

# Richardson Highway MP 359 Grade Separated Facility: Interchange Concept Development Memo

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This memorandum presents sketch plans of grade separated interchange concepts for the Richardson Highway at milepost (MP) 359 in Fairbanks, Alaska. Three concepts were evaluated and two concepts are recommended for further consideration.

# 1.0 Purpose

The Alaska Department of Transportation and Public Facilities (DOT&PF) has tasked CH2M HILL to prepare and evaluate up to four interchange concepts for the Richardson Highway at-grade intersection at MP 359.

The DOT&PF and CH2M HILL have identified several goals for the project that support the continued transition of the Richardson Highway to a controlled-access facility (freeway):

- Improve corridor safety and operations by grade separating crossing maneuvers.
- Improve connectivity with the Old Richardson Highway, particularly for freight vehicles.
- Accommodate new Fort Wainwright access from the north to the new interchange.

## 2.0 Existing Conditions

Figure 1 (Existing Conditions) shows several key existing elements within the project area.

The existing Richardson Highway near MP 359 consists of level terrain with two lanes in each direction. From west to east, the highway follows a slight S-curve and enters a tangent section prior to crossing the Alaska Railroad Corporation (ARRC) tracks. The highway is signed for a speed limit of 60 miles per hour.

There are two primary conflict points of concern in the project corridor: the at-grade railroad crossing and the at-grade crossing of the southbound lanes for northbound traffic heading to the Old Richardson Highway (Richardson Highway/Old Richardson Highway Crossover). An Existing and Background Traffic Conditions and Safety Analysis memorandum (TM1) of the study area indicates that 24 crashes occurred in the study area between 2008-2012, with a majority of these crashes occurring on the Richardson Highway and three of these crashes occurring near the at-grade railroad crossing. One crash, a rear-end, was reported at the northbound Richardson Highway off-ramp as it crosses the southbound lanes. TM1 also indicates that the study intersections and mainline segment have experienced crash rates below the statewide averages.



Notes:

1. Crash data was obtained from DOT&PF and covers the five year study period, January 1, 2008 through December 31, 2012. Crashes during this period include the following: MP 359 - 360: 1 angle, 3 rear end, 10 run-off-the-road, 2 animal;

SB Richardson Hwy Off-Ramp & Old Richardson: 4 angle, 3 fixed object NB Richardson Hwy Off-Ramp & SB Richardson Hwy: 1 rear end; and

Existing At-Grade Railroad Crossing: 3 crashes, none train-related.

2. The image and information (DOT mileposts, wetlands, and parcels) were provided by the Fairbanks North Star Borough.

3. Utility locations were approximated from Figure 11 in the Richardson/Old Richardson Highway Interchange I-OA2-4(14) Location & Environmental Assessment FONSI, dated Winter 1992. Electric lines included the following line sizes: 7.2 kV, 69 kV, and 138 kV. The report shows the crossing near the intersection as 138kV and the one near the railroad as 69kV.

# **Richardson Highway MP 359 Grade Separated Facility**

## **Existing Conditions**

Alaska DOT&PF Northern Region IRIS Program No: Z607340000 Federal No. 0A24033

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Given the proximity of the Golden Valley Electric Association substation and the Fort Wainwright power plant north of the highway, two overhead electrical transmission lines cross the corridor in this area, including a 138 kilovolt (kV) crossing near the existing northbound exit and a 69 kV crossing along the railroad tracks.

The project is bordered by federal (military) land on the north and south, with private land to the west.

Fairbanks North Star Borough (FNSB) GIS mapping indicates wetlands outside of the existing DOT&PF right-of-way (ROW) on federal land.

