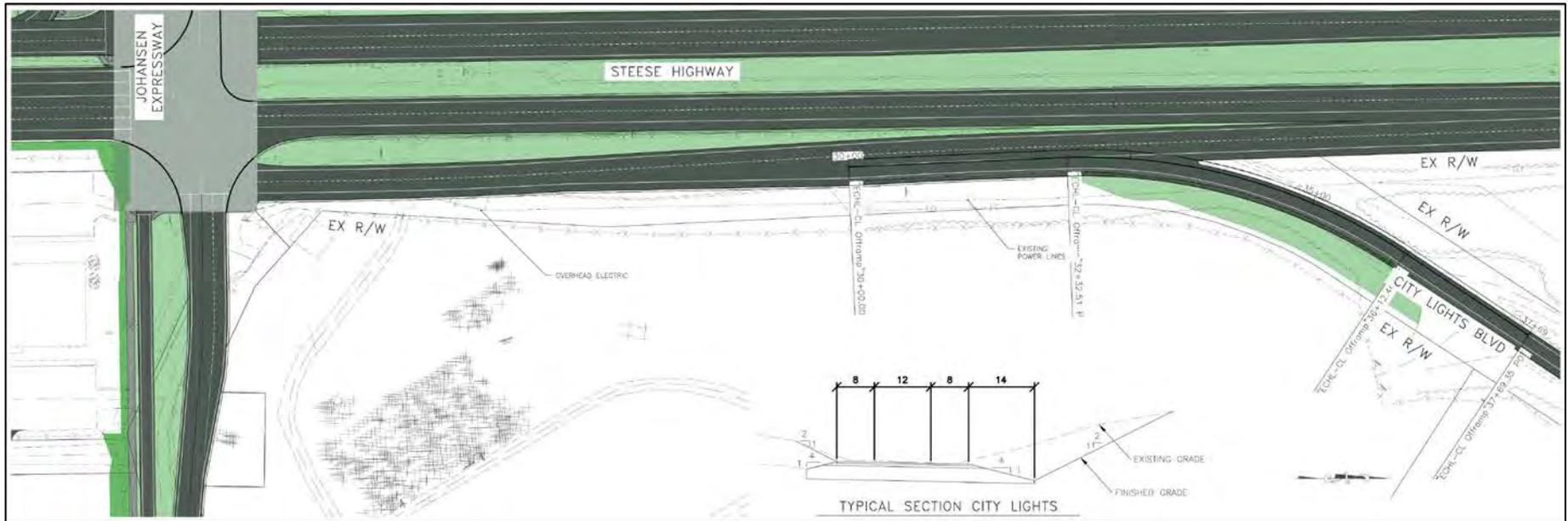


Figure 8: Potential Northbound Off-Ramp to City Lights Boulevard for Echelon Alternative

Access to Birch Hill Cemetery (see BAE3)

If City Lights Boulevard is terminated near the north access point to the Birch Hill Cemetery, the existing south driveway of the cemetery could be connected to City Lights Boulevard at the terminus through a new roadway built east of the existing City Lights Boulevard ROW. Figure 9 shows this potential access roadway. If, under the Echelon alternative, the proposed left-in-left-out access from City Lights Boulevard to the eastbound lane of Lazelle Road is built, then this connection would not be possible.

For all alternatives, internal circulation changes at the cemetery could allow the existing north entrance driveway to handle all vehicles entering and exiting the cemetery.



Figure 9: Cemetery Access Options

Tight Diamond Interchange – Intersection traffic control (see BAE4)

The Alternatives Analysis Report proposed three eastbound left turn lanes to head north on the Steese Expressway at the northbound ramp intersection of the Tight Diamond Interchange. Two other options for lane configuration or traffic control at this ramp intersection were considered: dual left turn lanes and roundabouts. Figure 10 shows the lane configurations that were analyzed. The analysis shows that triple left turns is the only configuration that works acceptably without additional ROW and traffic delay impacts; therefore, no changes were made to the design of this alternative as a result of this analysis.

