Exit 32 – I-90 Interchange Modification Justification Study

Introduction

The purpose of this study is to justify modifying the interchange configuration at Exit 32, the intersection of I-90 and Junction Avenue in Sturgis. Figure 1 shows the location of the interchange. This interchange provides important access the City of Sturgis. The existing interchange configuration cannot accommodate the current traffic demand. The predominate purpose for re-configuring the interchange is to improve operation; move the eastbound and westbound ramps to the same side of the rail line to provide adequate storage of vehicles wishing to cross the tracks and to remove the current condition interchange condition which isolates the west half of the interchange during the passage of a train; and, to facilitate the relocation of Junction Avenue to connect with Vanocker Canyon Road. Figure 2 shows the existing Exit 32 interchange configuration.

Figure 3 depicts the proposed interchange modifications. The preferred option will relocate the current interchange to the east to improve the operation of the interchange and accommodate the relocation of Junction Avenue.

This study addresses the policy requirements for new or revised access points to the existing Interstate system published in the Federal Register Volume 63 Number 28 February 11, 1998.

1. The existing interchanges and/or local roads and streets in the corridor can neither provide the necessary access nor be improved to satisfactorily accommodate the design year traffic demands while at the same time providing the access intended by the proposal.

The existing design of a split diamond interchange with a railroad line running between the ramps does not allow adequate storage of vehicles attempting to cross the tracks during the passage of a train. The existing configuration is a safety concern and is confusing to the travelling public.

There are times during the year when traffic volumes so overload the interchange that vehicles are backed up on the I-90 in the driving lanes waiting to exit into Sturgis. This situation is caused by a combination of trains passing through the interchange and the Sturgis Motorcycle Rally.

The railroad alignment bisects the interchange and separates ramp terminals causing added turning movements to cross the rail line and congestion . The relocation of the interchange to an undeveloped area just east of its present location away from the railroad would allow a safer and more efficient design.

In 2002, the South Dakota Department of Transportation reviewed the service life of the structures at Exit 32. This review indicated there was only 8 years of service life remaining. The structures will have to be replaced to allow traffic to continue on I-90.