#### 2.1 Existing Richardson/Old Richardson Access

At MP 359, facility access consists of the following routes:

- **Southbound Richardson Highway to Old Richardson Highway**: Right-hand exit via hook ramp with a stop-controlled intersection at Old Richardson Highway/Lakeview Drive. Exit ramp type: taper.
- Old Richardson Highway to Southbound Richardson Highway: Right-hand entrance via diagonal ramp, which joins the highway approximately 2,000' before the railroad crossing. Entrance ramp type: parallel with 400' acceleration lane.
- Northbound Richardson Highway to Old Richardson Highway: Left-hand exit with 500' long parallel deceleration lane, which crosses the highway southbound lanes with a stop-controlled intersection and then joins the Old Richardson Highway near the Fairbanks Sand and Gravel driveway.
- Old Richardson Highway to Northbound Richardson Highway: No access; travelers join the facility from Cushman Street, west of the project area.

#### 2.2 Existing Fort Wainwright Access

Fort Wainwright has several access gates:

- **3-Mile Gate:** The 3-Mile Gate (or Richardson Gate) is located on the south side of Fort Wainwright and accesses the northbound lanes of the Richardson Highway. This gate is approximately 2,000' east of MP 359 and is currently closed except for special occasions.
- Main Gate: The Main Gate is located on the west side of Fort Wainwright, just east of the Richardson Highway/Steese Expressway/Airport Way Intersection on Gaffney Road. This gate is approximately 3.3 road miles from MP 359 and is open 24 hours/day, 7 days/week.
- **Badger Gate:** The Badger Gate is located on the east side of Fort Wainwright, on Badger road. This gate is approximately 3.2 road miles from MP 359 and is open during the day.
- **Trainor Gate:** The Trainor Gate is located on the northwest side of Fort Wainwright, northeast of the Richardson Highway/Steese Expressway/Airport Way Intersection. This gate is approximately 5.4 road miles from MP 359 and is open during the day.

## 3.0 Concept Development

The interchange concepts were developed with several common characteristics and considerations, which were informed by previous studies.

### 3.1 Applicable Previous Studies

In 1984, the Fairbanks Metropolitan Area Transportation Study (FMATS) Policy Committee adopted a resolution that stated the Richardson Highway should be designated as a freeway between Fairbanks and the Eielson Air Force Base. This decision was founded on several grounds, including the fact that the Richardson Highway was considered a part of the National System of Interstate and Defense Highways.

In 1992, DOT&PF conducted an Environmental Assessment (EA) for the Richardson/Old Richardson Highway Interchange. The Federal Highway Administration (FHWA) issued a Finding of No Significant Impact (FONSI) in the same year for the EA's "Alternative 2, Option 1".

The FONSI alternative consists of:

- a new full-access interchange at the junction of the Richardson and Old Richardson Highways;
- a new Fort Wainwright access point at the new interchange and closure of the 3-Mile Gate; and
- a grade separated railroad crossing with allowance for a future access road underneath to allow military personnel to travel to/from the ranges on the south side of the freeway.

(The existing hook ramp from southbound Richardson to the Old Richardson was the first construction phase of the FONSI alternative.)

In 2015, a Planning and Environmental Linkages (PEL) Study for the Richardson Highway/Steese Expressway Corridor was completed. This study considered two concepts at MP 359, both of which eliminated the two conflict points with new grade separations. The first concept was a diamond interchange that accommodated military vehicle access to the Richardson and realigned the railroad to remove the curves, with a parallel pedestrian undercrossing. The second concept consisted of the northbound left exit being converted to right exit with a flyover, with military access limited to a pedestrian undercrossing at the new railroad grade separation.

In 2017, Fort Wainwright completed their West Post District Area Development Plan. This plan outlined the long-term vision for the West Post, including possible access to the Richardson Highway in proximity to the existing northbound exit.

In addition, Fort Wainwright completed their South Post District Area Development Plan in 2017. This plan includes creating a troop connection to the Small Arms Complex in the Full Build-Out Plan.

The research and outcomes of these studies were used as the basis of design for the interchange concepts developed.

