



# Junction Avenue Corridor Study Technical Report

Prepared by:



JEO CONSULTING GROUP



SD  
DEPARTMENT OF  
TRANSPORTATION

# **Junction Avenue Corridor Study**

## **Technical Report**

City of Sturgis, South Dakota

Prepared for:



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August 22, 2023

The preparation of this report has been financed through the South Dakota Department of Transportation's SPR Funding for Local Agencies program. The contents and recommendations of this report do not necessarily reflect the official views, policy, or endorsement of the South Dakota Department of Transportation.

The preparation of this report has been financed in part through grant(s) from the Federal Highway Administration and Federal Transit Administration, U.S. Department of Transportation, under the State Planning and Research Program, Section 505 [or Metropolitan Planning Program, Section 104(f)] of Title 23, U.S. Code. The contents of this report do not necessarily reflect the official views or policy of the U.S. Department of Transportation.

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## List of Acronyms and Abbreviations

AASHTO	American Association of State Highway Transportation Officials
ADA	Americans with Disabilities Act
ADT	Average Daily Traffic
AWSC	All-way Stop Control
BLM	Bureau of Land Management
CMF	Crash Modification Factor
CWA	Clean Water Act
DANR	Department of Agriculture and Natural Resources
DOT	Department of Transportation
EB	Eastbound
EJ	Environmental Justice
EPA	US Environmental Protection Agency
FEMA	Federal Emergency Management Agency
FFS	Free Flow Speed
FHWA	Federal Highway Administration
GFA	Gross Floor Area
GIS	Geographic Information System
HCM	Highway Capacity Manual
HCS	Highway Capacity Software
I-90	Interstate 90
IMJR	Interchange Modification Justification Report
ITE	Institute of Transportation Engineers
LOS	Level of Service
LWCF	Land and Water Conservation Fund
M&A	Methods & Assumptions
MDT	Mountain Daylight Time
MEV	Million Entering Vehicles
MVMT	Million Vehicle Miles Traveled

MOE	Measure of Effectiveness
mph	miles per hour
MRM	Mileage Reference Marker
MUTCD	Manual on Uniform Traffic Control Devices
NB	Northbound
NCHRP	National Cooperative Highway Research Program
NEPA	National Environmental Policy Act
NPDES	National Pollutant Discharge Elimination System
NRHP	National Register of Historic Places
pcphpl	passenger cars per hour per lane
PDO	Property Damage Only (crash)
PHF	Peak Hour Factor
PROWAG	Public Rights-of-Way Accessibility Guidelines
RCPE	Rapid City, Pierre & Eastern Railroad
RIRO	Right-In/Right-Out
ROW	Right-of-Way
SAT	Study Advisory Team
SB	Southbound
SD	South Dakota
SDDOT	South Dakota Department of Transportation
SDGFP	South Dakota Game Fish and Parks
sec	second(s)
SHPO	State Historic Preservation Office
STIP	Statewide Transportation Improvement Program
TOC	Traffic Operations Center
TWLTL	Two-Way Left-Turn Lane
TWSC	Two-way Stop Control
US	United States
USACE	United States Army Corps of Engineers



USDA	United States Department of Agriculture
USDOT	United States Department of Transportation
USFWS	United States Fish and Wildlife Service
USGS	United States Geological Survey
UST	Underground Storage Tank
Veh	Vehicle(s)
vphpl	vehicles per hour per lane
WB	Westbound
WCSC	Worst-Case Stop Control
WATUS	Waters of the United States

# Executive Summary

Beginning in 2022, the South Dakota Department of Transportation (SDDOT), in partnership with the City of Sturgis, commenced a study to identify needed improvements to an approximately 1.15-mile corridor of Junction Avenue, between Pine View Drive and Harmon Street, in Sturgis, South Dakota. The purpose of this corridor study was to evaluate existing and anticipated future conditions to identify potential improvements to the study corridor and associated intersections.