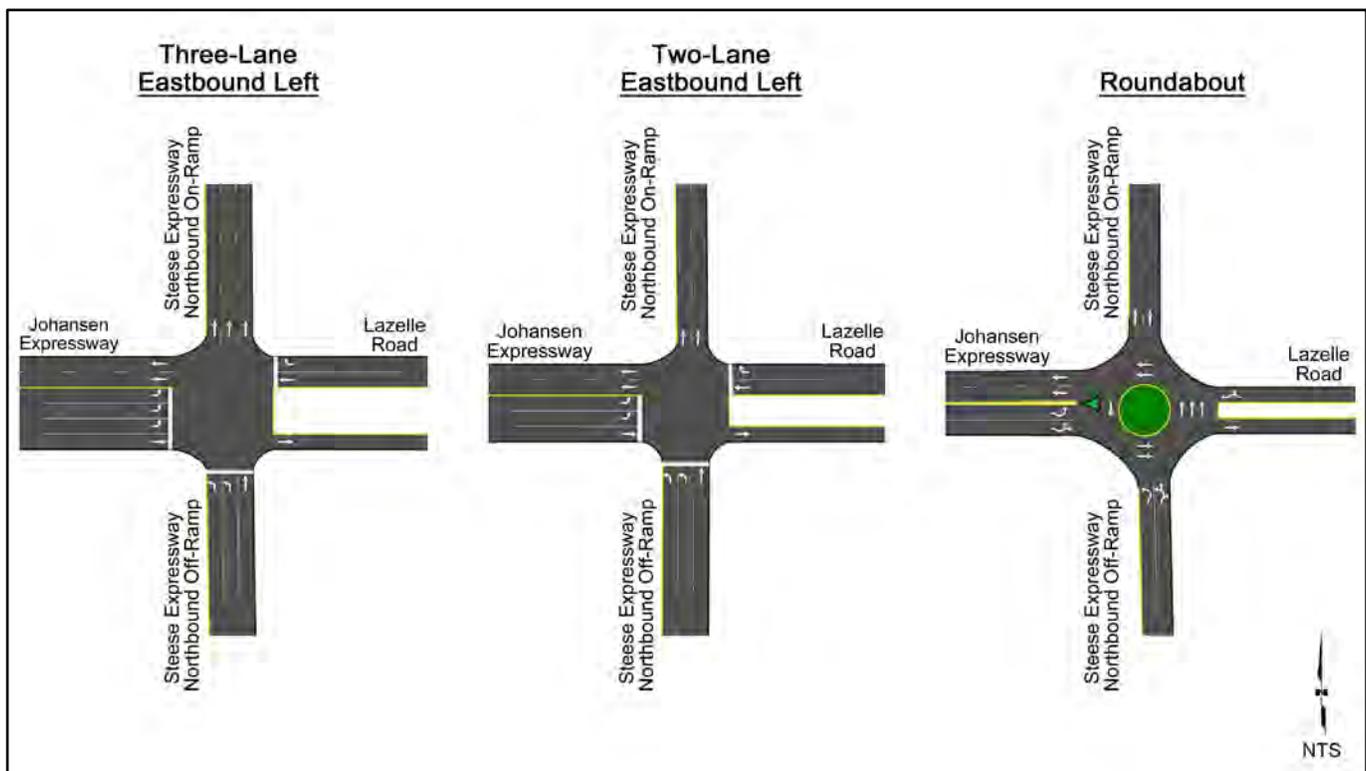


Figure 10: Lane Configurations Considered for Steese Expressway Northbound Ramp Intersection for Tight Diamond Alternative

Minimum Bridge Clearance (see BAE5)

The proposed vertical bridge clearance for the interchanges is 18 feet for the Alternatives Analysis Report. Memo BAE5 looks at the impacts of taller bridge clearance heights to account for oversize freight vehicles traveling through the intersection. Both 19-foot minimum clearance and 21-foot minimum clearance were considered. As a result of this analysis, the minimum bridge clearance for the presentation of the alternatives in the Environmental Assessment is 19 feet. This will provide for oversized vehicles traveling north of Fairbanks, at an additional cost of approximately \$215,000.

Dedicated Eastbound Left Turn Ramp to Farmers Loop Road (see BAE6)

The interchange alternatives all have northbound ramps from the Johansen Expressway entering Steese Expressway from the right side. Drivers desiring to turn left at Farmers Loop Road would have to make multiple lane changes in order to enter the left turn lanes at Farmers Loop Road. Three ramp entrance scenarios were analyzed and compared to determine the optimal ramp entrance location: right ramp entrance, left ramp entrance, and a split ramp entrance (see Figure 11). The split ramp entrance would provide a ramp dedicated to vehicles from Johansen Expressway turning left at Farmers Loop Road. Although the split ramp configuration has the least number of lane changes of the three alternatives, it is not recommended because all three alternatives have similar capacity and the split ramp has additional ROW impacts. The left ramp entrance is not recommended because it requires the greatest number of lane changes. Based on this analysis, no changes were made to how vehicles entered Steese Expressway.