### 3.2 Fairbanks Metro Area Transportation Plan

The Fairbanks Metropolitan Area Transportation System Fairbanks Metro 2040 Plan (2015) proposes several projects in the MP 359 area that this project will coordinate with or address. These consist of two short-range (SR) and one long-range (LR) project:

- SR-42 Richardson Highway MP 359 Railroad Overpass Construct a grade-separated railroad crossing at MP 359 of the Richardson Highway and a pedestrian underpass east of the railroad crossing.
- SR-56 MP 356-362 Bicycle/Pedestrian Path (Richardson Highway) Construct a paved bicycle/pedestrian path on the Richardson Highway between MP 356-362, starting from the Richardson Highway/Airport Way intersection, continuing along the Richardson Highway to the Badger Loop North Bound Ramp, and terminating at the Badger Road/Old Richardson Highway intersection.
- LR-29 Old Richardson Highway Interchange Construct a grade-separated interchange at the intersection of Richardson Highway and Old Richardson Highway. This may include additional access to Fort Wainwright. (Project VLR-20 is a duplicate of LR-29 and will be combined with LR-29 in the next Plan revision.)

#### 3.3 Core Project Elements

Each of the concepts proposed include several common characteristics. These are outlined below.

#### 3.3.1 Improved Access

#### Highway

All concepts maintain the existing degree of access. Some of the concepts increase the level of access, including: an additional southbound exit ramp to the Old Richardson Highway; and access northbound from the Old Richardson Highway.

#### Fort Wainwright

The Richardson Highway is a part of the Strategic Highway Network (STRAHNET), supporting US military operations. All concepts allow for a future connection to Fort Wainwright at the interchange.

#### 3.3.2 Enhanced Safety

#### **Grade Separations**

The interchange concepts will eliminate the two primary vehicle conflict points within the corridor: the at-grade railroad crossing and the Richardson Highway/Old Richardson Crossover. Though the instance of crashes is relatively low at these locations, potential severity of these crashes is high due to highway speeds.

These conflict points do not meet driver expectation, as the adjacent full-access interchanges to the west (Mitchell Expressway) and east (Badger Road) may cause drivers to believe that they are traveling on a freeway facility.

The railroad crossing will be eliminated in accordance with the Alaska State Rail Plan (ASRP). A primary objective this plan, developed by DOT&PF and the Alaska Railroad Corporation (ARRC), is to remove at-grade railroad/highway crossings throughout the state to enhance safety. A focal point of this effort is to grade separate all crossings on Alaska's National Highway System (NHS) routes. As a part of the PEL Study, the Diagnostic Team (DT) supported the grade separation of this crossing.

The primary entrance to the Cushman business district from the northbound lanes is the Richardson Highway/Old Richardson Crossover which requires drivers to navigate a skewed crossing of the high-speed Richardson Highway at a left-hand exit. This crossing is more challenging for the associated truck traffic as those vehicles require larger gaps due to slower vehicle starts.

#### Ice Fog

The EA discusses the occurrence of dense "ice fog" events during the winter, which are generated by the Fort Wainwright power plant's cooling ponds. This ice fog can severely limit visibility through the project area and pose safety issues, especially with high speeds at the two primary conflict points. The EA states that elevating and lighting the highway should help mitigate the ice fog's impact. In addition, the post-project conflict points will be at the cross-street intersections, where lower speeds will require less sight distance and crash severity is lessened.

#### Pathway

Dedicated non-motorized transportation facilities are not currently located within the project limits. The Richardson Highway, within the project limits, is a controlled-access facility. The Alaska Administrative Code (AAC) restricts pedestrian and bicyclist use except in an emergency; however, bicyclists and pedestrians currently utilize the highway shoulders due to the lack of nearby alternate routes. DOT&PF is in the early design stages to construct a pathway on the north side of the Richardson Highway that will connect Fairbanks and North Pole (Richardson Highway MP 356-362 Bicycle and Pedestrian Facility project). This new facility will improve safety by increasing the separation between non-motorized transportation users and freeway traffic. Concepts will integrate this new pathway.