Figure 1

Map of Sturgis, South Dakota showing Project Location

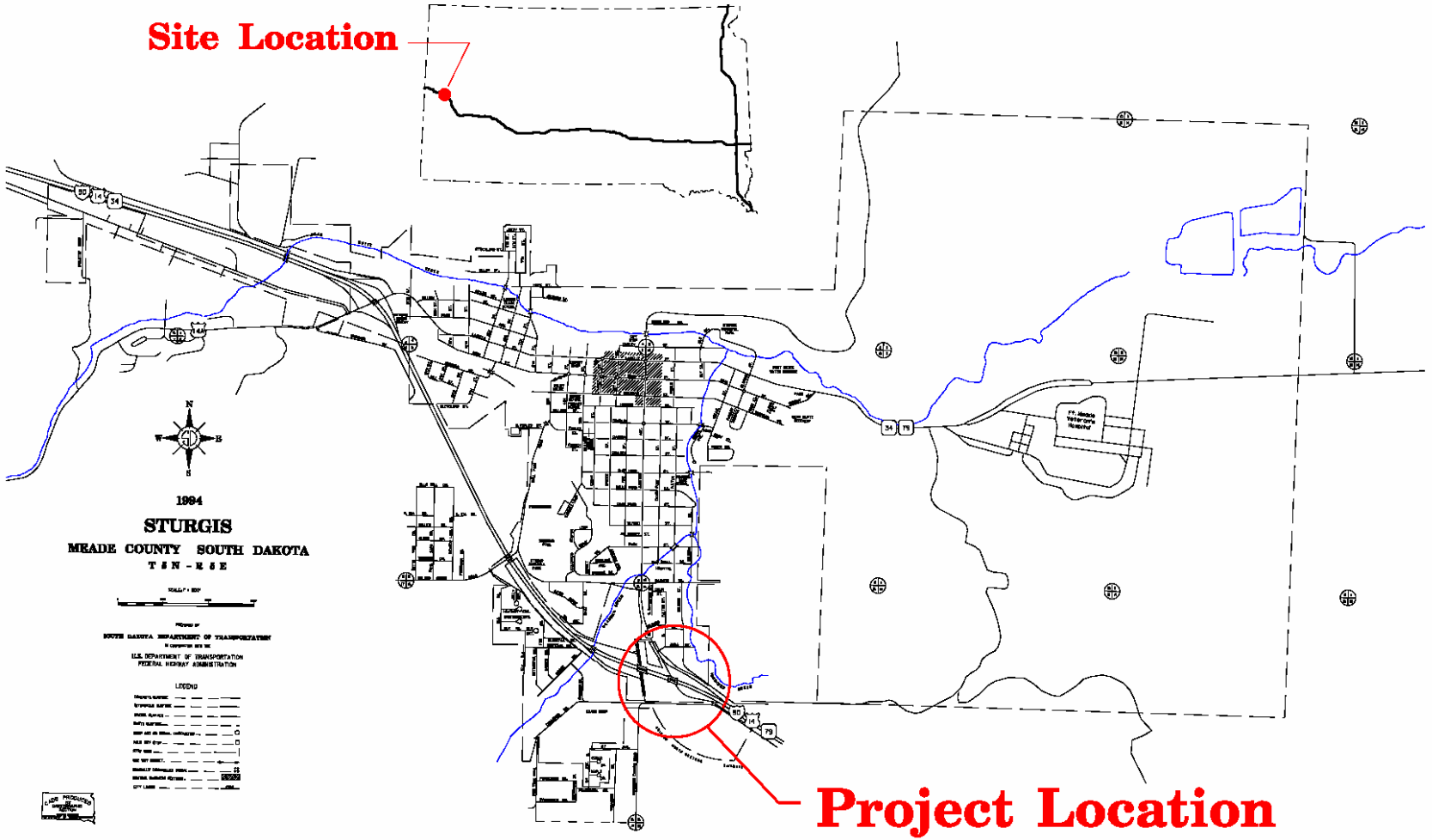


Figure 2