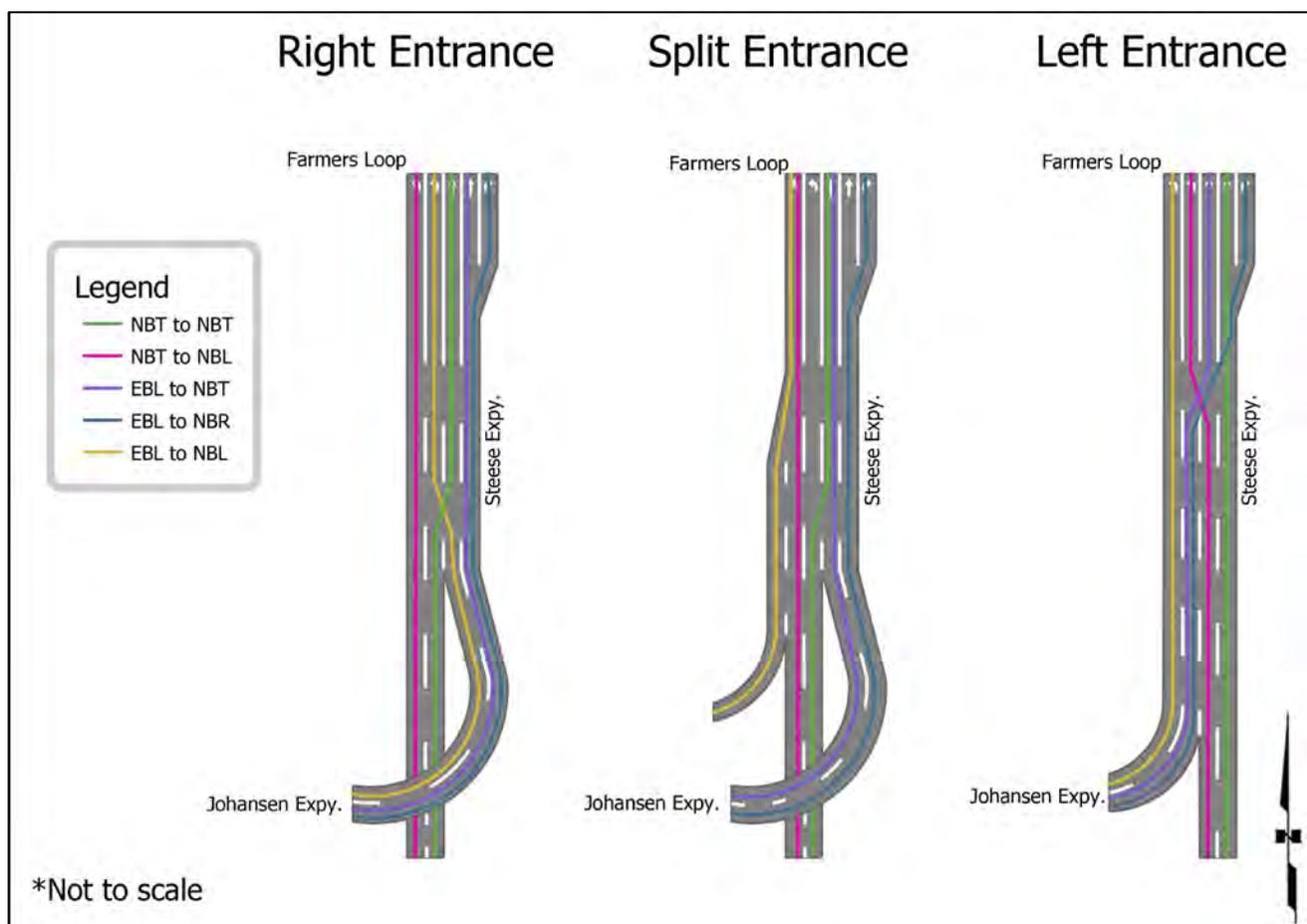


Figure 11. Lane Entrance Types and Depiction of Mandatory Lane Changes

Constructability (see BAE7)

The BAI memos were reviewed for constructability in four general categories: detour traffic, storage yard, construction impacted properties, and the project construction of the individual alternatives.