#### 3.3.3 Improved Operations

The elimination of the primary conflict points will improve operations by reducing delay for all highway users.

#### **Railroad Grade Separation**

When active, the existing at-grade railroad crossing causes traffic delays; when not active, it still requires some vehicles to stop at the crossing utilizing the pullout lanes. These vehicles, often freight traffic hauling hazardous materials, must accelerate and merge with traffic. The speed differential and merging maneuvers can cause operational issues as well as reduce safety performance. Due to the northbound exit's proximity to the railroad crossing, some of the same vehicles stopping at the railroad crossing have difficulty maneuvering through three lane changes in less than a half mile to make the existing left-hand exit.

#### Northbound Exit Grade Separation

The northbound exit to the Old Richardson Highway will also be grade-separated and will eliminate delay due to southbound traffic. The left-hand exit will be converted to a right-hand exit to meet driver expectation for freeway exits.

#### 3.3.4 Possible Phased Construction

All concepts can be phased, with the initial phase eliminating the primary conflict points while maintaining existing access and the final phase constructing the remainder of the access for the new Fort Wainwright gate. Based on the Fort Wainwright West Post District Area Development Plan, it is expected that the gap between the initial phase and the Fort access would be more than ten years.

#### 3.3.5 Stakeholder Considerations

Several stakeholder concerns were identified in the PEL Study and in recent conversations with the military. Additional stakeholder comments for the proposed project will be fielded at future stakeholder and public meetings.

- Freight mobility (Freight Industry): The Richardson Highway is a critical freight corridor and a part of the National Highway Freight Network (NHFN), connecting Fairbanks and North Pole with communities in eastern Alaska, Canada, and the contiguous 48 states. This road has about 7% truck traffic and is designated as an official route for long-combination vehicles (17 AAC 25.014). With the industrial district to the southwest, there are trucks that travel to and from the Old Richardson. Freight mobility will be improved by new interchange ramps and considerations for over height and overweight trucks.
- North-South Fort Access for Military Personnel (Military): Concepts would allow for future gradeseparated troop access across the highway, as proposed in the FONSI and PEL. Recent conversations with ARRC indicate that this access should be separate from the railroad grade separation.
- Access to the Richardson Highway (Military): All concepts will account for a future access point for Fort Wainwright at the new interchange. At a minimum, right-in/right-out access to the northbound lanes will be accommodated (per DOT&PF conversation with Fort Wainwright representatives on July 25, 2018).

#### 3.3.6 Other Considerations

- **ROW Constraints**: The concepts proposed do not require acquisition of federal land, which would impact the project timeline. Acquisition of land that is not federal was not considered a constraint in the development of concepts.
- **Categorical Exclusion**: Concepts were developed with consideration to environmental constraints and are expected to have minimal impacts, which is advantageous to the project timeline.

- **No Realignment of ARRC Tracks**: Concepts were designed to maintain the existing railroad routes to minimize impacts to the project timeline.
- **High-voltage Transmission Lines**: Existing high-voltage lines cross the corridor at the proposed grade separations, both lines will need to be raised to span across the corridor. If raising the lines near the interchange is an issue, it would be possible to shift the interchange north offsetting utility relocation costs with ROW costs. The power lines at the railroad crossing would still need relocation.
- Infrastructure Height Restrictions: The concepts do not consider restrictions of infrastructure heights due to air space rules. The Fort Wainwright Army Base has runways within two miles of the project area, so its airspace navigational requirements should be reviewed (HPCM Section 1170.6). The runways are oriented such that the approaches and departures do not cross directly over the project area, so there may not be an airspace conflict for the proposed work. Specific restrictions and associated project impacts will be coordinated with the Army and the Federal Aviation Administration (FAA) as the design progresses.