Existing I–90 Exit 32 Configuration in Sturgis, South Dakota

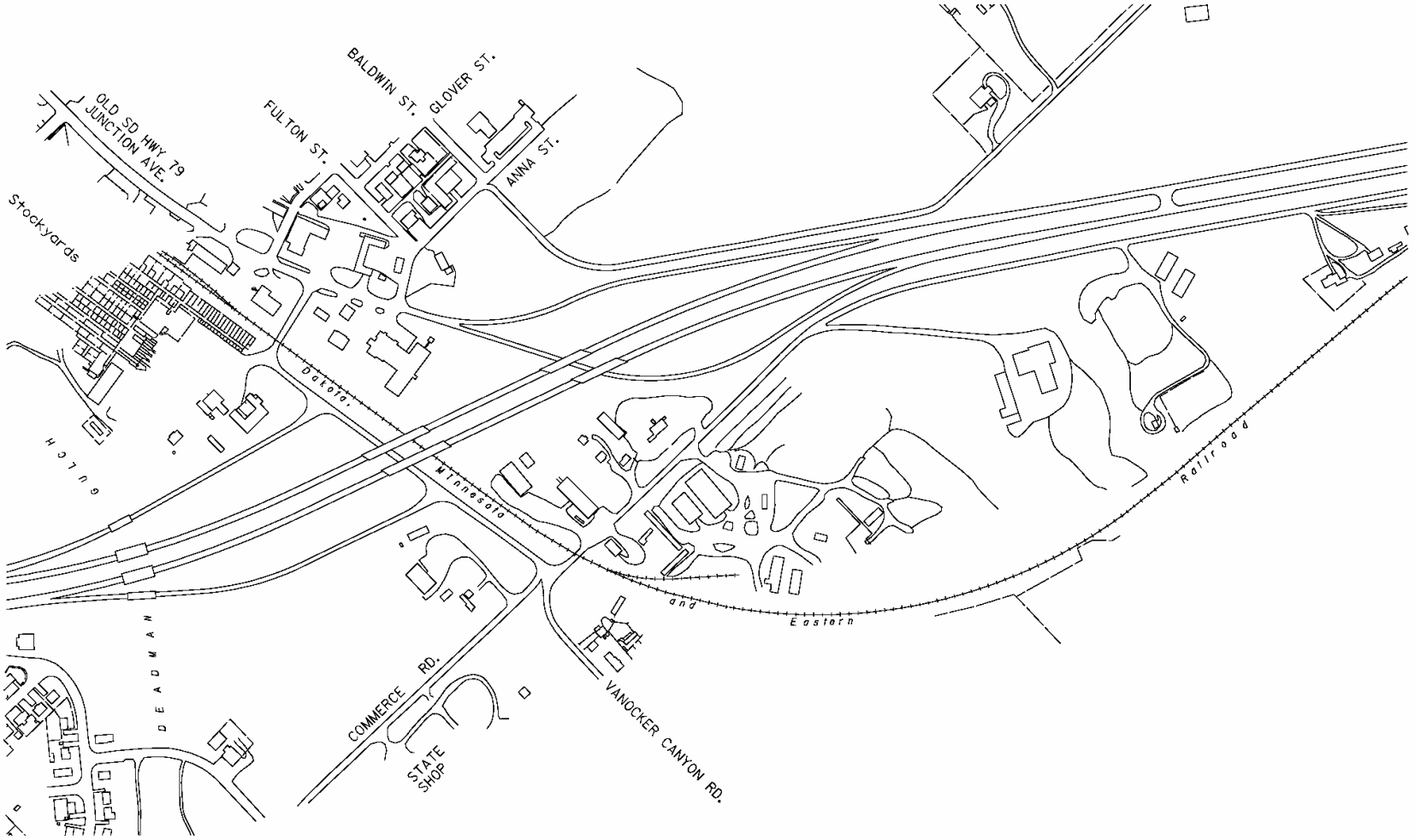
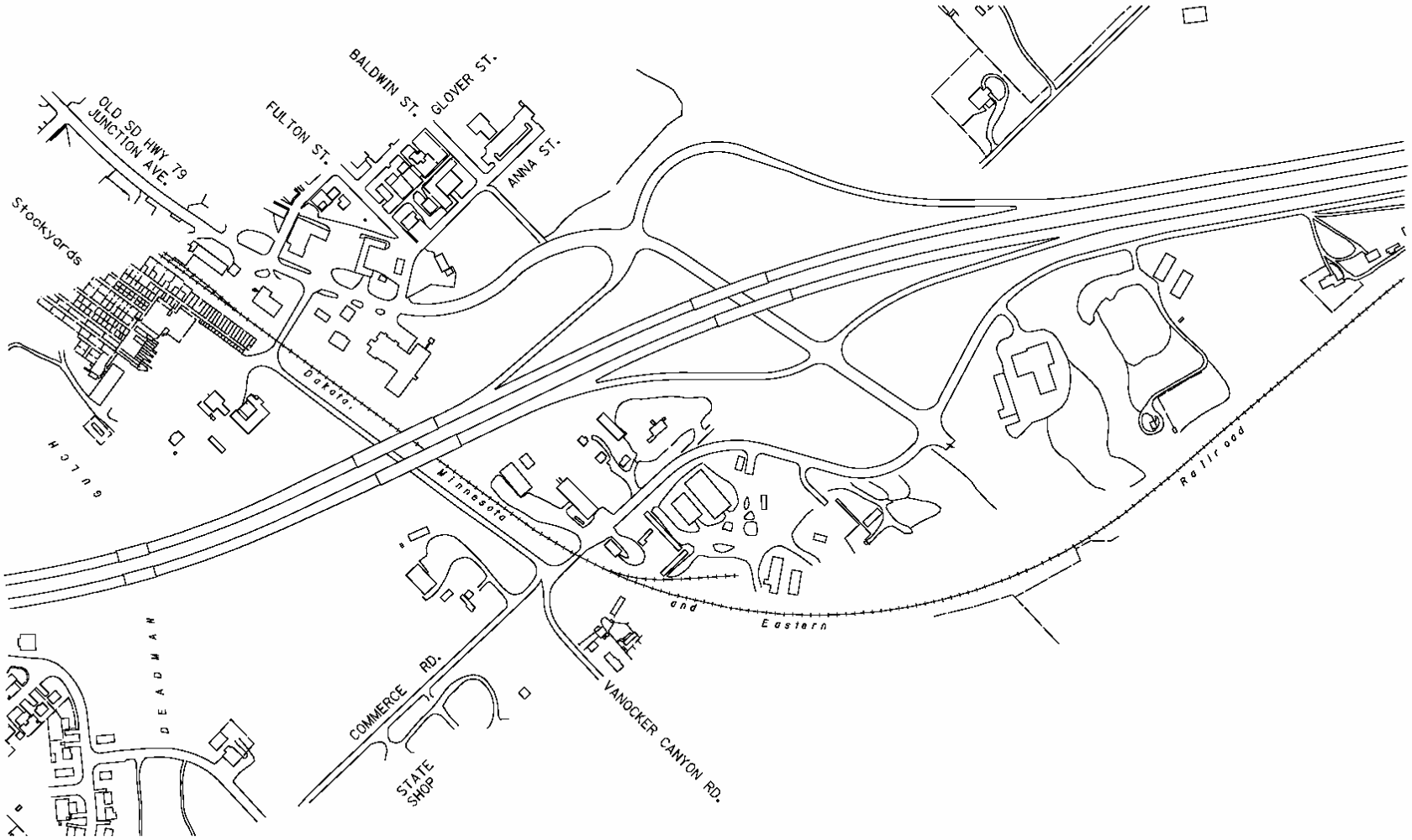