Figure 12 shows the proposed closures, detours, and storage yard sites during construction. These are the same for each of the three alternatives.

Detour Traffic: The memo describes suggested traffic control and detours to divert traffic from the Steese-Jo intersection, understanding that the intersection will need to be generally open during construction. The Farmers Loop Road Extension connection would help divert traffic away from the intersection during construction. Closing Lazelle Road (diverting traffic to Trainor Gate Road) and encouraging northbound left turn traffic to use College Road will also remove traffic from the intersection. This would help control traffic through the construction zone and facilitate construction activities.

Storage Yard: The most favorable location for a potential staging yard is the undeveloped lots east of the Church of Jesus Christ of Latter-day Saints and the Shannon Park Baptist Church because it is close to the intersection, is out of the way of the majority of traffic, and can be used for offices, a fabrication yard, and a staging yard. Other potential areas include the undeveloped area northwest of the intersection and the area north of the wetland conservation area. The location of the yards is crucial, as yards outside the immediate area of the intersection would require longer travel time for materials, labor and management, which would slow down production and increase costs.

Construction Impacted Properties: The car dealership, churches, and cemetery are expected to be impacted by construction operations. Traffic construction easements (TCE) will be needed on north and east sides of the car dealership. The churches and cemetery will be impacted by the closure of Lazelle Road and potential TCEs; concerns are expected from church and cemetery personnel.

Comments on individual alternatives are summarized in the BAI memos.

