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STATE OF ALASKA

DEPARTMENT OF TRANSPORTATION AND PUBLIC FACILITIES
HIGHWAY DESIGN AND ENGINEERING SERVICES – CENTRAL REGION

PRELIMINARY ENGINEERING REPORT

For

Dowling Road/Seward Highway Interchange Reconstruction
Project No.: CFHWY00359

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<td>TMP</td>
<td>Traffic Management Plan</td>
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<td>USGS</td>
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1.0 EXECUTIVE SUMMARY

Since the early 2000’s, the Alaska Department of Transportation and Public Facilities (DOT&PF) has been reconstructing the Seward Highway from Rabbit Creek Road to Tudor Road. The reconstruction program improves the facility from a four-lane, divided, controlled access highway to a six-lane, divided, controlled access highway. Reconstruction of the Seward Highway and Dowling Road interchange was identified as a central component of the overall program.

This Preliminary Engineering Report documents the DOT&PF’s efforts to select a build alternative for the interchange reconstruction in accordance with commitments set forth in the project EA and environmental documents. Forecasted traffic in the year 2040 was used as the design criteria for the project. Critical decisions regarding disposition of the existing Seward Highway Bridge and decisions about preserving continuity of the one-way frontage road systems were pivotal in selection of a build alternative.

Nine interchange alternatives were developed to a sketch planning level. The alternatives included options that preserved the existing bridge, replaced the existing bridge, and maintained the continuity of the frontage road system, as well as options that eliminated the frontage road through-movement.

DOT&PF conducted a sketch planning/work session, including functional leaders from within the Department and the Municipality of Anchorage, with planning and interchange expertise from the consultant team. The work session concluded with a decision to replace the Seward Highway Bridge and to preserve the through-movement on the frontage roads.

A tight diamond interchange with signalized terminals and a compressed diamond interchange with roundabout terminals were advanced to detailed design. The design efforts considered design year level of service, pedestrian and non-motorized accommodations, construction cost, maintenance requirements, ROW impacts, environmental impacts and corridor consistency.

Both alternatives are viable and reasonable interchange types that could be selected to meet the travel demand in the design year (2040). The roundabout alternative is less expensive to construct, does not require long term maintenance of signals, is consistent with other interchange types on the corridor and meets both driver and agency expectations for the interchange. It was selected as the build alternative and will advance to final design.
2.0 PROJECT DESCRIPTION

Part of the National Highway System, the Seward Highway's functional classification is that of an urban principal arterial, interstate. It is defined as a freeway in the Municipality of Anchorage (MOA) Official Streets and Highways Plan and it is a primary link in the Anchorage transportation system. Since the early 2000's the Department of Transportation and Public Facilities (DOT&PF) has been reconstructing the Seward Highway from Rabbit Creek to Tudor Road. The reconstruction program improves the facility from a four-lane, divided, controlled access highway to a six-lane, divided, controlled access highway.

DOT&PF has completed a Major Investment Study (MIS) and an Environmental Assessment (EA) that contain recommendations and commitments for the program (New Seward Highway Environmental Assessment, 2007). These governing documents identified the reconstruction of the interchange between the Seward Highway and Dowling Road as a central component of the overall program.

This Preliminary Engineering Report has been prepared to document the design decisions used to select a build alternative for the reconstruction of this interchange. The DOT&PF's selected build alternative will be advanced to detailed design and bid ready documents in order to support a 2020 construction project. These improvements will accommodate the anticipated traffic volumes for the year 2040.

2.1 Project Location

The project is located at the interchange between the Seward Highway and Dowling Road, within the MOA. It is located between the Dimond Boulevard and Tudor Road interchanges, at approximate latitude 61.166400 and approximate longitude -149.852766. The work encompasses portions of adjacent frontage roads Brayton Drive and Homer Drive, and ramps in all four quadrants of the interchange. See Figure 1 on Page 3 for Project Location and Vicinity Map and Figure 2 on Page 4 for the Existing Conditions and Major Constraints.
Figure 1: Project Location and Vicinity Map
2.2 Existing Conditions

The Seward Highway/Dowling Road interchange is a diamond form interchange with ramps in all four quadrants that terminate at a pair of two-lane roundabouts. The mainline, ramps and frontage roads south of Dowling Road are currently being reconstructed as part of the Seward Highway: Dimond Boulevard to Dowling Road (D2D) reconstruction project. The corridor north of Dowling Road was recently reconstructed as part of the Dowling Road to Tudor Road (D2T) reconstruction project. These two projects expanded the Seward Highway from a 4 lane divided facility to a 6 lane divided facility. Because neither project replaced the existing Dowling Road bridge, the Seward Highway mainline was reduced in cross section in order to fit six travel lanes over the existing bridge. This also required the elimination of the median, along with reduced shoulder widths and median barriers.

The roundabout terminals were constructed in 2003. The roundabouts replaced poorly operating signals and were Alaska’s first multi-lane roundabouts. They were designed to accommodate projected traffic in the year 2020. The roundabouts were constructed to fit within limited space, constrained by tight Right-of-Way (ROW) and the existing highway bridge. A high voltage Chugach Electric Association transmission line runs east-west along the south side of Dowling Road. Impacts to the transmission line are undesirable and are a significant geometric constraint. Running sands, a high ground water table, and the presence of deep peat constitute the existing geotechnical conditions at the interchange.

Figure 2: Existing Conditions and Major Constraints
The one-way frontage roads Brayton Drive (northbound) on the east, and Homer Drive (southbound) on the west, join the ramps in all four quadrants. These frontage roads provide through movement connectivity for businesses and residents along the corridor, and provide emergency redundancy in the system by providing mainline detour/bypass capacity. Figure 2 shows the current configuration of the interchange and the associated constraints.

2.3 Purpose and Need

This project is part of the broader Seward Highway Reconstruction: Rabbit Creek Road to Tudor Road environmental document. The purpose and need statement for the overall corridor is focused on reconstructing the Seward Highway with improvements that address current and future travel demand and mobility needs by providing additional capacity, connectivity and safety enhancements.

Working within the prior commitments and parameters of the reconstruction program, the objective of this project is to develop reasonable and feasible alternatives for a reconstructed interchange at Dowling Road in sufficient detail to select a build alternative. Specifically, the purpose of this work is to:

1. Review previous concepts and recommendations for the interchange and develop additional concepts as appropriate.

2. Determine if the Dowling Road bridge will be replaced with a new structure that accommodates the full build cross section of the Seward Highway mainline.

3. Determine if the through movements on the one-way frontage road systems are to be preserved with the interchange configuration.

The work requires an evaluation of ROW and environmental impacts, design year 2040 traffic and safety performance, and development of cost estimates.

3.0 DESIGN STANDARDS AND GUIDELINES

Design standards and guidelines that apply to the Seward Highway/Dowling Road Interchange Reconstruction Project are contained in the following publications:

Standards:


• **ADA Standards for Accessible Design**, United States Department of Justice, 2010.