Figure 3

Proposed I–90 Exit 32 Configuration in Sturgis, South Dakota



2. All reasonable alternatives for design options, location and transportation system management type improvements (such as ramp metering, mass transit, and HOV facilities) have been assessed and provided for if currently justified, or provisions are included for accommodating such facilities if a future need is identified.

Table 1 discusses the alternatives originally considered.

Table 1
I-90: Exit 32 at Sturgis
Alternatives Pros and Cons

Alternative	Pros	Cons
Loop Ramps Alternative 1	• Right hand exits to Sturgis • High speed operation • One structure location – 2 bridges	• Loop ramps – trucks & winter • Single route to west of RR • Acquisitions – relocations • South area w/o direct access • West off-ramp construction conflict • Same ramp storage
Modified Loop Ramps Alternative 2	• Right hand exits to Sturgis • Moderately high speed operation • Optional routes to west of RR • One structure location – 2 bridges • Increased ramp storage • Direct access to south area • South infield developable • Expandable to south w/RR bridge	• Loop ramps – trucks & winter • West off-ramp construction conflict
Relocated Diamond Alternative 3	• Right hand exits to Sturgis • Optional routes to west of RR • Increased ramp storage • Direct access to south area • Expandable to south w/RR bridge	• Low speed operation • Two structure locations (3 bridges w/maximum flexibility)
Partial Cloverleaf Alternative 4	• High speed operation • Minimizes ROW takes • Direct access to south area • Splits traffic to N-S of I-90	• Three structures locations (4 bridges w/Alternative w/maximum flexibility) • Loop ramps – trucks & winter • East on-ramp construction conflict • Splits traffic to N-S of I-90
Trumpet Diamond Alternative 5	• Moderate speed operation • Utilizes much existing pavement • Optional routes to west of RR • One structure location – 2 bridges • Access to south area • Minimizes ROW takes	• East off-ramp: tight geometry • Minor ramp construction conflict
Relocated Junction Ave. Alternative 6	• Moderate speed operation • One structure location – 2 bridges • Optional routes to west of RR • Direct access to south area • Expandable to south w/RR bridge • Minimizes ROW takes	• Ramp termini are close • Ramp construction conflicts
Urban Interchange Alternative 7	• Moderate speed operation • One structure location – 2 bridges • Optional routes to west of RR • Direct access to south area • Expandable to south w/RR bridge • Minimizes ROW takes	• Driver expectancy – large intersection • Construction maintenance of traffic • Vertical clearances/geometry

Based on evaluation of the alternatives, the following alternatives were selected for further evaluation:

- relocate Junction Avenue and construct diamond interchange (Alternative 6),
- construct single point urban interchange (Alternative 7).

Construct Single Point Urban Interchange

This type of interchange brings all four ramps together at a single point on the minor roadway, in this case relocated Junction Avenue. Locating the ramps at grade instead of on an overpass structure reduces the cost of the structure and fits well with the existing topography. South Outer Road is relocated south of its existing alignment. Junction Avenue is relocated much as it is in the diamond interchange alternative. Figure 4 depicts the urban interchange considered.