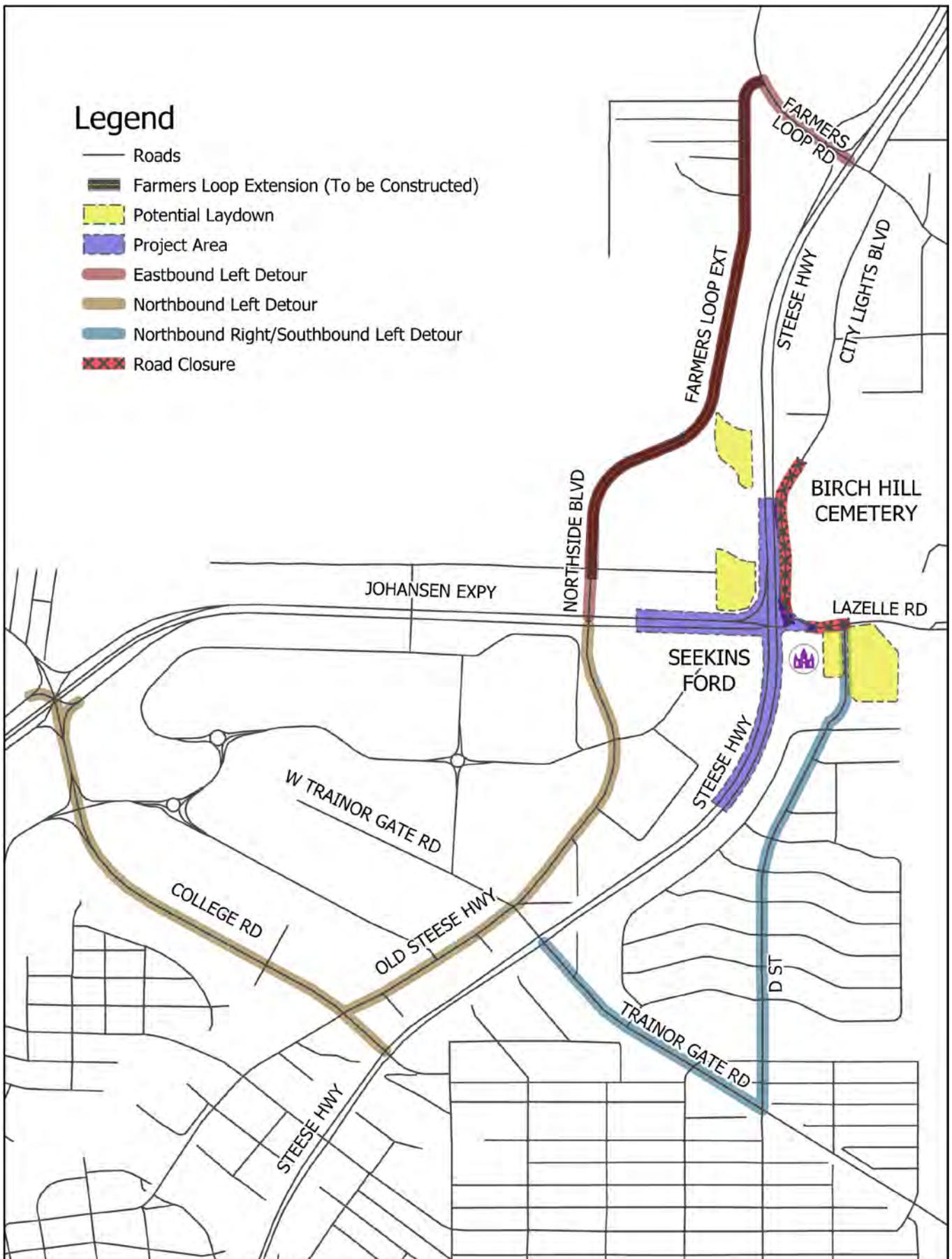


Figure 12: Proposed Construction Closures, Detours, and Storage Yards

Effect of Proposed Construction Detours on Surrounding Road Network (see BAE8)

During construction, it is expected that two major movements will need to be diverted from the Steese-Jo intersection: the eastbound left turn and the northbound left turn. For both of these movements, drivers will be instructed to turn left prior to the main intersection and travel to their destination via the surrounding road network. Where the detoured traffic is found to significantly impact traffic, mitigations are proposed to reduce the delay.

Under existing conditions, it takes drivers making these movements approximately 5 minutes to travel through the corridor. During construction with no mitigations, travel times through the detoured routes will increase to approximately 30 minutes for eastbound left turn vehicles and about 10 minutes for most northbound left turn traffic. The proposed mitigations are expected to reduce detoured travel times to approximately 5 to 10 minutes.

Figure 13 shows the affected intersections and proposed mitigations for the eastbound left turn detour in the PM peak (there are no significant impacts in the AM peak for this detour. Figure 14 and Figure 15 show the affected intersections and the proposed mitigations for the northbound left turn detour, as well as detours due to the Lazelle Road closure, in the AM and PM peaks, respectively.

The benefits of the mitigations are ranked as followed:

- HIGH – Mitigation alleviates delays from impacted movements
- MEDIUM – Mitigation alleviates delays, but impacted movements will still have long delays
- LOW – Mitigation has no significant change to operations