# 4.0 Interchange Concepts

Three interchange concepts were considered, with varying degrees of access to the existing and future street network.

The concepts were developed as single line drawings over aerial photography that will be later used to facilitate public comments. The figures for each concept depict the initial phase, with the final increased-access phase as an inset.

The roadway alignments for the proposed concepts were designed to utilize the existing roadway embankments to take advantage of the existing consolidated soils.

#### Railroad Crossing Project Timing

All concepts presented would construct two new bridges to raise the mainline over the railroad with the initial phase. Although the construction of the railroad grade separation is shown with the initial interchange construction, this project could be completed prior to or after the interchange project.

The grade separation will raise the highway about 30-feet to provide clearance over the ARRC tracks. Reconstruction of approximately 1600' of highway on each side of the crossing will be required to achieve the separation; assuming 70 MPH design speed and 3% maximum grade (Figure 10-8; A Policy on Geometric Design of Highways and Streets, 2011). If separated into two separate phases, the grade separations' reconstruction limits would have some overlap (200'-600').

The two grade separation projects would provide operational and safety improvements individually:

- **Railroad crossing project prior to interchange project:** Without an at-grade crossing, railroad traffic would have little impact on highway operations and safety. In addition, with the pullout lanes eliminated, less lane changes would be required to reach the existing left-hand exit.
- Interchange project prior to railroad crossing project: Without an at-grade crossing, exiting traffic would have little impact on highway operations and safety. In addition, with the left-hand exit converted to a right-hand exit, less lane changes would be required to reach the exit. Advance warning infrastructure for the railroad crossing should be replaced/maintained.

Undertaking the construction of the two projects separately would have some challenges, including:

• **Storm water quality and quantity:** The constrained ROW in proximity to the railroad crossing project will present challenges to storm water management for that individual project. Constructing the two projects together would offer more alternatives for drainage improvements and controls.

- Pullout lane conflict with southern ramps: If the interchange project was constructed prior to the railroad crossing project, the southern ramps would connect with the highway very near the western end of the railroad pullout lanes. The ramp designs would need to account for this proximity, as sufficient distance from the ramp taper to the pullout lane taper will provide better operations and safety. For example, if the ramp and pullout lanes were connected, ramp and pullout traffic would be mixed which could result in avoidance maneuvers or rear-end collisions.
- Increased total project cost: Breaking into two projects will increase costs due to: loss in economy of scale; additional costs for administration, mobilization/demobilization, etc.; possible schedule impacts; overlapping project reconstruction limits; potential limitations to holistic design solutions.

### 4.1 Flyover Concept

The Flyover concept (Figure 2) maintains the existing degree of access, while removing the two primary points of conflict. The new Fort Wainwright gate would maintain the degree of access as is present at the existing 3-Mile Gate (right-in, right-out access to northbound highway).

The northbound Richardson Highway mainline would be reconstructed to parallel the existing southbound lanes to provide space for the new exit ramp within the existing ROW, which would cross over the mainline with a single two-span bridge. Over height vehicles could bypass the overcrossing utilizing the interchange ramps.

The cross street was selected to go over the highway, as the costs for ramp embankment construction and associated retaining walls is much less than costs to elevate the mainline.

#### 4.1.1 Initial Phase – No Fort Access

The initial phase of this concept would construct everything but the Fort Wainwright access. Over height vehicles could be accommodated southbound with the existing ramps and northbound with an optional bypass (that would be later used with the Fort access).

### 4.2 Loop Concept

The Loop concept (Figure 3) increases the existing degree of access, while removing the two primary points of conflict. The new Fort Wainwright gate would have an increased degree of access compared to the existing 3-Mile Gate.

The Old Richardson Highway would be extended over the Richardson Highway to connect to the new northbound ramps. Northbound, the exit ramp would be reconstructed and a new loop entrance ramp would be added. The Richardson Highway mainline would be shifted to the southwest to allow for construction of the northbound ramps within existing ROW.