Urban interchanges offer two major advantages over more conventional interchange types. Ramp traffic is passed through one signal instead of two and right-of-way acquisition is greatly reduced. However, the cost of the structure over the interchange is increased due to the expanse of pavement underneath the signals which more than offsets the relative low cost of right-of-way in this area. Although traffic flow, especially left turns, is greatly improved in an urban interchange, present and future traffic volumes do not warrant the added structure costs. Furthermore, and urban interchange in such a rural setting as Exit 32 upsets driver expectancy.

Relocate Junction Avenue and Relocate Diamond Interchange (Preferred)

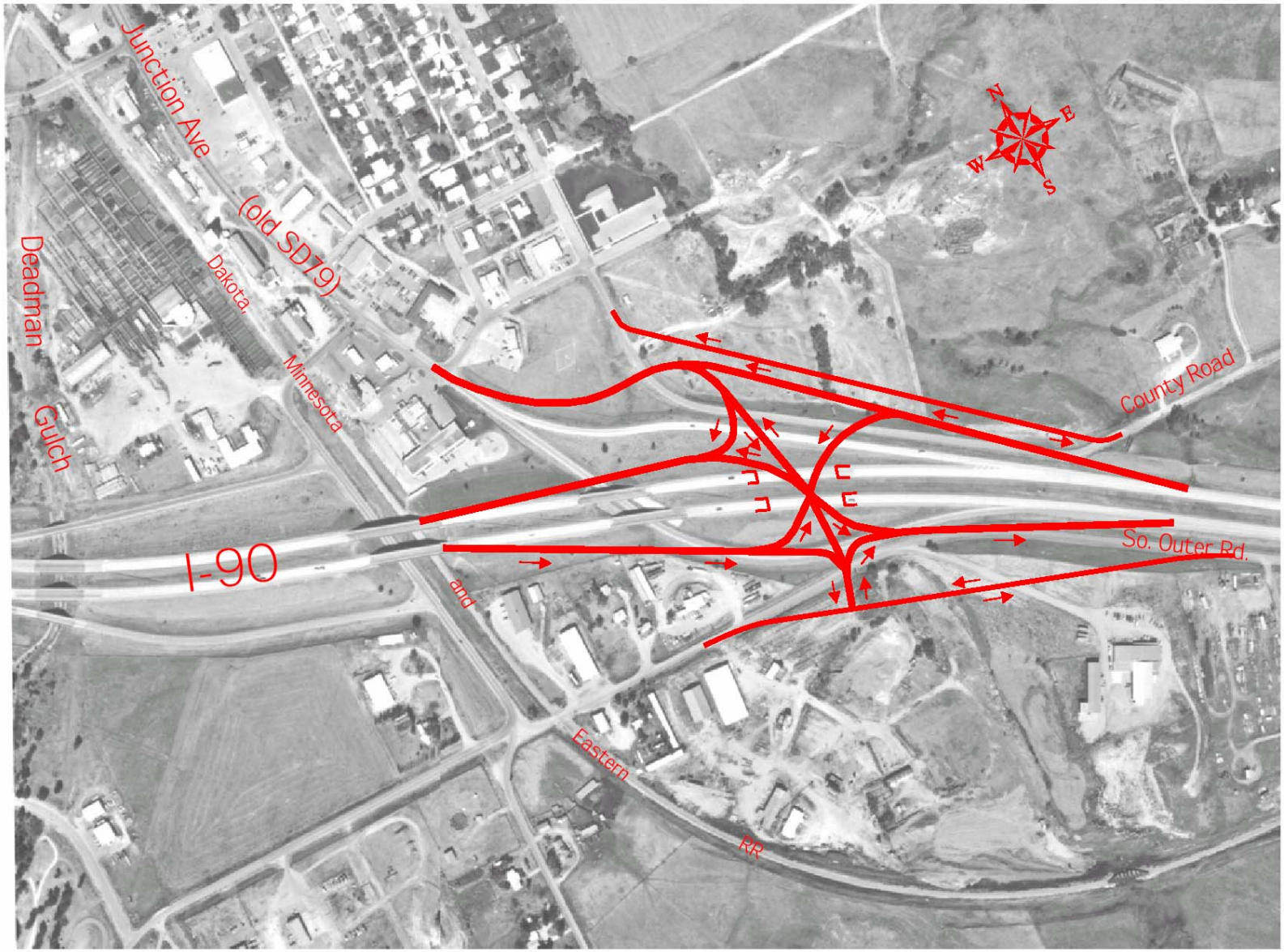
In this alternative, Junction Avenue is relocated and crosses under I-90 east of its present location. Two-way flow is maintained its entire length (the existing I-90 bridges over Junction Avenue would be removed as well as the pavement underneath) all the way to South Outer Road. South Outer Road is relocated south of its existing alignment. The resulting diamond interchange is located east of the present interchange. Easy traffic access to the north and south of I-90 is provided and vehicles exiting I-90 have two locations to cross the railroad.