The study used a detailed process to fulfill its identified objectives. A study advisory team (SAT) was created to guide the development of the corridor study and was comprised of representatives of the agencies identified above. Additionally, public and stakeholder involvement was instrumental to the study process. In summary, the overall corridor study process consisted of the following milestones:

- Documentation of existing and future no-build conditions and identification of deficiencies and needs
- Development and evaluation of alternative solutions
- Preparation of a project implementation plan

This report, and the referenced technical memorandums developed throughout the study process, provides documentation of the corridor study process and the findings formulated by the consultant study team based on technical analyses. Additional considerations provided via public input are summarized in the May 23, 2023 Public Meeting Summary Report.

Summarized in Tables 1, 2 and 3 on the following pages, is a project implementation plan addressing the various needs/deficiencies identified through this study process. Project planning timelines are defined as follows:

- High-priority: within 5 years
- Mid-priority: 5-15 years
- Low-priority: beyond 15 years

While the majority of the projects identified as a result of this study focus on addressing needs north of I-90, consideration of the remainder of the study corridor should not be forgotten. As development continues, resulting in a growing community, it is recommended that the City of Sturgis continue to promote good access management practices along this southern segment of the corridor. This includes the requirement of proper intersection spacing, evaluating alternatives for safe and efficient intersection traffic control, and configuration of street/driveway connections in response to ongoing or changes in development patterns. Doing so will best ensure that desirable traffic safety and operational characteristics of this current segment are maintained into the future.

Table 1 – Project Implementation Plan – High-Priority

Project Reference No.	Corridor Need/Deficiency	Location	Most Feasible Alternative(s) to Address Need	2028 Project Cost <sup>1</sup>
1	A) Recurring crashes	Junction Ave & Anna St intersection <sup>2</sup>	A) Construct roundabout <sup>3</sup>	\$1,490,000 – \$4,700,000 <sup>3</sup>
	B) Traffic operations which experience peak hour LOS D, or worse		B) Construct roundabout or traffic signal <sup>3,4</sup>	
	C) Lack of designated crossings, of Junction Avenue, other than at the Ballpark Road intersection	Junction Ave – Anna St to Ballpark Rd	C) Construct roundabout or traffic signal at the Anna Street intersection <sup>3,4</sup>	
2	Pedestrian facilities that do not satisfy ADA standards	corridor-wide	Other than with other projects included within this implementation plan, upgrade pedestrian facilities proactively or opportunistically	varies by location <sup>5</sup>
3	Missing links to the city-wide bike path (trail) network; specifically, connections to Anna Street development and the proposed adventure park	corridor-wide	Refer to Figure 25 for recommended bike path network	\$420,000 – \$1,310,000 per project; \$3.36M total
4	Impacts of growth including degraded intersection operations and need for street connectivity and development access	corridor-wide	See Project Nos. 1, 3, 5, 7 and 9 (see also Access Management section later in this document)	-
5	Safety issues created by the current location of the “Welcome to Sturgis” sign at the Junction Avenue & Anna Street intersection	Junction Ave & Anna St intersection	See discussion under “Priority of Need” on page 39	\$885,000

<sup>1</sup> Project cost includes 2023 construction cost inflated 10% per year plus 30% contingency, right-of-way, and engineering. (Details provided in Appendix D.)

<sup>2</sup>Should the decision be made to align Vanocker Canyon Road and Anna Street to a common intersection, the priority of improvements at Vanocker Canyon Road (Project #7) would rise to that of the Anna Street intersection.

<sup>3</sup>Could be implemented with or without the realignment of Vanocker Canyon Road and Anna Street to a common intersection along Junction Avenue.

<sup>4</sup>Before traffic signal is constructed, MUTCD warrant criteria shall be satisfied for current, or near-current conditions.

<sup>5</sup>A more thorough inventory of all accessible ramps and sidewalks is needed prior to determining total project cost.

