

To: Steve Gramm, SDDOT	
From: HDR Engineering	Project: I-190/Silver Street Interchange
CC: File	
Date: September 20, 2011	Job No: 137390

RE: Constructability Review

The South Dakota Department of Transportation (SDDOT) has requested a review of the potential construction issues associated with the interchange concepts proposed for the Silver Street interchange (Exit 1) on Interstate 190 in Rapid City. The constructability review documented in this technical memo is part of a comprehensive study of the Silver Street interchange which includes preparation of an interchange justification report (IJR) and an environmental assessment (EA).

The alternative interchange concepts described below have several similar aspects and pose fairly routine constructability issues of similar magnitude. In general, the new interchanges are proposed to be constructed to the west of its existing location. This was recognized early in the design option analysis due to the availability of right-of-way created by previous property buyouts and traffic construction and phasing benefits over rebuilding the bridge structures in the same location. By shifting the I-190 alignment west, the majority of the interchange and ramps could be constructed with reduced impacts to I-190 traffic. During the initial stages of the re-construction project, traffic would remain on the existing interstate roadway with closures to the southbound on and off-ramps. Following construction of a major portion of the new lanes including a big percentage of the southbound lanes and the northbound bridge, traffic would be shifted to the existing northbound lanes to allow completion of the southbound lanes (tying into the existing alignment at both ends of the project). In the latter stages of construction, traffic would then be shifted onto the new southbound lanes and bridge for completion of the northbound lanes. Use of temporary ramp tie-ins and traffic control devices would allow the existing northbound I-190 off-ramp at North Street and the on-ramp at Anamosa remain open throughout the project.

In addition to a review of traffic impacts both during and following construction, a review of utility impacts and expected adjacent land improvements were also reviewed for construction impacts. Public utility impacts would be minor and consist of expected drainage improvements and storm sewer upgrades improving drainage in the northwest quadrant and minor city utility modifications would be needed. The biggest impact would be to private utilities. Specifically, a major impact would be to the Black Hills Power high-voltage line running east-west along the North Street corridor. This will need to be addressed during final design to determine new placement of relocated poles and to ensure proper clearance from the new bridge structures. It should be noted that a critical pole exists on the southeast corner of the interchange by the Rapid City Central parking lot. Due to the expense of relocating this structure, the proposed interchange alternatives purposely avoided the utility structure.

Potentially larger constructability issues are posed by the associated neighborhood street connections. The local street connection issues have been further investigated and will also be covered in this memorandum to provide an overall picture of the constructability of a new Silver Street interchange.

Interchange Alternatives

Eight interchange alternatives were developed during the first phase of the study. A number of the alternatives have been eliminated through the environmental review process. All the alternatives are discussed in this memorandum to provide a complete comparison of constructability issues.

Alternative 1

This alternative consists of a diamond interchange at Silver Street/North Street with I-190 shifted west. Shifting the I-190 alignment to the west allows for sufficient room to build all interchange options and provide adequate turn lanes and other geometric features. The southbound I-190 ramp terminal in this option has a fairly high degree of skew on the cross-road and subsequent sharp

turning paths on some movements. The mainline bridges would be relatively long due to the cross-road skew. Additional right-of-way will be needed west of the existing I-190, although some of the needed property is already in public ownership. Additional local street connections will be needed west of the interchange to facilitate local traffic movement. The parking lots at Central High School will no longer be allowed to access the Interstate off ramp in this concept. The ramp in the northeast quadrant may also provide limited local street access for a short distance before the actual entrance ramp begins (optional).