3. **The proposed access point does not have a significant adverse impact on the safety and operation of the Interstate facility based on an analysis of current and future traffic. The operational analysis for existing conditions shall, particularly in urbanized areas, include an analysis of sections of Interstate to and including at least the first adjacent existing or proposed interchange on either side. Crossroads and other roads and streets shall be included in the analysis to the extent necessary to assure their ability to collect and distribute traffic to and from the interchange with new or revised access points.**

Relocating the interchange to the east of the existing interchange will improve the operation of the Exit 30 interchange located 2 miles to the west. The distance to first adjacent interchange to the east is approximately 2.4 miles and the proposed interchange relocation will have no impact this interchange's operation.

Figure 4

Alternative 7 - Urban Interchange



An analysis of the merge and diverge movements on the mainline of I-90 before and after the interchange modification indicated no change in the level of service.

Figure 5 shows the existing level of service for the ramp intersections. The existing northbound left turn movement to the westbound on ramp is at a LOS E. Figure 6 shows the improvement in the level of service at the ramp intersections resulting from the interchange improvement.

The distance between the ramp intersections and the nearest intersections on Junction Avenue are increased under the proposed interchange modification improving the operation of these intersections. The relocation of this interchange combined with the new route of Junction Avenue will improve the operation of the crossroad.

4. **The proposed access connects to a public road only and will provide for all traffic movements. Less than "full interchanges" for special purpose access for transit vehicles, or HOV's or into park and ride lots may be considered on a case by case basis. The proposed access will be designated to meet or exceed current standards for Federal-aid projects on the Interstate system.**

   The access improvement connects to a public road only and will continue to provide for all traffic movements. The improvement will meet or exceed current standards for Federal-aid projects on the Interstate system.

5. **The proposal considers and is consistent with local and regional land use and transportation plans. Prior to final approval, all requests for new or revised access must be consistent with the metropolitan and/or statewide transportation plan, as appropriate, the applicable provisions of 23 CFR part 450 and the transportation conformity requirements of 40 CFR parts 51 and 93.**

   The proposed interchange improvement is consistent with the STIP and local planning.

6. **In areas where the potential exists for future multiple interchange additions, all requests for new or revised access are supported by a comprehensive Interstate network study with recommendations that address all proposed and desired access within the context of a long-term plan.**