Table 2 – Project Implementation Plan Plan – Mid-Priority

Project Reference No.	Corridor Need/Deficiency	Location	Most Feasible Alternative(s) to Address Need	2028 Project Cost <sup>1</sup>
6	Recurring crashes	Junction Ave & Ballpark Rd intersection	Construct roundabout	\$1,820,000
7	Traffic operations which experience peak hour LOS D, or worse	Junction Ave & Vanocker Canyon Rd intersection <sup>2</sup>	Construct roundabout or traffic signal <sup>3,4</sup>	\$1,470,000 - \$4,700,000
8	Sidewalk deficiencies including narrow width, location (with respect to back of curb) and gaps in the overall sidewalk network	corridor-wide	Other than with other projects included within this implementation plan, address sidewalk deficiencies proactively or opportunistically	varies by location <sup>5</sup>
9	High density of private driveways north of Anna Street	Junction Ave – Anna St to Ballpark Rd	Construct raised median or reduce number of private driveways through removal or consolidation efforts in coordination with property owners <sup>6</sup>	\$910,000 - \$1,370,000
10	Misaligned public streets that form offset, “T” intersections	Vanocker Canyon Rd and Anna St intersections	Realignment of Anna St or Vanocker Canyon Rd to connect to the other at a common intersection along Junction Avenue	\$3,560,000 - \$4,700,000

<sup>1</sup> Project cost includes 2023 construction cost inflated 10% per year plus 30% contingency, right-of-way, and engineering. (Details provided in Appendix D.)

<sup>2</sup> Could be implemented with or without the realignment of Vanocker Canyon Road and Anna Street to a common intersection along Junction Avenue.

<sup>3</sup> Before traffic signal is constructed, MUTCD warrant criteria shall be satisfied for current, or near-current conditions.

<sup>4</sup> In the descriptions provided previously in this document, this need was identified as a mid-to-low priority.

<sup>5</sup> A more thorough inventory of the corridor’s sidewalk network is needed prior to determining total project cost.

<sup>6</sup> If raised median is constructed, implementation of roundabouts at the intersections of Anna Street (project #1), Ballpark Road (project #6), and Vanocker Canyon Road (project #7) should be considered to accommodate the increase in u-turn volumes resulting from the elimination of left-turn movements to/from driveways.

Table 3 – Project Implementation Plan Plan – Low-Priority

Project Reference No.	Corridor Need/Deficiency	Location	Most Feasible Alternative(s) to Address Need	2028 Project Cost <sup>1</sup>
11	Traffic operations which experience peak hour LOS D, or worse	Junction Ave & Harmon St intersection	The only alternatives developed to address operational issues at the Harmon St. intersection were the peanut roundabout and those incorporating street realignment. Because the operational issues are experienced by a relatively low volume of vehicles, this need is considered a very low priority.	\$3,850,000 - \$6,780,000
12	Traffic operations which experience peak hour LOS D, or worse	Junction Ave & Glover St intersection	This need is considered a very low priority as the operational issues are experienced by a relatively low volume of vehicles. No alternatives were developed to address this need.	-
13	Traffic operations which experience peak hour LOS D, or worse	Junction Ave & Dickson Rd intersection	This need is considered a very low priority as the operational issues are experienced by a relatively low volume of vehicles. No alternatives were developed to address this need.	-
14	Misaligned public streets that form offset, “T” intersections	Harmon St and Ballpark Rd intersections	All alternatives were considered not feasible due to resulting impacts to private properties and associated cost.	\$3,850,000 - \$6,780,000
15	Two roadway horizontal curves that do not satisfy design criteria	Junction Ave – Exit 32 westbound ramps to Anna St	Realign/reconstruct Junction Avenue	\$2,850,000

<sup>1</sup> Project cost includes 2023 construction cost inflated 10% per year plus 30% contingency, right-of-way, and engineering. (Details provided in Appendix D.)

# Introduction

In partnership between the South Dakota Department of Transportation (SDDOT) and the City of Sturgis, a planning-level corridor study was performed for a portion of Junction Avenue in Sturgis, South Dakota. The study corridor includes Junction Avenue between the south city limits of Sturgis, at the intersection with Pine View Drive, and Harmon Street. The study corridor, including the nine study intersections, is illustrated in Figure 1.



Figure 1 - Study Corridor and Study Area Intersections

The purpose of this memorandum is to present a possible implementation plan of short-term and long-range capital improvements necessary to address corridor needs/deficiencies identified as part of this corridor study. Included in this implementation plan are generalized timelines and planning-level costs for each project. Additional considerations and recommendations in conjunction with the identified capital improvements are also documented herein.