• **AASHTO LFRD Bridge Design Specifications**, 2017

• **AASHTO Guide Specifications for LRFD Seismic Bridge Design**, 2011

• **Alaska DOT&PF Bridges and Structures Manual**, 2011

**Guidelines:**


Appendix A contains the Preliminary Design Criteria. These criteria are replications of the criteria used for the recent Seward Highway Reconstruction projects from Dimond Boulevard to Dowling Road, and from Dowling Road to Tudor Road. They will be updated as appropriate and finalized with detailed design.
4.0 DISCUSSION OF ALTERNATIVES

Numerous multimodal highway improvements were analyzed during the development of the original EA. These included a no build alternative, 8-lane expansion of the highway, provisions for high occupancy vehicle lanes, conversion to two-way frontage road systems, and various transportation system management techniques.

The preferred alternative identified expanding the Seward Highway mainline to six lanes, reconstructing frontage roads and ramps, improving pedestrian facilities along the corridor, providing grade separated crossings at 92nd Avenue, 76th Avenue, 68th Avenue, Campbell Creek, and International Airport Road, and reconstructing the bridges at Dimond Boulevard, Dowling Road and Tudor Road.

To date, the corridor has been reconstructed from just north of Dowling Road to Tudor Road and portions of the grade separation at 92nd Avenue have been constructed. The segment from Dimond Boulevard to just south of Dowling Road is currently in construction, and the segment from O’Malley Road, north to Dimond Boulevard (O2D) is currently in design. The interchange and associated Seward Highway in the immediate vicinity of Dowling Road has not been reconstructed. This project will complete the link between the D2D and D2T projects.

During the Design Study Phase of the D2D project, detailed design options were developed and evaluated for the build alternative for the Dowling Road interchange. This work was documented in a Dowling Road Interchange Alternative Selection Report (DRIAS, CH2M Hill, 2013). Specifically, the work in the DRIAS evaluated:

1. Improvements to the existing roundabouts
2. Converting to a Tight Diamond Interchange (TDI)
3. Converting to a Single Point Diamond Interchange (SPDI)
4. Converting to a Diverging Diamond Interchange (DDI)
5. Converting to a Partial Cloverleaf Interchange (Parclo)

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<thead>
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<th>Diamond Forms</th>
<th>Results</th>
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<tr>
<td>Compressed Diamond w/ Roundabout Terminals (Existing Bridge)</td>
<td>Advanced for detailed analysis</td>
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<tr>
<td>Diverging Diamond – (Existing Bridge)</td>
<td>Screened out and not drawn due to incompatibility with frontage road and corridor consistency</td>
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<tr>
<td>Tight Diamond – (New Bridge)</td>
<td>Advanced for detailed analysis and Recommended as the Build Alternative</td>
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<tr>
<td>Single Point Diamond – (New Bridge)</td>
<td>Advanced for detailed analysis with provision for frontage road through movement</td>
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<th>Partial Cloverleaf Forms</th>
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<td>Two Loops (Existing Bridge)</td>
<td>Screened out and not drawn due to ROW Impacts</td>
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Figure 3: DRIAS Results
A TDI was identified as the preferred alternative because it was found to be operationally acceptable for the future capacity given the best available data at the time, and had the advantages of a smaller footprint than other alternatives. Figure 3 shows a summary of the results of the previous study.

The work of this PER builds on the work of the previous study with the added benefit of updated traffic projections and newly acquired ROW. Additionally, the DDI interchange type has recently been constructed in the region and is currently planned for future construction on this corridor. DDI’s did not exist in Alaska at the time of the previous study and they were dismissed, in part, because they did not meet driver expectations and were not consistent with other interchange types on the corridor. This is no longer the case.

The additional work of this PER focused on diamond form and cloverleaf form service interchange types under two distinct scenarios:

1. Maintain the existing bridge and reduced Seward Highway cross section.
2. Complete the Seward Highway cross section and reconstruct the bridge.

A secondary but principle consideration for each alternative is the treatment of the frontage road through-movement. The one-way frontage roads Brayton Drive and Homer Drive provide access across Dowling Road for local businesses and residents along the corridor, and both diamond form and cloverleaf form alternatives have options that do not accommodate this through movement.

Figure 4 depicts the service interchange types considered for this study, loosely organized in order of increasing capacity from left to right.

![Figure 4: Service Interchange Types](image-url)
5.0 SKETCH PLANNING AND INITIAL SCREENING OF ALTERNATIVES

The interchange types depicted in Figure 4 were developed as site specific detailed sketches and organized to demonstrate each type's advantages and disadvantages. The Sketches were prepared as an initial screening activity and were presented at a half-day sketch planning/work session with the DOT&PF and the MOA. The sketch planning session resulted in two critical decisions that caused the majority of the alternatives to be dropped from further consideration. These decisions were:

1. Complete the Seward Highway mainline expansion and replace the bridge
2. Maintain the frontage road through movement

Based on these decisions, two alternatives were selected for advancement to preliminary design and cost estimating. The worksession meeting minutes and presentation are contained in Appendix B and summarized below.

5.1 Diamond Form Alternatives

All service interchanges in the diamond form family feature one-way ramps in all four quadrants of the interchange. They are commonly used in both rural and urban environments and have a high degree of driver familiarity. The type of diamond is a function of the ramp terminal spacing, ramp control techniques, and the cross section of the minor road. Service interchange alternatives in the diamond form family include compressed diamonds, tight diamonds, single point diamonds and diverging diamonds. Each has distinct advantages and disadvantages.

The FHWA maintains an online interactive design tool that describes diamond form alternatives in detail. (https://www.fhwa.dot.gov/modiv/programs/intersta/idp.cfm). The following is a summary of the FHWA’s definitions of compressed and tight diamonds and a discussion of how these definitions are applied to this project.

Compressed diamond form interchanges feature ramp spacing between 400' and 800' feet apart and they are suitable for use where ROW is constrained. These diamond forms can utilize traffic signal or roundabout terminals and both configurations are common along the corridor.

Traffic signal phasing at compressed diamonds typically aims to progress minor street through movements through the interchange, while storing left-turning vehicles between the ramp terminals. From a capacity perspective, signal-controlled compressed diamonds are one of the least efficient diamond forms. Under high volumes of traffic, obtaining signal progression and providing sufficient queue storage can prove difficult. As such, the FHWA recommends their use in rural or suburban settings where traffic demands are low to moderate.
The actual spacing of the ramp terminals has very little effect on the operational performance of roundabout terminals, as interior queuing is minimal due to nominal conflicting traffic. However, other criteria such as entrance and exit geometry, inscribed circle diameters, fastest path considerations and sight distance, constitute the predominate performance parameters.

Tight diamond form interchanges feature ramp spacing between 250’ to 400’ apart. Both roundabout terminals and signalized terminals can be applied in a tight diamond configuration. Signalized tight diamonds require close coordination between each ramp signal. With proper signal timing, they are a high capacity interchange form that progress nearly all vehicles through the interchange and store vehicles outside of the interchange, along the minor street.

The existing Dowling Road interchange features roundabout ramp terminals spaced approximately 390 feet apart, on the boundary between the tight and compressed diamond definitions. This requires some further clarification for the purpose of this report.

The roundabout alternatives described below feature ramp terminals that closely match the spacing of the existing interchange at the boundary of the tight/compressed definition. This report refers to these alternatives simply as compressed diamond form interchanges. Alternatively, these could simply be thought of as diamond form interchanges featuring roundabout terminals, where the exact definition of “tight” or “compressed” is somewhat arbitrary in nature.