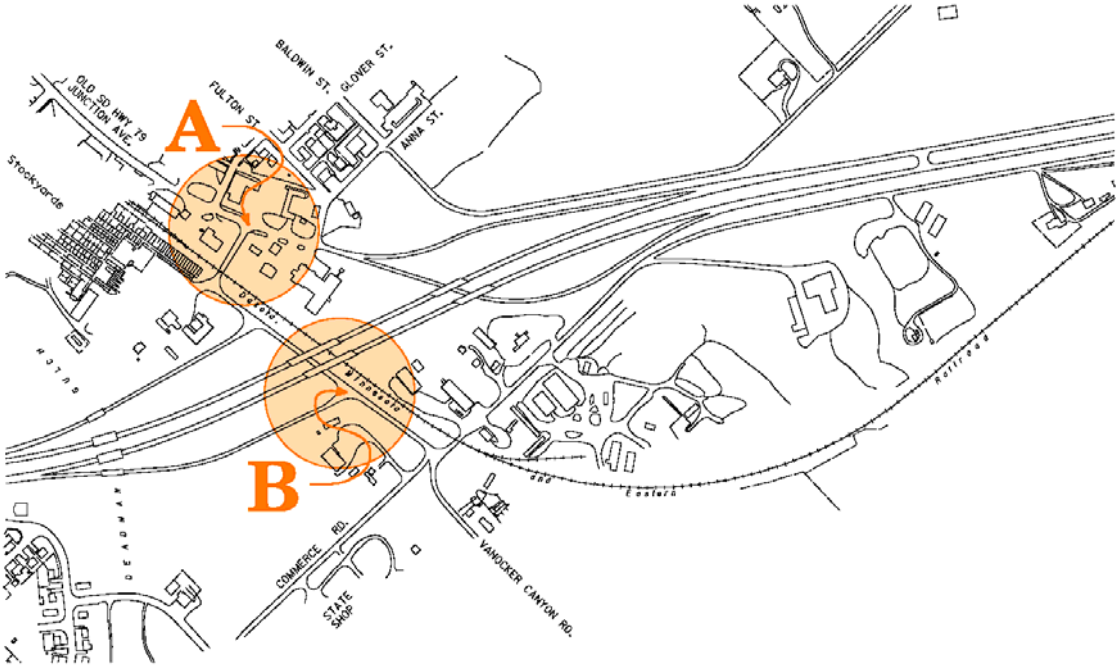
   The South Dakota Interstate Corridor Study completed in February 2001 indicated that there is no potential for future interchange additions along this segment of Interstate.

7. **The request for a new or revised access generated by new or expanded development demonstrates appropriate coordination between the development and related or otherwise required transportation system improvements.**

   This request for revised access is not the result of new development but corrects problems with the existing interchange configuration. It is the result of the natural growth of the City of Sturgis. The transportation system improvements are coordinated with and consistent with this natural growth. The improvement is also to relocate the ramps on the same side of the rail line and facilitates the relocation of