The basis for much of this project implementation plan was documented in the following technical memoranda developed as part of this corridor study and are included as appendices for reference.

- *Evaluation of Existing and Future No-build Conditions; Identification of Needs* (January 26, 2023)
- *Traffic Operations and Safety Analyses of Feasible Alternatives* (May 22, 2023)
- *Environmental Screening Report* (May 24, 2023)

## Identification of Needs

Based on an evaluation of existing and anticipated future conditions, as summarized in the technical memorandum *Evaluation of Existing and Future No-build Conditions; Identification of Needs*, January 26, 2023 (see Appendix A), the following summarizes (in no particular order of priority) potential needs, in the form of issues and deficiencies, which were evaluated as part of this corridor study.

- Recurring crashes at the following intersections:
  - Ballpark Road & Junction Avenue
  - Anna Street & Junction Avenue
- Traffic operations at the following intersections, which experience peak hour LOS D, or worse, by year 2035 or year 2050:
  - Harmon Street & Junction Avenue
  - Glover Street & Junction Avenue
  - Vanocker Canyon Road & Junction Avenue
  - Anna Street & Junction Avenue
  - I-90 (Exit 32) WB Ramp Terminal & Junction Avenue<sup>1</sup>
  - I-90 (Exit 32) EB Ramp Terminal & Junction Avenue<sup>1</sup>
  - Dickson Road & Junction Avenue
- Sidewalk deficiencies including narrow width, location (with respect to back of curb) and gaps in the overall sidewalk network
- Lack of designated crossings, of Junction Avenue, other than at the Ballpark Road intersection
- Pedestrian facilities that do not satisfy ADA standards
- Missing links to the city-wide bike path (trail) network
- High density of private driveways north of Anna Street
- The following misaligned public streets that form offset, “T” intersections:
  - Harmon Street/Ballpark Road
  - Vanocker Canyon Road/Anna Street
- Two roadway horizontal curves, between Anna Street and the I-90 (Exit 32) WB ramp terminal intersection that do not satisfy design criteria
- Satisfaction of turn lane warrant criteria at the following locations:
  - Northbound right-turn lane at I-90 (Exit 32) EB ramp terminal & Junction Avenue<sup>1</sup>
- Impacts of growth including degraded intersection operations and need for street connectivity and development access

<sup>1</sup> Though deficiencies at the Exit 32 ramp terminal intersections were identified, further evaluation of elements related to Exit 32 was not included within this corridor study’s scope of services.

## Project Alternatives

The purpose of this section of the memorandum is to document feasible alternatives that were developed to address the various corridor-wide operational and safety deficiencies summarized previously in this memorandum and appendices. This section is organized into elements of the project which are defined by a specific segment, geographic location, or issue along the project corridor. For each of these, the following information is provided:

- Description of the need, or deficiency being addressed
- Priority of the need, or deficiency being addressed
- Summary of feasible alternatives. For each alternative, the following information is also provided:
  - Description and illustration(s) of the alternatives/options developed to address the needs/deficiencies
    - For each alternative, it is presumed that, as applicable, improvements will be made to address deficient pedestrian accommodations like sidewalks and accessible ramps
  - Preliminary project cost (inflated to an assumed 2028 year of construction; includes 30% contingency) estimate for each alternative (summary provided in the appendix)
  - Preliminary list of alternative benefits & drawbacks, as compared to no-build conditions
  - Possible construction phasing strategy or strategies
    - For each alternative, and as applicable, if pedestrian detours are not available, pedestrian access will need to be maintained during construction.
    - For each alternative, and as applicable and feasible, reasonable access will need to be maintained to properties along the project corridor during construction.
  - Estimation of construction duration
    - For purposes of this memo, one construction season is defined as either construction completed in one calendar year or a scenario that begins with construction in the fall, following a given motorcycle rally, and concluding the following spring/summer before the subsequent motorcycle rally begins.