This is not the case with signalized alternatives because the spacing of the ramps is pivotal to the signal phasing approach and the resulting operations of signalized terminals. For signalized terminals, this study considers tight diamonds as diamond form interchanges near the lower limit of the strict definition, on the order of 250’ ramp terminal spacing. The signalized alternatives that are on the boundary, approaching 400’ spacing, are treated as compressed diamond forms.
Compressed Diamond / Signalized Terminals:
Figure 5 shows a compressed diamond form with signalized terminals under the existing bridge.

This represents a familiar interchange type to motorists and is an alternative that could preserve the existing bridge structure, requiring little to no new ROW to construct.

This alternative features no improvements to the Seward Highway mainline, maintaining the reduced cross section, median and shoulder widths. Minor ramp and frontage road work would be required to reconnect the ramps to Dowling Road, and the frontage road through movement would be retained. The existing roundabout terminals would be converted to signalized terminals in approximately the same location. Improvements to Dowling Road would be nominal, and maintaining the bridge effectively precludes providing for left turn lanes under the structure.

Operationally, simply converting the roundabout to signalized terminals would not meet the future travel demand. The only advantage to this alternative was the preservation of the existing bridge. Since a new bridge is required, this alternative was not advanced to preliminary engineering.
Compressed Diamond / Roundabout Terminals:
Figure 6 shows a compressed diamond form with roundabout terminals under the existing bridge. This is the form in place at the interchange today.

No improvements are proposed to the Seward Highway mainline with this alternative. The existing bridge structure and reduced highway cross section, shoulder widths, and median are retained.

Substantial realignment of the ramps would be required to provide the geometry for suitable performance. This is particularly apparent at the north and southbound off ramps. Nominal reconstruction of the frontage roads is required to reconnect them with the realigned ramps, and the through movement is retained.

Variable inscribed diameters are applied to the roundabout circles, which are proposed slightly further apart than the existing configuration.

By taking advantage of newly acquired ROW, this represents an improvement over the existing condition. Operationally, at the sketch planning level, this alternative showed promise at meeting the future travel demand. It was dismissed from further consideration with the decision to replace the highway bridge.
Compressed Diamond / Roundabout Terminals:
The final compressed diamond form considered is depicted in Figure 7. This diamond interchange features roundabout terminals under a new bridge.

In this alternative, the Seward Highway is fully reconstructed, completing the link between the D2D and D2T projects. The ramps are realigned as previously described, requiring similar frontage road reconstruction.

The roundabout terminals are essentially the same as described in the alternative that preserves the bridge. However this alternative takes full advantage of previously acquired ROW north of Dowling Road by shifting the new bridge and Dowling Road centerline north. This also provides distance from the CEA overhead transmission line.

At the sketch planning level, this configuration was expected to meet the future travel demand. As it is consistent with driver expectations on the corridor, is compatible with the completion of the mainline cross section, and maintains the frontage road through movement, it was advanced to preliminary design.

Figure 7: Compressed Diamond/ Roundabout Terminals/ New Bridge
**Tight Diamond**: Tight diamond form interchanges are widely used as service interchanges. They are very efficient diamond form interchanges that feature closely spaced, signalized ramp terminals. Their efficiency comes from the ability to coordinate signal timing. Because both intersections are so closely spaced, they can be operated and controlled as a single intersection, which can be coordinated with adjacent signalized intersections. While few interchanges are operated as tight diamonds in Alaska, the lane configurations would be similar to the Seward Highway/Tudor Road interchange.

In this alternative, the Seward Highway mainline is fully reconstructed and a new bridge is provided. Major realignments of the ramps are required in all four quadrants in order to provide the 250’ spacing between ramp terminals. This tight spacing requires the use of retaining walls along the Seward Highway mainline. Frontage roads require reconstruction to reconnect with the new ramp locations, and the through movement can be preserved.

Dowling Road is realigned to the north similar to the roundabout alternative shown in Figure 7 and the cross section features dual left turn lanes under the new bridge. This interchange type was recommended in the DRIAS and is expected to accommodate the travel demand. This alternative was advanced to preliminary design.
Single Point Diamond: Single Point Diamond form interchanges are a very high capacity type of interchange. They do exist in Alaska, but are not very common and are not in use on the corridor, thus do not meet driver expectations for interchange consistency. SPDI’s bring all four ramps together at a single point. This is very efficient from a ROW standpoint, but requires a very long bridge to accommodate the ramps and cross street. The length of the bridge requires deeper girders to accommodate the span, which, in turn, requires deeper mainline embankments to provide appropriate clearance. SPDI’s also require retaining walls, adding to their overall cost.

The efficiency of the SPDI comes from eliminating a phase from a traditional four-phase signal with the interchange operating under 3 phases of signal control. The geometrics and reduced phase, however, are not compatible with a through movement, which is a significant penalty at Dowling Road. Figure 9 depicts a traditional SPDI, showing a reduced ROW footprint, a fully reconstructed highway mainline and new bridge, and realigned ramps and frontage roads. The through movement on the frontage road is not maintained with this alternative and it was not advanced for further evaluation.

Figure 9: Single Point Diamond Interchange
**Single Point Diamond with frontage through movement:** Figure 10 depicts an alternative of an SPDI that was developed to accommodate the frontage road through movement.

This alternative fully reconstructs the Seward Highway mainline, complete with a new bridge, and realigns the ramps and frontage roads similarly to the alternative shown in Figure 9. This version of an SPDI was evaluated in detail with the previous DRIAS study.

The difference between this alternative and the more traditional SPDI is that an additional phase in the signal is incorporated to allow for a movement across Dowling Road. Completing this link and introducing a fourth phase of signal control eliminates the efficiency of the interchange type. This effectively eliminates the benefits of the SPDI configuration. This would not be expected to accommodate the travel demand and it was not advanced for further evaluation.

*Figure 10: Single Point Diamond Interchange with Frontage Road Connectivity*
Diverging Diamond Interchange:

Diverging Diamond Interchanges are new to Alaska with one recently constructed at the Glenn Highway/Muldoon Road interchange. Just south of Dowling Road, two DDIs are proposed to retrofit the Dimond Boulevard and O’Malley Road interchanges. DDIs are an innovative way to significantly increase the capacity of an interchange, and they are commonly used as a retrofit technique to preserve an existing structure where interchange improvements are needed.

DDIs are considered to be one of the highest capacity diamond form of interchange. Their efficiency comes from the use of two signals located outside of the interchange that are used to cross traffic over prior to entering the interchange, converting left turns into free movements, avoiding the inefficient left-turn signal phases, reducing vehicle conflicts, and minimizing queue storage needs.

Figure 11 depicts a site specific layout of a DDI. This alternative represents a retrofit technique for the Dowling Road interchange that maintains the existing bridge. No changes to the Seward Highway are required to accommodate this alternative. The ramps would be slightly reconfigured to connect with the cross over lanes on Dowling Road. The frontage roads are essentially untouched with this alternative, but the through movement across Dowling Road would not be accommodated. This alternative was dismissed from consideration with the decision to replace the Seward Highway bridge and maintain the frontage road connectivity.
5.2 Cloverleaf Form Alternatives

Two Quadrant Cloverleaf Form: Two quadrant cloverleaf forms are commonly in use in Alaska with two examples just west of Dowling Road at the Minnesota Drive/International Airport Road and Raspberry Road interchanges. They are typically one of the highest capacity forms of interchanges.