The extension of Old Richardson to the new northbound ramps would cross over the mainline with a single two-span bridge. Over height vehicles could be accommodated southbound with the existing ramps and northbound via a circuitous detour. A northbound diagonal entrance ramp could be added to improve access, enhance safety (eliminates a left turn at the northbound ramps intersection), and provide a more direct route for over height vehicles.

The configuration of the cross street over or under could work at this location. For this concept, the cross street was selected to go over the highway to reduce costs of the realigned mainline embankment and associated retaining walls. This configuration would still require retaining walls along the north side of the project and would likely increase the costs of a future connection from Fort Wainwright.

The connection of the ramps to the Old Richardson Highway may consist of intersections with stop, signal, or yield (roundabout) control. The type of intersection control will be determined with future analyses.

#### 4.2.1 Initial Phase – Flyover

The initial phase of this concept would construct the final bridge and enough of the embankment and retaining walls to open the flyover to traffic.

#### 4.3 Diamond Concept

The Diamond concept (Figure 4) increases the existing degree of access, while removing the two primary points of conflict. The new Fort Wainwright gate would have an increased degree of access compared to the existing 3-Mile Gate. The new southbound exit ramp shown is not required, but it should fit in the existing ROW while providing a more direct access to the gate. The hook ramp to Old Richardson would remain in place, maintaining this direct access to the Cushman industrial district.

The Old Richardson Highway would be extended under the elevated Richardson Highway to connect to the northbound ramps. Along with the reconstructed northbound exit ramp, a new northbound entrance ramp would be added. The Richardson Highway mainline would be realigned into the existing median to provide space for the new ramps within the existing ROW and would cross over the extended Old Richardson with a single-span bridge. Over height vehicles would not have to reroute from the mainline to pass through the MP 359 area.

The cross street was selected to go under the highway in this case to reduce initial phase embankment and ROW or wall requirements, as the ramps and cross street can stay at-grade and tie into the highway near existing ground on either side of the grade separation. In addition, the raised highway would help to mitigate the effects of ice fog. Furthermore, the final phase work is simplified as the initial phase does not require temporary embankment for the free flow northbound exit ramp.

The connection of the ramps to the Old Richardson Highway may consist of various intersection types, such as: conventional diamond intersections with stop, signal, or yield (roundabout) control. The type of intersection control will be determined with future analyses.

The diverging diamond interchange (DDI) and single point diamond interchange (SPDI) intersection forms were considered as a part of this concept. The DDI and SPDI are considered "high-capacity" diamond interchange forms, and are typically utilized at locations with large through or turning volumes. These forms will not be considered beyond this concept study for the following reasons:

- relatively low intersection volumes;
- higher cost to construct and maintain (e.g. require signals, present more complex winter maintenance, the SPDI requires a large crossing structure); and
- these interchange forms would not meet the context of the Richardson Highway corridor, which currently does not include these types of intersections.

#### 4.3.1 Initial Phase - Flyunder

The initial phase of this concept would construct the final raised highway (bridge, embankment, and walls) and complete other minimal work needed to open the free-flow nourthbound exit ("flyunder") to traffic.

Another initial phase possibility with even lower cost and footprint would maintain the existing left-hand exit and grade separate just the southbound intersection. This concept would maintain the northbound lanes at their present at-grade location and elevate the southbound lanes over the northbound exit ramp. Only a minor grade adjustment would be required for the southbound entrance ramp.





# LOOP INTERCHANGE CONCEPT









# 5.0 Evaluation of Concepts

To determine the two corridor configurations to be advanced to 35% design for a quantitative evaluation, the concepts will be evaluated with several key criteria, as discussed below.