## Ballpark Road/Harmon Street & Junction Avenue

### Definition of Need

The alternatives associated with these intersections were developed to address the following needs/deficiencies:

- Recurring, minor crashes at the Ballpark Road intersection
- Traffic operations on the stop-controlled approach of the Harmon Street intersection, which is expected to experience peak hour LOS D (AM Peak) and LOS E (PM Peak) by year 2035
- Pedestrian facilities, namely ramps, that do not satisfy ADA standards
- Misaligned public streets (Ballpark Road and Harmon Street) that form two, offset, "T" intersections

### Priority of Need

While the intersection has experienced recurring, minor crashes, the intersection is presently operating sufficiently as a signal-controlled intersection and is expected to do so into the future. Furthermore,



though the original signal infrastructure was constructed in 1997, the City of Sturgis performs recurring maintenance and component upgrades in an effort to maximize the service life of the signal infrastructure (average service life of signal infrastructure is 30 years). Because the age of the signal is reaching the end of its service life, it is likely the signal will need to be reconstructed or the intersection converted to roundabout control within the next 10-15 years. As such, the need for improvements to the operation and safety of the intersection is considered **mid-priority**.

Later in this document, an alternative to construct a raised median on Junction Avenue, between Ballpark Road and Anna Street, is documented. Should this alternative be advanced to implementation sooner than the 10-15 year time frame referenced in the preceding paragraph, the implementation of a roundabout at Ballpark Road, to facilitate u-turn movements (as left-turn movements to and from driveways will be prohibited under this median alternative) may need to be heightened in priority.

Regardless of the intersection control type selected at the Ballpark Road intersection, upgrades to pedestrian facilities are considered **high-priority** to satisfy ADA standards.

Based on input received from the Study Advisory Team (SAT) and the general public, addressing the misaligned streets of Ballpark Road and Harmon Street is deemed **low-priority**.

**Alternatives**

The following alternatives were developed to address the above-referenced needs/deficiencies for the intersections at Ballpark Road and Harmon Street.

*A0: No-build*

This alternative would maintain existing intersection conditions including the lack of ADA-compliant sidewalk facilities (including ramps) and aging traffic signal infrastructure.

*A1: Ballpark Road & Junction Avenue (Signal)*

This alternative would consist of reconstructing the existing traffic signal infrastructure, allowing for enhanced capabilities and operability, and upgrading sidewalk facilities (including ramps) to satisfy ADA standards. No improvements to the Harmon Street intersection are included with this alternative.

A conceptual illustration of this alternative is provided in Figure 2.

**Cost**

The estimated 2028 cost (assumes 10% annual inflation) of this alternative, inclusive of preliminary engineering and 30% contingency, is \$850,000.

**Benefits and Drawbacks**

A preliminary list of benefits and drawbacks of this alternative is provided below.

**Benefits**

- Improved accessibility for persons with disabilities (sidewalk and ramp improvements)
- Upgraded signal technology and infrastructure

**Drawbacks**

- Maintaining traffic signal control does not mitigate recurring crashes
- Does not address peak hour delays experienced by motorists approaching Junction Avenue on Harmon Street



Figure 2 - A1: Ballpark Road & Junction (signal)

**Construction Phasing Strategy**

Phasing for this alternative will consist of minor lane shifts of traffic to remove and replace the existing signal infrastructure. Minor lane shifts and phasing will also be needed to construct the ADA ramps and sidewalk improvements.

**Estimate of Construction Duration**

This alternative can be completed within one construction season.

*A2: Ballpark Road & Junction Avenue (Roundabout)*

This alternative would consist of reconstructing the intersection as a single-lane roundabout with upgraded pedestrian facilities (including sidewalks and ramps) to satisfy ADA standards. No improvements to the Harmon Street intersection are included with this alternative. During project implementation (design), additional analysis is needed for year 2050 conditions to further consider the need for and benefits of an additional lane for southbound right-turning vehicles.

A conceptual illustration of this alternative is provided in Figure 3.

**Cost**

The estimated 2028 cost (assumes 10% annual inflation) of this alternative, inclusive of preliminary engineering and 30% contingency, is \$1,820,000.