Figure 12 depicts a two quadrant cloverleaf with ramps located beyond the Dowling Road Bridge.

The alternative fully reconstructs the Seward Highway mainline, complete with a new bridge. Loop ramps are provided beyond the cross street in the northeast and southwest quadrants. These ramps are located to eliminate the high demand left turn movements, and their use requires significant realignment of the on-ramps in these quadrants.

The frontage roads would require realignment to connect back to the ramps. In this alternative, the through movement is eliminated but the dashed red lines in Figure 12 show how they could be provided, albeit for a substantial increase in ROW. Dowling Road is shown relocated to the north to avoid the CEA transmission line.

This alternative requires a prohibitive amount of ROW. Because there are other alternatives that meet the travel demand, with a significantly smaller project footprint, this alternative was dismissed.
Single Quadrant Cloverleaf Form: A single quadrant cloverleaf form, with a loop in the southwest quadrant is shown in Figure 13.

At the sketch planning level, the traffic analysis indicated that the loop in the southwest quadrant would serve 750 vehicles per hour in the PM peak, justifying the use of the loop ramp. Peak demands for the northbound to westbound left turn are substantially less, and the use of the loop in the northeast quadrant shown in Figure 12 is not required.

This single quadrant cloverleaf form features a loop ramp in the southwest quadrant of the interchange. The east terminal includes a signalized intersection but a roundabout terminal could also be considered for this alternative.

The Seward Highway mainline improvements are identical to the two quadrant loop alternative. The ramps and frontage roads require less realignment than the two loop option. Homer Drive on the west is shown without a through movement connection, but a connection could be accommodated as shown in Figure 12. Dowling Road is also similarly relocated to the north to avoid the transmission line and to minimize ROW requirements along the cross street.

The ROW impacts are substantial and there are other diamond form interchanges with higher capacity than a single quadrant cloverleaf. For these reasons, this alternative was dismissed.
Alternatives advanced to Preliminary Engineering: Nine alternatives were developed as detailed site specific sketches and presented at the sketch planning worksession. These included seven diamond form interchanges and two cloverleaf alternatives. The diamond form alternatives featured three options that preserved the existing bridge structure and four that required a new bridge. Both cloverleaf options require a new bridge.

Two alternatives, the single point diamond and the diverging diamond, are not compatible with the through movement on the frontage road. Three other alternatives can provide this movement at a substantial loss of utility to the interchange (SPDI w/ frontage road) or require a prohibitive amount to ROW to accommodate (both cloverleaf alternatives).

With the decision to complete the Seward Highway mainline and reconstruct the bridge, and the requirement to preserve the through movement on the one way frontage road, the majority of alternatives were eliminated as candidates for further design and analysis. Only the cloverleaf alternatives and the signalized tight diamond and compressed diamond with roundabout terminals satisfy both parameters. Both cloverleaf alternatives require a prohibitive amount of ROW to construct and do not provide any substantial advantages over the other candidates to warrant further development.

The compressed diamond interchange with roundabout terminals and the tight diamond interchange both accommodate the full build mainline cross section and maintain the through movement on the frontage road. These also feature footprints that can reasonably be constructed at this interchange. Both alternatives were advanced to the preliminary engineering level of analysis.

6.0 ADVANCED ALTERNATIVES

The preliminary engineering analysis required developing each alternative to the 30% level of detail, including horizontal and vertical geometric design and three-dimensional digital terrain modeling (DTM). The development of DTM’s for each alternative were used to prepare planning level construction cost estimates and depict draft project footprints including cut and fill limits. Each alternative is described as follows:

6.1 Tight Diamond Interchange

The TDI alternative features a six lane expanded mainline and reconstruction of all four ramp and frontage road connections to the interchange. The mainline work begins just south of Dowling Road, where the previous D2D project transitions from the ultimate full build cross section, to the reduced interim cross section. The cross section is completed from the end of the D2D project to the beginning of the D2T project, completing the full build of the Seward Highway mainline expansion.
The horizontal alignment and profile grade of the mainline closely match the existing geometry. The auxiliary lanes to and from the north are maintained as is the southbound auxiliary lane between Dowling Road and Dimond Boulevard. Both off ramps are lengthened, departing earlier from the mainline in order to increase the ramp length and provide more weave length for ramp and frontage road traffic operations.

Signalized terminals are shown spaced approximately 250’ apart, at the lower limit of the formal definition of a tight diamond. This tight ramp spacing requires longitudinal retaining walls along the mainline to retain the roadway embankment. The close spacing shown represents the “worst case” with respect to the heights of the walls. If the TDI is selected as the build alternative, further design efforts would seek to increase the ramp terminal spacing while simultaneously seeking to balance signal timing, in an effort to reduce the required retaining wall height.

A new Seward Highway bridge with six mainline lanes and fully developed shoulder and median widths would span Dowling Road. Four different bridge types were considered for the alternative. A single span bridge on shallow foundations consisting of 5.5’ deep deck bulb tee girders is used in the preliminary design as the most likely bridge type for the project. The bridge proposed would be at the maximum limit for bridge length for a single span bridge with this girder type, and vertical abutment walls would be needed to provide the required width for Dowling Road.

In the alternative, the centerline of Dowling Road is re-aligned approximately 30 feet to the north. This realignment eliminates impacts along the south of the alignment, and allows for the reconstruction to avoid impacting the CEA transmission line and associated power poles. Similar to the TDI shown in the DRIAS report, this realignment would require new ROW along Dowling Road at the east and west ends of the improvements where the realigned geometry transitions back to the existing centerline.

The profile grade of Dowling Road is shown slightly lowered from the existing profile in order to provide clearance underneath the mainline bridge girders. Slightly more clearance has been provided than what is required by the Preconstruction Manual for this preliminary design. The profile is designed with respect to several topographic surveys and design surfaces of various vintages. With an accurate survey of the existing ground at the new centerline it is likely that the cut along Dowling Road can be minimized or eliminated.

Dowling Road’s cross section under the new bridge features dual left turn lanes and two through lanes each in the east and west direction, for a total of 8 lanes under the new bridge structure. Pedestrians are accommodated by a combination of 10’ wide pathways along Dowling Road and 5’ wide sidewalks and bikeways on the frontage road approaches to the cross street. Figure 14 depicts the TDI corridor as developed to the preliminary engineering level of design.
Figure 14: Tight Diamond Interchange Under New Bridge
6.2 Compressed Diamond Interchange with Roundabout Terminals

The compressed diamond with roundabout terminals alternative features the same six lane expanded mainline and reconstruction of all four ramp and frontage road connections described in the TDI. The mainline work begins and ends at the same location of the TDI, completing the full build of the Seward Highway mainline expansion. The alternative features the same mainline horizontal and vertical geometry and the cross section can be accommodated by the same single span bridge. Ramps are treated similar to the TDI, and more room is provided for the ramp/frontage road weaving maneuvers. They are also realigned to provide more perpendicular geometry at each approach. The auxiliary lanes are maintained to and from the north and south.

