



Executive Summary

Three build alternatives (Tight Diamond Interchange, Diverging Diamond Interchange, and Echelon Interchange) were advanced from initial alternatives development and evaluated in support of selecting the preferred build alternative for the Steese Expressway/Johansen Expressway Interchange project (project). These alternatives were further analyzed and refined with regards to public and agency concerns, noise impacts, cost, technical feasibility, constructability, and construction impacts and final design configurations were selected.

After full analysis of impacts, cost, and technical feasibility, the Diverging Diamond Interchange (DDI) with Farmers' Loop Connection is the preferred build alternative. While the Echelon Interchange (EI) still scores slightly higher, primarily due to the best pedestrian connectivity through the intersection, the cost and technical feasibility of this alternative don't outweigh the benefits.

The (DDI) was selected as the preferred alternative as it had the next-best traffic operations compared to the EI, while still minimizing the acquisition of private property. The structure for the DDI is a standard single-span bridge that can be constructed efficiently and cost-effectively and is similar to other bridges in the Department's inventory across the state. The relatively small interchange footprint required for the DDI also minimized the need for retaining walls, further reducing anticipated project costs as compared to the Tight Diamond Interchange and Echelon Interchange.

The DDI performs similarly to the EI with regards to traffic improvement, has the least property acquisition, and costs approximately \$20M less to construct. Noise impacts are similar to the EI. The DDI will likely require a relocation of the Church of Jesus Christ of Latter-day Saints, however preliminary analysis indicates the church may be able to be relocated on the existing property. All build alternatives will require relocation of the cemetery's winter storage facility and will require internal circulation changes for the cemetery, but the DDI and EI both do not appear to affect grave site locations.

The Farmers' Loop Connection is a necessary component to maintain bicycle connectivity between the Johansen and Farmers' Loop bike paths as the existing separated path at the corner of Steese and Johansen cannot be maintained with any of the alternatives without encroaching in the wetlands conservation area. In addition, this new connection is critical to managing traffic during construction of the interchange, allowing for full closure of the high volume left turn off the Johansen while construction is ongoing.

Dismissed Build Alternatives

The EI was dismissed due to technical feasibility challenges caused by the complicated structure geometry. To build a structure that could carry the non-standard traffic loading and geometry, the structure would have been considered fracture critical. Fracture critical means that important structural components would not have redundancy, and if they were to be damaged (for instance in the event of a bridge strike by over-height vehicles), the entire intersection would have to be shut down until repairs could be made. This was determined to be an unacceptable risk for this important junction of two principal National Highway System (NHS) routes in the Fairbanks area. In addition, designing the structure for the anticipated poor foundation soils and large earthquake loadings increased project cost estimates by nearly \$20M.

The TDI was dismissed due to large right-of-way (ROW) impacts and the lowest LOS of the three build alternatives.



Build Alternatives Comparison

The table below compares construction costs and the vehicle and pedestrian operations of each proposed build alternative to the existing intersection.

Proposed Build Alternative	Construction Cost	Average Vehicle Delays (sec/veh)				Pedestrian Delays (sec/ped)	
		2022 AM Peak	2022 PM Peak	2045 AM Peak	2045 PM Peak	2045 AM Peak	2045 PM Peak
		No Build	-	20 (LOS C)	72 (LOS E)	46 (LOS D)	143 (LOS F)
Alternative G1 – Tight Diamond (Full Interchange)	\$65,400,000	17 (LOS B)	18 (LOS B)	28 (LOS C)	17 (LOS B)	22 - 88	29 - 110
Alternative G3 – Diverging Diamond (Full Interchange)	\$40,100,000	7 (LOS A)	10 (LOS A)	13 (LOS B)	14 (LOS B)	32 - 47	34 - 79
Alternative H1 – Full Echelon (Partial Interchange)	\$63,000,000	7 (LOS A)	10 (LOS A)	10 (LOS B)	16 (LOS B)	12 - 33	13 - 41

Build Alternatives Scoring

The table below indicates the performance of each proposed build alternative when compared to the existing intersection.

Proposed Build Alternative	Overall Score*	Purpose and Need				Other Issues Addressed			
		Improve Pedestrian/Bicycle Safety	Reduce Pedestrian Delay	Reduce Conflicts between Intersections	Reduce Congestion	Reduce Freight Delay	Accommodate increased Traffic to the East	Avoid Impacts to Cemetery	Minimize Maintenance Impacts
Alternative G1 – Tight Diamond (Full Interchange)	17.5	Better	Better	Much Better	Much Better	Much Better	No Impact	Much Worse	No Impact
Alternative G3 – Diverging Diamond (Full Interchange)	18.4	Better	Better	Much Better	Much Better	Much Better	No Impact	Worse	No Impact
Alternative H1 – Full Echelon (Partial Interchange)	20.3	Much Better	Much Better	Better	Much Better	Much Better	No Impact	Worse	No Impact

* See Build Summaries Memo for breakdown of scoring criteria and scores.