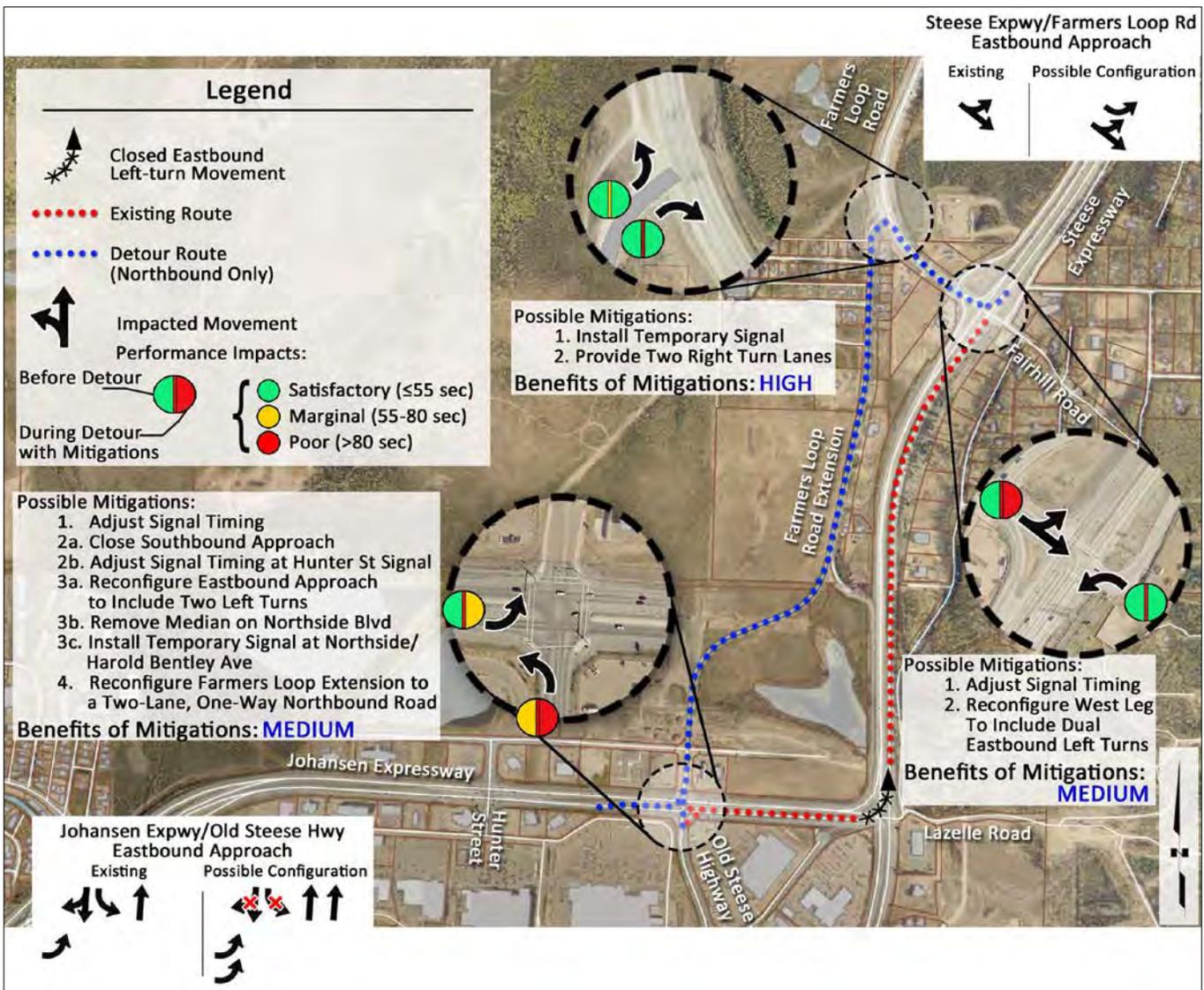


Figure 13: Impacted Intersections Caused by Detour of Eastbound Left Turns from Steese-Jo, PM Peak