Constructability issues include:

- I-190 realignment allows structure construction while maintaining traffic.
- Construction on Silver Street/North Street would require phased completion or a long detour.
- Due to safety concerns during construction, it is recommended that the accesses to the high school parking lot from the northbound off-ramp should be closed when construction begins.
- The I-190 bridges would be located on a straight tangent of I-190. Due to the alignment of the crossing Street, the bridge would be skewed at approximately 45 degrees and requires a longer bridge when compared to the other alternatives. Except for reconstruction of North Street/Silver Street due to the condition of the roadway, there will be no major changes to the non-interstate street network.
- Unless a network of temporary ramps are provided during construction, long-term ramp closures for southbound traffic will be expected.
- A borrow site will need to be identified due to the large volume of embankment needed. There is a large hill directly west of the interstate and south of Silver Street that could be considered for borrow.

Alternative 1a

This alternative consists of a diamond interchange at North Street with I-190 shifted west. This alternative is similar to Alternative 1, except North Street would be extended straight west connecting to Philadelphia Street and eliminating direct access to the interchange from Silver Street west of the interstate. The closure of direct access to the interchange from Silver Street would require a connection of the existing development to Philadelphia Street.

Constructability issues include:

- I-190 realignment allows structure construction while maintaining traffic on existing I-190 lanes.
- Due to safety concerns during construction, it is recommended that the accesses to the high school parking lot from the northbound off-ramp should be closed when construction begins.
- The I-190 bridges would be located on a straight tangent of I-190. The structure required in this alternative is shorter than in others.
- The Van Buren local street connection is recommended and would be constructed prior to closing the interchange to serve neighborhood access.
- Unless a network of temporary ramps are provided during construction, long-term ramp closures for southbound traffic will be expected.
- A borrow site will need to be identified due to the large volume of embankment needed. There is a large hill directly west of the interstate and south of Silver Street that could be considered for borrow.

Alternative 2

Single point diamond interchange at Silver Street/North Street with I-190 shifted west. The single-point ramp terminal suffers from a fairly high degree of skew on the cross-road and a large area of pavement for turning movements. The mainline bridges would be relatively long and wide due to the cross-road skew. Additional right-of-way will be needed west of the existing I-190, although some of the needed property is already in public ownership. The additional right-of-way required will be less than option 1 or option 1a. Additional local street connections will be needed west of the interchange to facilitate local traffic movement. The parking lots at Central High School will no longer be allowed to access the Interstate off ramp in this concept.

Construction issues include:

- I-190 realignment allows structure construction while maintaining traffic.
- Construction on Silver Street would require phased completion or a long detour.
- Traffic using the high school driveway from the northbound off ramp would need to be rerouted prior to construction.
- A straight structure with skewed ends would be required. The structure required in this alternative is longer than in others.
- No new local street connection would be required, but Silver Street would need to be reconstructed in phases in order to keep neighborhood access during construction.
- Earthmoving and potential borrow activities would affect construction phasing and progress. Ramp closures may be necessary to allow earthmoving to take place.

Alternative 2a

This alternative consists of a Single Point Diamond Interchange at North Street with I-190 shifted to the west. The alignment of the intersecting street is similar to Alternative 1a. North Street would be extended straight west connecting to Philadelphia Street and eliminating direct access to the interchange from Silver Street west of the interstate. The closure of direct access to the interchange from Silver Street would require a connection of the existing development to Philadelphia Street.

Construction issues include:

- I-190 realignment allows structure construction while maintaining traffic. Also, the realignment allows for additional room to the east of I-190 for improved northbound ramp alignment.
- Temporary access to the neighborhood will be provided during construction.
- Ramp access for north and southbound traffic will be intermittent during construction and use of temporary ramps will be determined during final design.
- Direct access to the high school parking lots from the northbound off-ramp will be closed prior to construction beginning.
- The I-190 bridges would be located on a straight tangent of I-190. This alternative utilizes a structure associated with this alternative is shorter than used with other alternatives.
- The West Boulevard local street connection is recommended and would be phased to serve neighborhood access at Silver Street. The local street connection would require a large cut and retaining wall so a mass haul diagram should be considered during the phasing plan.
- Earthmoving and potential borrow activities would affect construction phasing and progress. Ramp closures may be necessary to allow earthmoving to take place.