- Vehicular Safety: All the concepts improve traffic safety along the mainline, as the northbound exit across the southbound mainline and the at-grade railroad crossing are eliminated from the freeway. The differentiator for safety is along the new cross street, so concepts will be ranked based on the number of conflict points.
- Vehicular Operations: All concepts eliminate two primary sources of highway delay and convert this section of highway to a freeway. The differentiator for operations is at the new interchange, so concepts will be ranked based on the expected intersection delay.
- **Pedestrian Safety**: All concepts accommodate the new north side pathway. Concepts that have fewer conflict points and provide controlled pedestrian crossings would be safer for pedestrian and bicycle traffic.
- **Degree of Access**: The concepts provide varying degrees of access and will be ranked by the level of access.
- **Context**: Interchange concepts that are configured like adjacent interchanges along the corridor are favored, as they meet driver expectation and are consistent with the rest of the corridor. This is important in mitigating crashes related to confusion, delay, and wrong-way movements.
- **Stakeholder Considerations:** The concepts will be ranked based on how they meet the project stakeholder considerations identified in the PEL.
- **Right-of-Way**: All concepts avoid federal land, but could require private land acquisition. Concepts will be ranked based on the amount of ROW area expected for purchase.
- Construction Costs: Concepts will be ranked relatively based on expected construction costs.
- Utility Relocation Costs: Utility costs are important, but are not expected to be a differentiator as all concepts will require relocation of various utilities in the project area, including the overhead electrical transmission lines.

Each concept was ranked based on how they best meet the criteria, with 3 points for the top-ranked concept, 2 points for the middle-ranked concept, and 1 point for the bottom-ranked concept. The two concepts with the highest scores are those that will be advanced forward to alternative analysis.

#### Table 5.1 presents a summary of the concept evaluation.

Criteria	Flyover Concept	Loop Concept	Diamond Concept	<b>Remarks</b> The flyover has the fewest number of conflict points.	
Vehicular Safety	3	2	1		
Vehicular Operations	3	2	1	The flyover has the fewest number of intersections, which will result in the lowest delay.	
Pedestrian/Bicycle Safety	3	1	2	The north side pathway crossing at the flyover could be configured to provide a safer crossing than the street crossings on the other concepts, which also have more maneuvers in conflict with non-motorized traffic.	
Degree of Access	1	2	3	The diamond concept has the highest degree of access and the loop could have a similar degree of access with additional northern ramps.	
Stakeholder Considerations	2	1	3	The diamond concept provides the greatest freight mobility. All concepts provide for troop access across the highway and northbound highway access for Fort Wainwright.	
Context	2	1	3	Interchanges south of MP 359 are diamond forms with the mainline going over the cross street.	
Right-of-Way	3	1	2	The flyover requires the least amount of ROW, while the loop will require the greatest amount of ROW.	
Construction Cost	3	1	2	The flyover requires the least amount of work, while the loop will require substantial reconstruction.	
Totals	20	11	17		

Table 5 1	Concent	Evaluation	Summary
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# 6.0 Recommended Concepts

As it had the lowest score, the loop concept was dismissed. The primary reason it scored low was due to its footprint and cost; to provide an adequately sized loop with consideration to freight and adverse weather conditions; also, substantial highway realignment and retaining walls would be required. Although it has more access than the flyover, it scored lower on freight mobility due to the increased number of intersections and the low-speed loop.

The two recommended concepts are the Diamond and Flyover concepts; these concepts will be advanced to alternative development and evaluation.

Both recommended concepts eliminate the two primary conflict points and address the key criteria, including improving roadway operations with the establishment of access control. Additional benefits include utilizing the existing ROW and allowing for future roadway connection for the military land. Initial construction costs could be reduced by phasing the project, with the first phase maintaining the existing degree of access and addressing the immediate needs of the project.

The Diamond concept provides the best mobility for vehicular and pedestrian traffic and offers a full degree of access.

The Flyover concept meets the purpose of the project at the lowest expected cost. The primary drawback of this concept is that it cannot be easily converted to a full-access interchange.

# 7.0 References

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