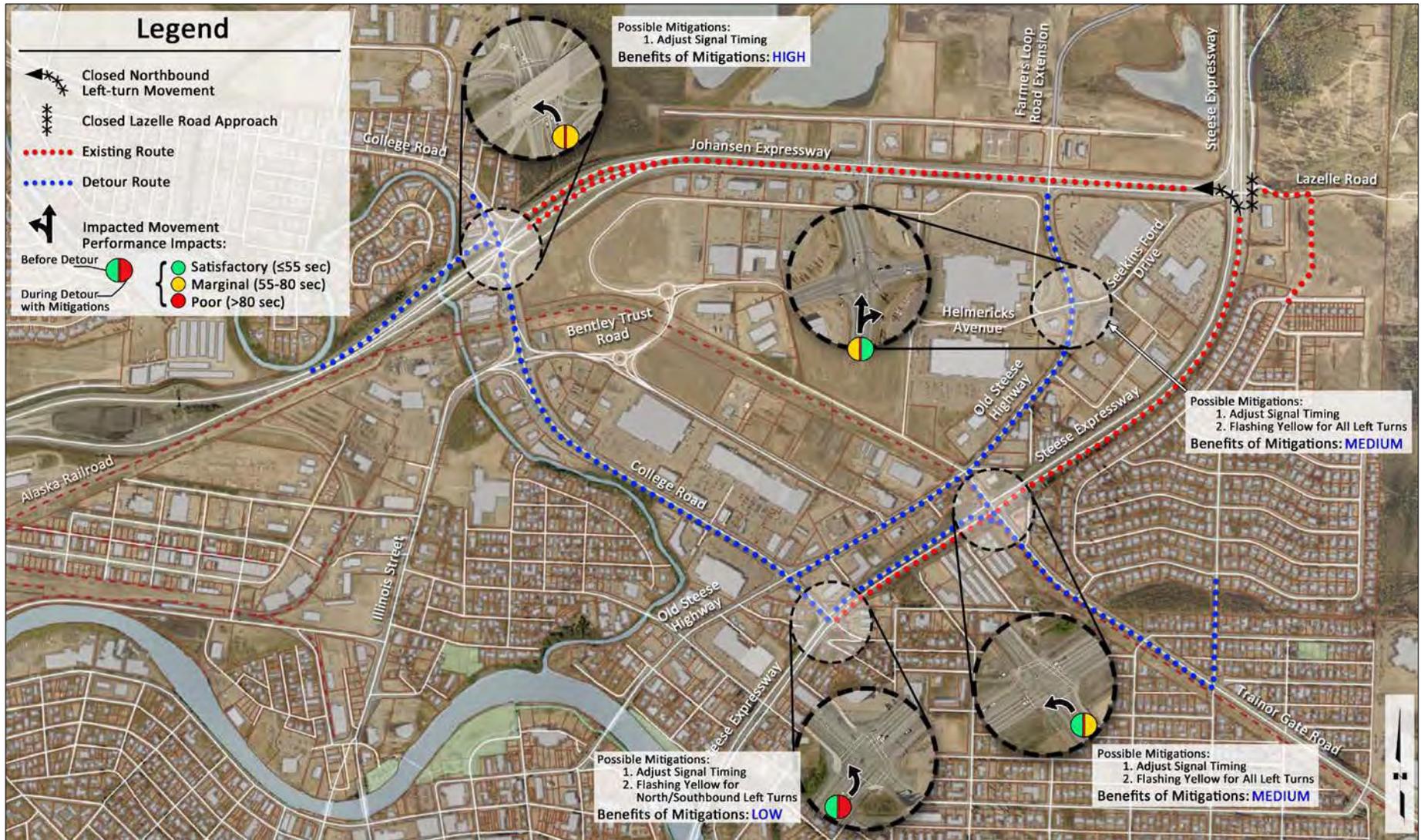


Figure 14: Impacted Intersection Movements Caused by Detour of Northbound Left Turns from Steese-Jo, AM Peak