Dowling Road is re-aligned approximately 30’ to the north to avoid the CEA transmission line, similar to the TDI alternative. The profile grade is slightly lowered from the existing profile in order to provide clearance underneath the mainline bridge girders. The ramp terminals are spaced about 400’ apart. This spacing does not require walls to retain mainline embankment. The ramps terminate at a pair of roundabouts that vary significantly from the roundabout in use today. The east circle features an inscribed circle diameter (ICD) of approximately 185’. Horizontal curvature at the westbound approach takes advantage of available ROW to provide geometry that aids in speed control for this circle. The west circle features a larger 210’ ICD to provide the required geometry where the ROW on Dowling Road is more limited. Figure 15 shows an overlay of the proposed Dowling Road and roundabout design compared to the existing roundabout and cross street. Figure 16 shows the Roundabout Corridor.

![Figure 15: Roundabout Comparison](image_url)
7.0 TRAFFIC ANALYSIS

Substantial delay and extensive queuing regularly occurs during the weekday p.m. peak hour at the existing roundabout interchange with spillback impacting the safety and operations of the Old Seward Highway/Dowling Road intersection and the southbound Seward Highway. While the roundabouts have the highest number and rate of crashes of all Alaska roundabouts, only one severe injury crash was reported from 2010 to 2014.

The preferred alternatives as proposed are forecast to operate at Level of Service C or better with reduced queues and improved weaving and ramp operations in 2040. Sensitivity testing indicates that to accommodate growth beyond what is projected for 2040, the following may be required:

- TDI: A second northbound right-turn lane at the east signal.
- Interchange Roundabouts: A third eastbound through lane and a free northbound right turn lane.

A preliminary traffic and safety report is provided in Appendix D.

8.0 UTILITIES

The recent D2T and D2D reconstruction projects relocated numerous utilities parallel to the corridor along the frontage roads and ramps. Minimal impacts are expected to these utilities.

The predominant utility along Dowling Road is the CEA high voltage transmission line that runs east-west along the south of the corridor. Both the TDI and roundabout alternatives relocate Dowling Road to the north to avoid impacts to this utility. This realignment introduces impacts to other utilities along the cross street. Shallow buried electric and telephone are present in the existing road section and will likely be disturbed by construction. The deeper buried water lines and sewer lines in the existing roadway section will not be impacted significantly, but the storm drain system will require major reconstruction or reconfiguration to collect runoff from the relocated and new impervious areas. The utility impacts are similar for each alternative.

9.0 SOIL CONDITIONS

The Department has conducted several geotechnical investigations along the corridor to support the D2T and D2D projects. An exploration program in the fall of 2008 supported the preparation of a report titled Geotechnical Investigation Memo for Seward Highway: Dowling – Tudor Reconstruction #50816. The work for this report included borings advanced to depths of 25 feet below the existing ground surface in the vicinity of Dowling Road. The native material
is typical of glacial till and is described as being generally silty sandy soils, including the presence of dense to very dense well graded gravel, cobbles, boulders and silts and clays.

Peat material is known to exist in prevalent amounts along the corridor, particular in the vicinity of Dowling Road. A layer of peat up to 13 feet thick was encountered in the vicinity of the existing Dowling Road overcrossing and is assumed to exist north of the current alignment where the new alignment is proposed. This peat is anticipated to be very soft and saturated, and will require over excavation or other treatments to prepare the ground prior to road construction. Medium dense silty sand is expected below the peat and groundwater has been observed from as deep as 30 feet below ground surface to as shallow as 8 feet below ground surface. Groundwater could be even shallower based on seasonal variations in the water table.

10.0 RIGHT-OF-WAY REQUIREMENTS

The Department has made a substantial investment in ROW along the corridor as part of the previous D2T and D2D construction projects, including acquiring interest in over 100 parcels abutting the frontage roads Brayton Drive and Homer Drive. In anticipation of this interchange improvement, the Department has also recently acquired parcels along the north side of Dowling Road, both east and west of the Seward Highway. Both the TDI and Roundabout alternatives require additional ROW. These requirements are depicted in Figure 17 and Figure 18 and described on the following pages.

Tight Diamond Alternative: The combination of the mainline embankment walls and closely spaced ramp terminals of the TDI result in no impacts to ROW along the ramps and frontage roads for this alternative. ROW impacts are limited to commercial properties on the north side of Dowling Road.

On the east side of the mainline, parcels bounded by Rowen Street on the west and Burlwood Street on the east, are impacted as the Dowling Road cross section widens to create space for the dual left turns under the bridge. These parcels were also identified as being impacted under the TDI alternative from the DRIAS study. West of the mainline, minor impacts are anticipated to the commercial properties on either side of Latouche Street as the widened cross section tapers back to the Dowling Road five lane section.
Figure 17: ROW Requirements for the TDI
Roundabout Alternative: The number of parcels impacted by the roundabout alternative is very similar to the TDI but the roundabout affects different parcels. Unlike the TDI, ROW is required for this alternative along the ramps and frontage roads. In the southeast quadrant, a small impact is anticipated to the landscaping easement and existing berm located along the frontage road at Polaris school. In the northwest quadrant, the ramp is being realigned to provide a more perpendicular approach to the cross street. This requires ROW from the undeveloped commercial property fronting Homer Drive south of 56th Avenue. The anticipated impacts along Dowling Road are limited to a single parcel east of Latouche Street.

Figure 18: ROW Requirements for the Roundabout
11.0 PEDESTRIAN AND BICYCLE FACILITIES

Dowling Road provides a key pedestrian and bicycle route for connections to the Campbell Creek Trail and as a Seward Highway crossing. A sidepath is provided along the south side of Dowling Road and a sidewalk is along the north side. While marked crosswalks are provided through the roundabouts, driver yielding behavior has been observed to be poor, particularly on the exit lanes. The interchange was identified for crossing improvements in both the Anchorage Pedestrian Plan and the Anchorage Bicycle Plan.

Both interchange concepts will provide for pedestrian and bicycle paths on the north and south sides of Dowling Road with marked crossings across ramps and across Dowling Road on the outside approaches to the intersection. The TDI would accommodate pedestrians and sidewalk bicyclists through signalized crossings and the roundabout through marked crosswalks. The key elements to the efficiency, comfort, and safety of these crossings will be the turning radii and resulting vehicle speeds across the crosswalks. For the TDI, the pedestrian phasing and signal cycle length, which contributes to crossing delay, will be further evaluated and refined. To accommodate visually impaired pedestrians, pedestrian activated beacons will likely be required at the roundabout crossings.

12.0 STRUCTURAL SECTION AND PAVEMENT DESIGN

The structural section and pavement design is anticipated to mimic design of the recently constructed adjacent D2T and D2D projects. The full build structural section of the mainline consists of 2 inches of Type V Hot Mix Asphalt with hard aggregate over 5 inches of asphalt treated base, supported by 2 inches of crushed aggregate grading D1 and a minimum of 2 feet of compacted Type A borrow.

The D2D construction project is currently under construction at the time of this report. That work has been coordinated with this plan. Because this design project will replace the existing bridge and construct the full build widened mainline section, the D2D construction work has been modified. The DOT&PF have eliminated the mainline reconstruction work south of Dowling Road from the D2D project, deferring that work to this project. This reduces the required construction dollars on the D2D work, simplifies traffic control for that project, and eliminates future rework.