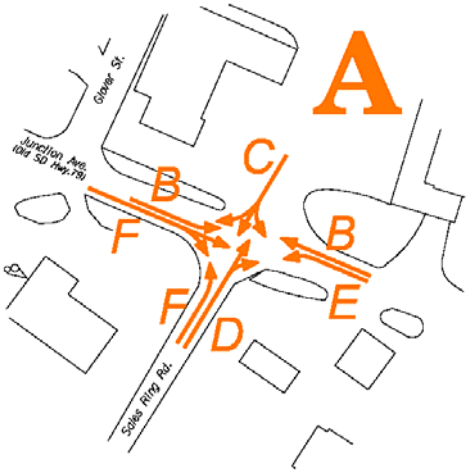
Figure 5

Existing I–90 Exit 32 Configuration in Sturgis, S.D. showing Level of Service



Level of Service

Jct. of Junction Ave. (old SD79) and Sales Ring Road



Level of Service

Jct. of Vanocker Canyon Road and I-90 EBL Off Ramp

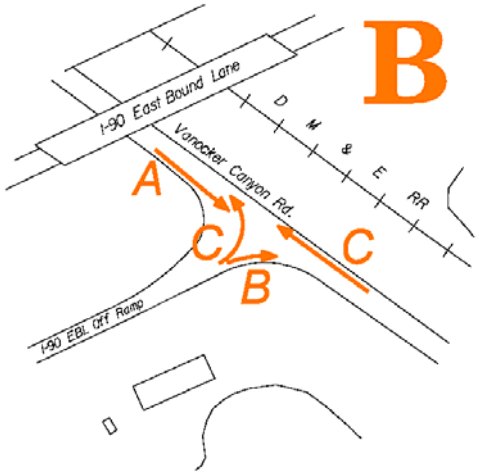
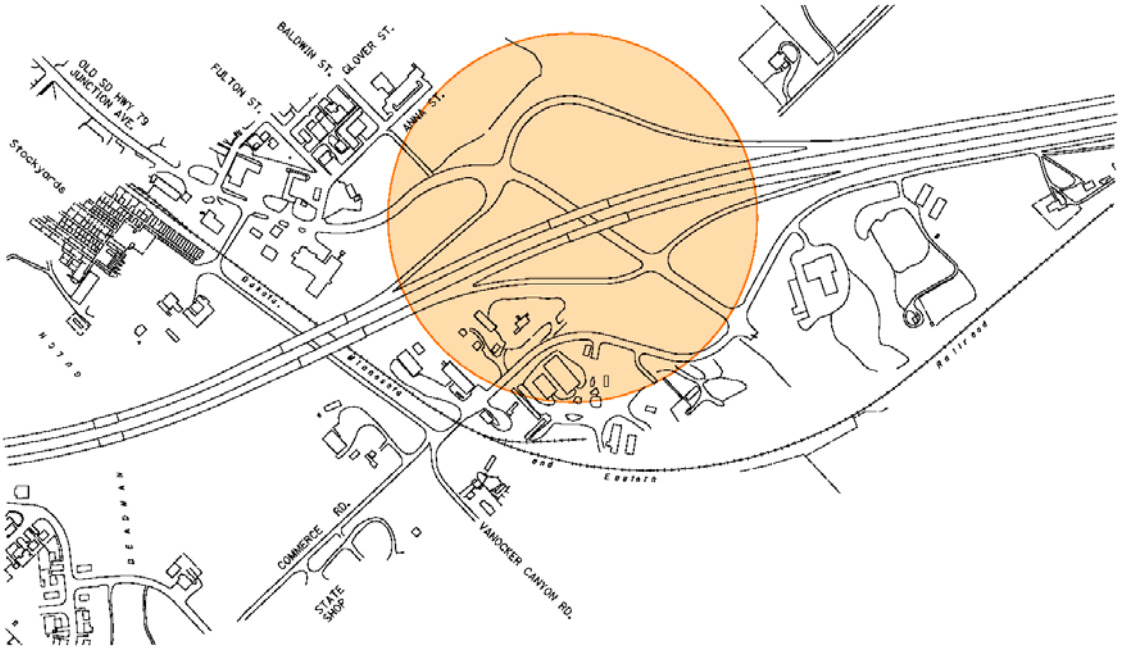
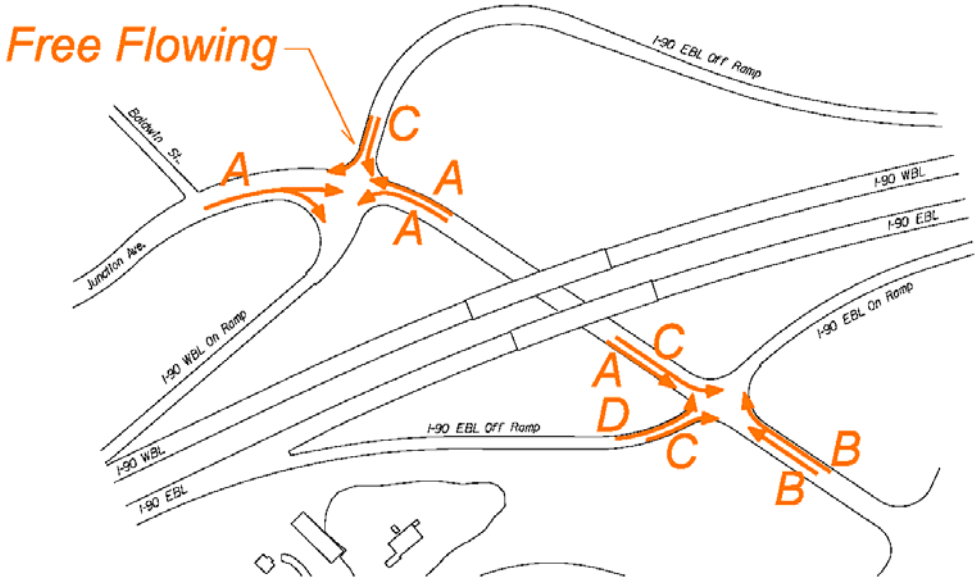


Figure 6

Proposed I–90 Exit 32 Configuration in Sturgis, S.D. showing Level of Service





Junction Ave. to improve operation of the local road system.

8. **The request for new or revised access contains information relative to the planning requirements and the status of the environmental processing of the proposal.**

   The proposed revised access is included in the STIP and the status of the environmental processing is a separate part of this request for the revised access.