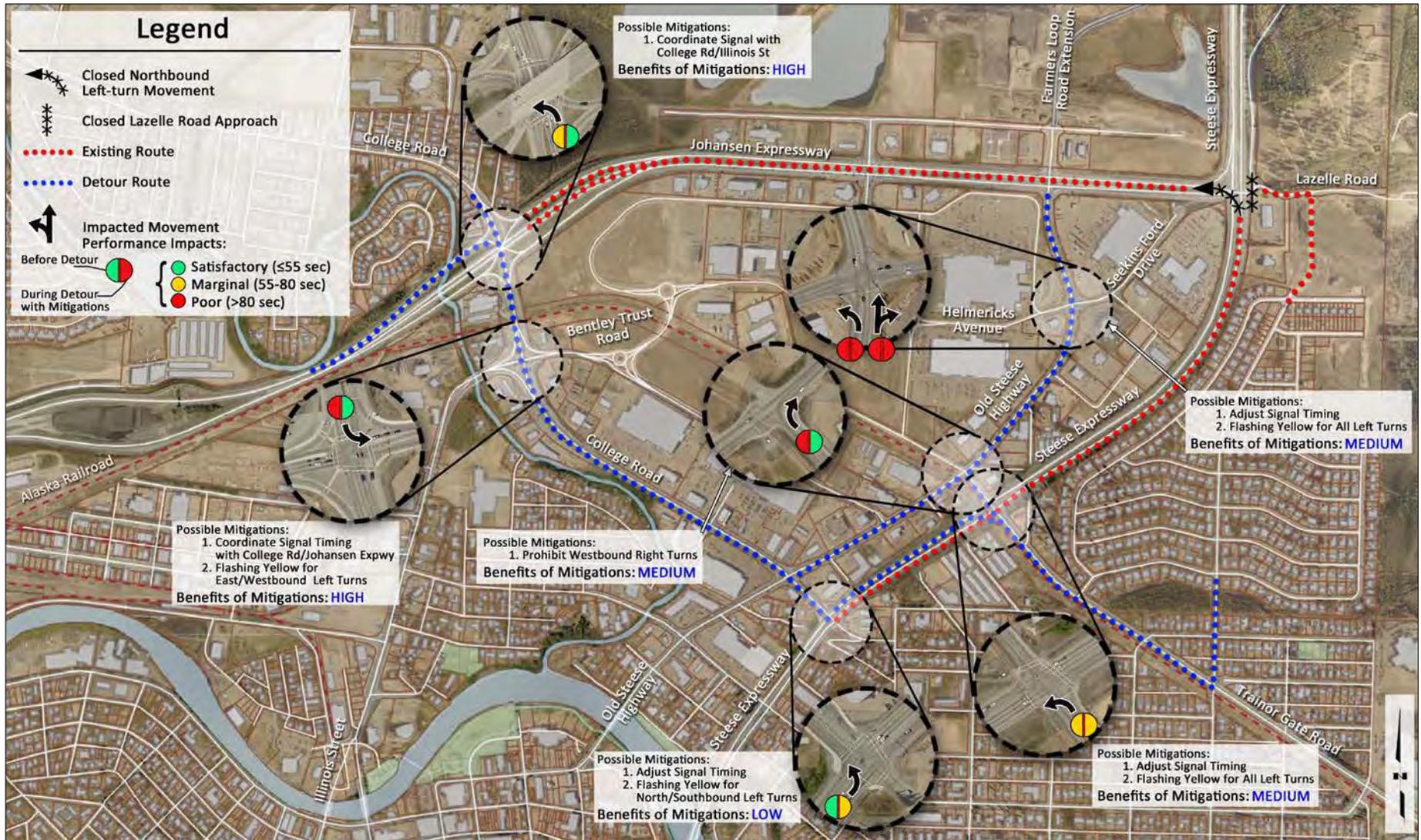


Figure 15: Impacted Intersection Movements Caused by Detour of Northbound Left Turns from Steese-Jo, PM Peak

Updated Screening Evaluation

Using the same screening criteria set forth in the Alternatives Analysis Report, the three build alternatives were reevaluated based on the recommended design changes. Table 3 presents the scores of the reevaluation. The scores for the Tight Diamond and Diverging Diamond remain the same; the score for the Echelon slightly decreased from its previous score.

In terms of the screening evaluation, the ROW acquisition score is the only criteria that could potentially be altered based on the proposed changes. In preparation for the Environmental Analysis, the decision of when to use retaining walls in the design for each alternative was standardized, so that cost and ROW impacts could be compared more consistently between alternatives. The use of retaining walls was limited to preserving the cemetery, wetland conservation area or any building structures. As a result, the concept design for the Tight Diamond and Diverging Diamond Interchanges used fewer retaining walls, resulting in an increase in the amount of land to be acquired, while the Echelon Interchange had an increase in retaining walls and a decrease in land acquisition area. These changes alone did not change the overall scores for the Minimize ROW acquisition criteria.

The change to the Echelon Interchange score resulted from including the U-turn roundabout, which requires additional land acquisition from the cemetery and changed the score for avoiding physical impacts to the cemetery from -0.5 to -1 and brought the total score for the alternative from 22.8 to 22.2. The Echelon Interchange score remains the highest of the three alternatives.

Table 3: Updated Screening Criteria Results

		Tight Diamond Interchange	Diverging Diamond Interchange	Echelon Interchange
GOALS (50%)	Weight			
Reduce congestion.	5	2	2	2
Improve non-motorized user safety.	3.5	1	1	2
Improve freight mobility.	3.25	2	2	2
Improve multi-modal connectivity.	2	1	1	2
Improve drainage.	1.25	1	1	1
Goals Score (Rating x Weight):		23.25	23.25	28.75
IDENTIFIED ISSUES (35%)	Weight			
Vehicular delay.	5	2	2	2
Proximity of Farmers Loop Road.	5	1	1	1
Non-motorized safety.	4	1	1	2
Proximity of Old Steese Highway.	3	2	1	2
Proximity of City Lights Boulevard.	2	0	1	-2
Identified Issues Score (Rating x Weight):		25	24	25
CONSTRAINTS (15%)	Weight			
Maintain Lazelle Rd access, including accommodating Ft Wainwright gate relocation.	5	-2	-1.5	0
Accommodate overheight/overweight vehicles	5	0	0	0
Maintain access to commercial areas (Northside, Bentley).	4	0	0	0
Avoid physical impact to cemetery	4	-1	-1	-1
Avoid physical impact to conservation area	3.5	0	0	0
Snow storage and snow removal techniques.	3	0	-2	0
Minimize ROW acquisition.	2	-1	-1	-1
Constraints Score (Alternative x Weight):		-16	-19.5	-6
TOTAL		18.0	17.1	22.2