Because this portion of the mainline is not being reconstructed with the D2D project, the full build structural section is required. This differs from the requirements for the mainline north of Dowling Road. Here, the mainline was fully reconstructed with the D2T project, albeit on a reduced, narrow cross section. This portion of the mainline will resemble a repaving and shoulder widening project. The structural section for this work will consist of repaving the mainline where these improvements fall within the limits of the D2T section, and will fully reconstruct the section where this project falls outside of the new paving limits.
The ramps and frontage roads will be fully reconstructed where their alignment deviates from the recently reconstructed section. Ramp typical sections are the same as the mainline, where the frontage roads are constructed with a Type II Hot Mix Asphalt and an asphalt treated base layer of 2 inches, over 2 inches of crushed aggregate grading D1 and a minimum of 2 feet of compacted Type A borrow. For this preliminary report, the structural section for the frontage roads is applied to Dowling Road. This will likely require revision with geotechnical recommendations that will be developed in design.

These structural sections are shown on the typical section drawings developed for each alternative contained in Appendix H and Appendix I.

**13.0 ENVIRONMENTAL COMMITMENTS AND CONSIDERATIONS**

The completed Environmental Assessment for the Seward Highway Reconstruction program studied the environmental impacts associated with an interchange reconstruction at Dowling Road. Many of the impacts identified in the environmental document were addressed with the previous D2T and D2D projects. This previous work includes a substantial Area of Potential Effect (APE) that has been cleared during multiple environmental re-evaluations and the limits of this improvement fall within that APE.

The governing EA is a broad document that covers improvements from Rabbit Creek Road north to Tudor Road. It was re-evaluated with the D2T, D2D and 92nd Avenue projects, and it is currently being re-evaluated yet again with the O2D work currently in design. Instead of re-evaluating the larger and more complex corridor document for this interchange work, the environmental strategy is to manage the previous commitments under a simple standalone environmental document, which is expected to be a Categorical Exclusion.

The impacts associated with either the TDI or roundabout alternative are nominal. Each alternative satisfies the overall purpose and need of enhancing mobility and improving safety on the corridor. Providing modern pedestrian and non-motorized accommodations is a governing commitment that each alternative honors.

Resources that may be effected include wetlands, eagles, and a sensitive school property in the southeast quadrant of the interchange. The roundabout alternative is expected to have a minor impact to a landscaping easement abutting the school property, and the realignment of the southbound off ramp may introduce minor impacts to wetlands on the undeveloped parcels along the Homer Drive/ramp convergence.

The use of walls to mitigate noise to surrounding businesses and residents was examined twice with the prior projects. Noise walls did not meet the reasonable and feasible criteria of the DOT&PF’s noise policy in place at the time of construction and noise walls were not constructed. A reexamination of the selected build alternative should be conducted to confirm that the proposed improvements are consistent with the current policy.
14.0 PUBLIC INVOLVEMENT

The team launched public involvement for the project with a booth at the Anchorage Transportation Fair on February 8, 2018. Initial PI work also featured a kick-off email notification containing a survey about different types of interchanges. Other public involvement work to date included a public involvement plan, a website, and a public meeting in June concurrent with release of the draft Preliminary Engineering Report (PER). The public meeting, at the Dimond Center Hotel, was held in conjunction with an online open house. Additional events are planned to seek input as project design continues. The final approved public involvement plan is contained in Appendix F.

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<tr>
<td>Public Involvement Plan</td>
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<td>Mailing list preparation</td>
<td>March 2018</td>
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<td>Public Meetings</td>
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<td>2018 Anchorage Transportation Fair</td>
<td>February 8, 2018</td>
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<td>Open House #1 Draft Design Study Report</td>
<td>June 27, 2018</td>
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<td>Open House #2 Plans, Specification, and Estimates</td>
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<td>Organization / small group meetings</td>
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Figure 19: Public Involvement Chronology as of August 1, 2018
The kick-off survey asked respondents to provide input on various interchange types and to rate the relative importance of cost, construction impacts, right-of-way impacts, and non-motorized accommodations. Figure 20 summarizes these responses. A full summary of the survey responses is available on the project website.

Comments were submitted via email, paper and online survey, in-person at the February Anchorage Transportation Fair, and over the phone. The team has received approximately 300 comments. The following is a summary of key comments:

- Congestion at the Dowling Road/Seward Highway interchange is an issue during rush hour.
- Better bike and pedestrian accommodations are needed as many non-motorized users avoid the current interchange sighting safety reasons. Commenters cited good non-motorized facilities on Dowling segments east and west of the interchange.
- Consider future traffic needs.
- Consider enhancing driver education about how roundabouts and other interchanges work.
- Speeding is a problem with the current roundabout interchange and throughout the area.
- Commenters support the current design, stating that it works most of the time.
- Better directional signage would be a great help with any interchange selected.
- People driving don’t see or yield to people walking or biking in the crosswalks.
• In a two-lane roundabout, traffic in the outside lane should be going straight or to the right and the inside lane should be making a forced left, similar to the roundabouts at C Street and Minnesota.

• Consider showing interchange options in three dimensions or video to enhance the public’s understanding of how to navigate them.

• Roundabouts, if redesign is chosen, should be larger and accommodate all users—including trucks and non-motorized users.

• Design for our winter city by considering snow storage, sidewalk/pathway setbacks so the facilities can be used throughout the year.

• Consider the human factor—how people behave—when designing the location of curb cuts, light poles, cross walks, push buttons, etc.

• The traffic light option is NOT a solution as it replicates the original problem. Magical thinking about how these lights will be coordinated to solve the heavy traffic flow during rush hours and still allow normal wait times at other times is childish and naive.

• Ensure design meets future traffic volumes.

Comments received at the June public meeting focused on the two alternatives advanced in the Preliminary Engineering Report (PER). A summary follows of key comments specifically related to the PER.

• Favorable comments about roundabouts in general.

• Concern about pedestrian and bicycle safety with both alternatives but more so with roundabouts.

• Many commenters stated the alternative preferred when driving is the roundabout; as a pedestrian or bicyclist, they preferred the tight diamond with signal terminals.

Comments received at the June public meeting focused on the two alternatives advanced in the Preliminary Engineering Report (PER). A summary follows of key comments specifically related to the PER.

**How does the tight diamond alternative meet your needs?**

Comments in favor: Better for pedestrians/bicyclists; favors through traffic; stops traffic; moves traffic; pedestrian signal; lots of lanes; straight forward; easy access to New Seward Highway from the east side; safer.
Comments opposed: Difficult to turn onto Rowan Street; less safe; higher cost; not as good as roundabout for moving traffic; stopping traffic not good for fuel economy; has problems typical of traffic lights where folks may run red lights; creates traffic; opposed to traffic signals; may cause increase in crashes; needs bike lanes; changes to business access off of Dowling; stopping traffic creates traffic.

What potential issues do you see with the tight diamond alternative?

Issues in favor: Better access for snow removal equipment; better for pedestrians/bicyclists because of signalized crossings; no issues.