Alternative 2b

Hybrid interchange with features of diamond and single-point interchanges. The on-ramps are served by a central intersection and the off-ramps terminate in stop-controlled intersections. The interchange configuration fits the existing street system, but would produce greater delay for off-ramp traffic than other configurations.

Construction issues include:

- I-190 realignment allows structure construction while maintaining traffic.
- Construction on Silver Street would require phased completion or a long detour.
- Traffic using the high school driveway from the northbound off ramp would need to be rerouted prior to construction.
- A straight structure with skewed ends would be required. The structure required in this alternative is longer than in others.
- No new local street connection would be required, but Silver Street would need to be reconstructed in phases in order to maintain neighborhood access during construction.
- Earthmoving and potential borrow activities would affect construction phasing and progress. Ramp closures may be necessary to allow earthmoving to take place.

Alternative 3

I-190 interchange with loop at North Street. Connecting the cross-road to the new roadway west of the interchange results in the opportunity to provide a loop ramp to handle one of the largest turning volumes. Eastbound traffic would not be able to turn south at the interchange in this concept, but other local street alternatives are available. The mainline bridges would be relatively short in this option, but the southbound bridge would need to be three lanes wide to handle the accelerating loop traffic. Additional right-of-way will be needed west of the existing I-190, although some of the needed property is already in public ownership. The additional right-of-way required will be larger in the loop quadrant, but less in the southwest quadrant. Additional local street connections will be needed west of the interchange to facilitate local traffic movement. The parking lots at Central High School will no longer be allowed to access the Interstate off ramp in this concept.

Construction issues include:

- I-190 realignment allows structure construction while maintaining traffic.
- Construction on Philadelphia Street could begin while Silver Street remains open to serve neighborhood access.
- Traffic using the high school driveway from the northbound off ramp would need to be rerouted prior to construction.
- A straight structure with skewed ends would be required. One structure required in this alternative is wider than in others.
- The Van Buren local street connection is recommended and would be phased to serve neighborhood access.
- Earthmoving and potential borrow activities would affect construction phasing and progress. Ramp closures may be necessary to allow earthmoving to take place.
- The larger interchange footprint to the west encroaches on the large hill with potential impacts to the driveway access to the apartment building.

Alternative 3a

This alternative consists of a modified diamond interchange. The southbound on ramp is relocated into the northwest quadrant as a loop. Connecting the cross-road to the new roadway west of the interchange results in the opportunity to provide a loop ramp to handle the largest turning volume within the interchange. Eastbound traffic would access the southbound interstate via a slip ramp onto the loop ramp. The interstate bridges would be relatively short in this option, but the southbound bridge would need to be three lanes wide to handle the accelerating loop traffic. Additional right-of-way will be needed west of existing I-190, although some of the needed property is already in public ownership. The additional right-of-way required will be larger in the loop quadrant, but less in the southwest quadrant. Additional local street connections will be needed west of the interchange to facilitate local traffic movement.

Constructability issues include:

- I-190 realignment allows structure construction while maintaining traffic. Also, the realignment allows for additional room to the east of I-190 for improved northbound ramp alignment.
- Temporary access to the neighborhood will be provided during construction. Ramp access for north and southbound traffic will be intermittent during construction and use of temporary ramps will be determined during final design.
- Direct access to the high school parking lots from the northbound off-ramp will be closed prior to construction beginning.
- The I-190 bridges would be located on a straight tangent of I-190. This alternative utilizes a structure associated with this alternative is shorter than used with other alternatives.
- The Van Buren local street connection is recommended and would be constructed prior to closure of the interchange to serve neighborhood access.
- Earthmoving and potential borrow activities would affect construction phasing and progress. Ramp closures may be necessary to allow earthmoving to take place.
- The larger interchange footprint to the west encroaches on the large hill with potential impacts to the driveway access an apartment building.