Issues opposed: Sitting, waiting, polluting; increase bike/pedestrian crashes with vehicles; don’t need more signals on Dowling Road corridor; like the roundabout better for emergency response; better if islands separated turning and straight lanes; increase in traffic crashes; brings all the hazards of signalized intersections; the Municipality of Anchorage has a poor record of synchronizing signals; more difficult to U-turn than in roundabout; no bike lanes; more severe types of collisions than with roundabout; too expensive; traffic will still backup during rush hour due to volume and stoplights; might be difficult for large trucks.

Do you have issues or comments about the bicycle and pedestrian facilities incorporated into the tight diamond alternative?

Comments in favor: Better access for snow removal equipment; better for pedestrians/bicyclists except when motorists run red lights; more separation is always welcome; signals clarify all yielding issues; nice pathways; standard and predictable intersection; improvement over current setup.

Comments opposed: Neither option provides safety for pedestrians; increased bike/pedestrian crashes; would prefer more separation for pedestrians/bicyclists; very long six-lane crossing; would not ride a bike near Dowling no matter the design; no bike lanes; need tunnels or bridges for people to cross.

How does the roundabout alternative meet your needs?

Comments in favor: Larger circumference roundabouts will help; never had a problem with existing roundabouts; prefer roundabouts for both vehicle and pedestrian/bike traffic; provides access while minimizing delays; keep traffic moving, more efficient; best way to accommodate large vehicles turning left onto Dowling Rd off Rowan St; will shorten wait time in busy corridor; better for emergency response; safer; switching back to inefficient lighted intersections would be a step back; reduces speeds with less conflict points; roundabout seems more familiar; like the
number of lanes; keeps traffic exiting the Seward Highway from backing up onto the Highway; don’t put in stop lights; traffic lights kill; less severe collisions; no negative issues with roundabout.

Comments opposed: It dramatically fails to meet my needs; roundabouts do not work unless speed is controlled; install traffic cameras; exceeds needs; still presents bikes/ pedestrians with confusing situations and unprotected interactions with motor vehicles; considers non-motorized users as afterthought; requires more right-of-way; changes to business access off of Dowling; issues with motorists not yielding to pedestrians/bicyclists.

**What potential issues do you see with the roundabout alternative?**

**Issues in favor:** The striping, signage, and roll-out of this change would need to focus on clarity and consistency, unlike the previous roll-outs and modifications to this intersection; previous website animation did not match the actual design; original striping did not clearly indicate when outside lanes were expected to exit (current striping is much better); speed humps on roundabout exits (rather than entrances) was incredibly counterproductive; people slowdown in the larger diameter roundabouts; larger diameter roundabouts are great; non-motorized facilities seem to be afterthought; smoother traffic flow and fuel cost savings; other larger roundabouts in Anchorage work well; no issues with the roundabout alternative.

**Issues opposed:** Anchorage drivers have a difficult time with roundabouts; bike/pedestrian use of the roundabouts can be scary; keep vegetation and landscaping clear of Rowan Street and Dowling intersection for better visibility; traffic circles cause accidents; dangerous for pedestrians, cyclists and anybody with visual impairment; takes up too much space; will cost more; won’t save a lot of time; traffic will still back up at rush hour because of volume; more accidents as drivers switch lanes; not sure how pedestrians get right-of-way when crossing; still too small; needs lights; trail route is circuitous, users will take short cuts; image does not show bike infrastructure; drivers who don’t know how to navigate roundabouts cause accidents.

**Do you have issues or comments about the bicycle and pedestrian facilities incorporated into the roundabout alternative?**

**Issues in favor:** Looks like a good set up to me; separating bikes and pedestrians from traffic is good; design should allow easy flow with bicycle traffic and safe passage for pedestrians; appreciate the orthogonal road crossings; bike/pedestrian facilities situated in a manner that allows drivers to see them and provide safe crossings without expensive signal maintenance; good to have a path through the
intersection outside of the roundabout itself; safer in theory but traffic accelerates across the crosswalk when leaving the roundabout; prefer roundabouts as pedestrians can cross when safe and not have to wait for long lights; safety of pedestrian crossing is important even if it takes more time.

Issues opposed: Concern that traffic will not cooperate with the facilities and yield appropriately; pedestrian tunnel would make more sense; crossing Brayton dangerous because you cannot see the cars quick enough; confusing; only solution is to separate cars from bikes; busy multi-lane roundabouts are dangerous for cyclists and pedestrians; don’t see bike/pedestrian facilities in the image; will not ride through this intersection until there are flashing lights, noise, something to alert drivers.

The team asked the public to specifically identify other questions or comments that would help the team as work continues. The following is a summary of the responses.

- Provide bike lanes through (on) Dowling and frontage roads.
- Go with the safest and most cost-effective solution.
- Sell excess right-of-way back to private sector so it gets back on tax rolls.
- Keep the roundabout – everyone has finally gotten the hang of them and like them; pay meticulous attention to detail in rollout to ensure an accurate and consistent message; design for speed you want drivers to use; and provide good signage to guide drivers through it.
- Double diamond interchange keeps traffic of all kinds simpler.
- Roundabout is not a good option for this location and believe the signalized tight diamond could be a better alternative to make the road safer and less congested.
- Consider the pedestrians/bikes first and then figure out how cars fit in. Connect the non-motorized facilities along Dowling Road between Lake Otis and Old Seward.
- The traffic light design appears to be almost identical to the O’Malley/Seward intersection but concerned about Anchorage’s ability to coordinate traffic flow using traffic signals.
- Pay close attention to Brayton, sight distance and traffic entering from 64th; and the merging before the interchange. Some suggested a signal at 64th and Brayton to meter traffic on the merge to northbound Seward Highway off ramp.
- Please strongly consider the signalized tight diamond option for improved safety for cyclists and pedestrians.
15.0 CONSTRUCTABILITY CONSIDERATIONS

Constructing a new mainline bridge over Dowling Road while simultaneously keeping mainline and cross street traffic moving is the most significant and challenging aspect of the project. In addition to the maintenance of traffic, there are several elements at the existing site that add to this complexity. These include the presence of the high voltage overhead transmission main running along Dowling Road, anticipated running sands, deep peat and high groundwater at the project site.

The DOT&PF held a construction coordination meeting in advance of the planning worksession to address the overall constructability of the project. The coordination meeting included representatives from DOT&PF management, and leaders from the construction section, materials section, bridge design and consultant team design engineers. Minutes from this meeting are included in Appendix B.

The construction team noted several fundamental design elements needed to successfully construct the project. Specifically:

- Avoiding changes to the profile grade of the mainline or cross street
- Constructing a single span bridge
- Design pile supported bridge foundations

To the extent practical, these elements are represented in the preliminary designs. The mainline profile is replicated to match the exiting profile grade in the field today. Slight excavation along the Dowling Road profile is shown in order to provide adequate clearance underneath the bridge structure. This excavation may be reduced with future design as the bridge type, girder depths and roadway geometrics are refined.

A single span bridge can be provided for each alternative, and is proposed in these preliminary designs. The use of a single span provides the opportunity to demolish the existing structure and construct the new bridge using a “half width” construction technique to maintain traffic. Under this concept, eliminating roadway shoulders and using median barriers allow for the northbound and southbound mainline traffic to share one side of the existing bridge while the other side is demolished and reconstructed. Once half of the new bridge is in place, traffic is moved to that side while the other side of the structure is completed. This technique allows for Dowling Road to generally remain open during construction. At the preliminary engineering level, this appears to be a viable construction methodology, but the structural implications of a half-width bridge demolition need to be considered in greater detail as the design progresses. Other less desirable alternatives include mainline detours around the bridge site and extended closure of Dowling Road, or offsite fabrication and rapid installation of a non-traditional bridge.
The final major constructability consideration involves building the bridge immediately adjacent to the CEA high voltage overhead transmission line. While the Dowling Road alternatives have been thoughtfully laid out to avoid impacts to the line, there are safety regulations associated with operating bridge cranes in close proximity to these overhead lines. Generally the crane must be located a distance from the overhead line that is greater than the height of the crane. This overhead power line and crane conflict was an issue on the recently constructed West Dowling Road extension project. Despite thoughtful design and permitting, the Department was required to negotiate with the contractor to temporarily relocate power poles while in construction.

Benefiting from the West Dowling Road experience, this project has the opportunity to mitigate these risks during design. Alternative construction techniques to avoid this conflict may include requiring a single, mid-span crane pick for girder launching to create space between the line and the crane, or requiring girders to be jacked into place from below, completely eliminating the use of cranes.

16.0 BRIDGE AND MAJOR STRUCTURES

Detailed preliminary bridge designs are included with bridge selection memorandums for each alternative in Appendix G. Four options were developed for each alternative, including two single span options and two double span options. The single span options feature shallow foundations consisting of spread footings on MSE wall fill, while the double span bridge alternatives feature deeper pile supported foundations.

Three of the four alternatives developed feature deck bulb tee girders with depths ranging from 3.5 feet to 5.5 feet. These girder depths can provide adequate clearance under the structure while maintaining the profile grade on the Seward Highway mainline. One alternative features steel girders, which are approximately 3.5 feet deeper than the deck bulb tees. The use of the steel girder option requires substantial changes to the Seward Highway profile grade.

The most cost effective structure features a single span bridge on deck bulb tees with a bridge length of 145’ and vertical abutment walls. This bridge is the maximum length for this type of single span bridge. As configured, this bridge can accommodate either alternative, which is desirable because the structure design life is for 75 years and the project design horizon is only 20 years. This configuration provides forward compatibility and maximum flexibility in the future. This bridge was used as the selected bridge type for the preliminary designs. This does not preclude future use of either two span options if the geotechnical recommendations require deeper foundations.

These bridge types are common to local contractors, very durable and fast to construct. Their heavy girders require large cranes to construct, which need to be balanced by the
constructability issues associated with the CEA overhead transmission line. Figure 21 shows a similar bridge structure at the Minnesota Drive and Raspberry Road interchange.

Figure 21: Single Span Bridge on Deck Bulb Tee Girders
(Source: DOT&PF)

17.0 COST ESTIMATE

Planning level cost estimates were developed for each alternative. A comparison of these costs can be found in Figure 22 below. These estimates are based on the following assumptions:

- One season construction period;
- Single span bridge for both alternatives;
- Temporary relocation of two poles on CEA high voltage transmission line with no other significant utility relocations;
- ROW impacts for both alternatives;
- Nominal wetland impacts for the roundabout alternative
- 15% contingency for construction costs.

Detailed cost estimates for each alternative can be found in Appendix C.
The tight diamond and roundabout alternatives are very similar and feature a number of common design elements and expected performance characteristics. Both feature essentially identical reconstruction of the Seward Highway mainline and bridge and both require realignment and reconstruction of the ramps and frontage roads in each quadrant. Each alternative can take advantage of the available ROW by realigning Dowling Road to the north but both alternatives require additional ROW beyond what is available today. Both can be designed and constructed to avoid permanent relocation of the CEA overhead transmission line and each can accommodate pedestrian and bicycle users.

Despite the number of common elements, there are distinct differences between the two. These include:

- The TDI requires MSE walls which increases the construction cost of this alternative.
- The TDI requires signal coordination with the signals along Dowling Road to optimize progression along the alignment and for optimal signal spacing. Not only does this increase the construction cost for this option, but DOT&PF would incur costs to maintain these signals, increasing maintenance costs.
- Alternatively, the roundabouts can be landscaped with low cost improvements that require little maintenance.

### 18.0 COMPARISON OF ALTERNATIVES

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*Figure 22: Construction Costs*
• The roundabout footprint includes environmental impacts at Polaris school in the southeast quadrant and the undeveloped commercial property with known wetlands in the northwest quadrant.
• The roundabout is familiar to the traveling public at this location.
• There are other roundabouts in construction or in design that are used as interchange ramp terminals on the corridor (Huffman Road, 76th Avenue and 92nd Avenue), further demonstrating driver familiarity for this interchange type.
• Other signalized diamond interchanges on the corridor (Dimond Boulevard and O’Malley Road) are currently being redesigned as DDI interchanges and there are no signalized TDI’s on the corridor.

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✓ Alternative With the Advantage
- No Advantage Between Alternatives

Figure 23: Comparison Graphic
The previous section compares the tight diamond against the roundabout alternative on a number of project specific criteria. Figure No. 23 demonstrates that both alternatives are reasonable and technically feasible alternatives that could be selected for the build alternative. They both fully reconstruct the six lane expanded Seward Highway mainline, completing the link between the D2T and D2D projects, fulfilling the expanded highway reconstruction set forth in the project environmental documents. Each is expected to meet the travel demand in the year 2040 and they both feature the exact same Seward Highway bridge, providing for maximum flexibility in the distant future, beyond the design horizon for this project. With thoughtful design, both can readily accommodate pedestrians and non-motorized users, and each alternative requires a similar amount of additional ROW.

The tight diamond has clear advantages in the environmental category, as the footprint associated with this alternative does not pose impacts to wetlands or the Polaris School in the southeast quadrant of the interchange. The use of retaining walls along the mainline and the placement of signalized intersections adds to the upfront construction costs, which are higher than the roundabout alternative. Additionally, the TDI requires ongoing maintenance of two signalized intersections. This alternative was previously identified as the preferred build alternative for this interchange. This PER concurs that a tight diamond alternative is an acceptable and feasible alternative that could be selected as the build alternative.

The roundabout alternative has several unique advantages and disadvantages when compared to the TDI. The principal disadvantage is associated with the impacts to wetlands in the northwest quadrant and impacts to the Polaris School in the southeast quadrant, which would both require more emphasis on environmental permitting and coordination than the TDI.

These disadvantages are offset by several distinct advantages for this alternative. Specifically, the spacing of the ramps provide sufficient room such that walls are not required to retain the Seward Highway mainline embankment. This, combined with the lack of signalized intersections, results in an improvement that is initially less costly, and does not require long-term maintenance of signals.

Finally, roundabout terminals exist at the interchange today. A new grade separated crossing of the Seward Highway with roundabout terminals is currently being constructed just south on the corridor at 76th Avenue and a new grade separated crossing of the Seward Highway with roundabout terminals is currently in design and planned for 92nd Avenue. There are no signalized tight diamonds on the corridor and the roundabout alternative has distinct advantages from the perspective of corridor consistency and public and agency expectations for this interchange.

Because the roundabout alternative is less expensive to construct, does not require long-term maintenance of signals, is consistent with other interchange types on the corridor, and meets both driver and agency expectations for the interchange, it is the Engineer’s recommendation for the build alternative.