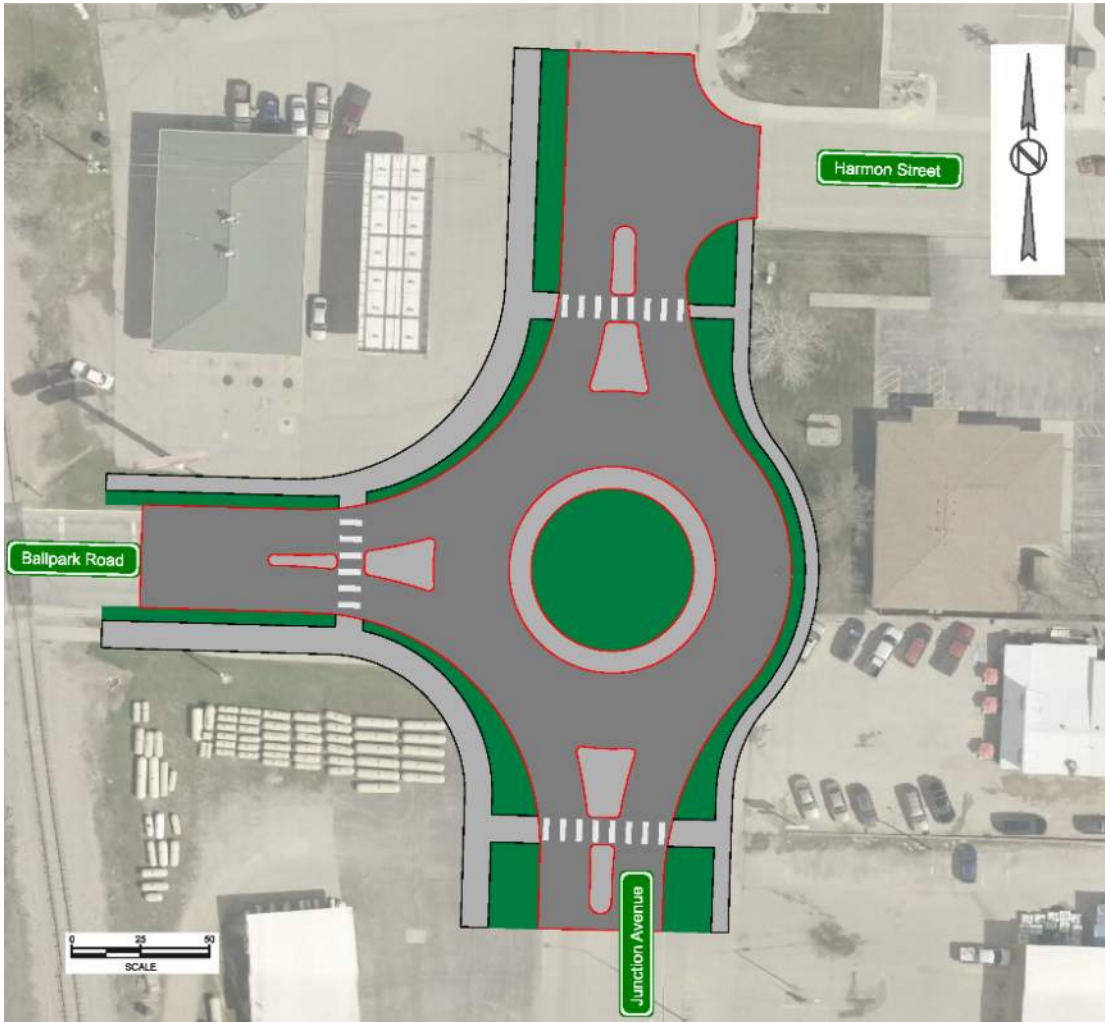


Figure 3 - Ballpark Road & Junction Avenue (Roundabout)

**Benefits and Drawbacks**

A preliminary list of benefits and drawbacks of this alternative is provided below.

**Benefits**

- Roundabouts provide for a safe intersection treatment, for both vehicles and pedestrians; best addresses historical recurring crashes
- Aesthetic enhancement opportunities

**Drawbacks**

- Impacts to private properties
- Does not address peak hour delays experienced by motorists approaching Junction Avenue on Harmon Street
- Traffic impacts (including potential detours) during construction

**Construction Phasing Strategy**

There are multiple phasing strategies for this alternative. The most cost-effective strategy, and one that can be completed in the shortest duration, is to close the intersection completely and reroute traffic

locally. By utilizing this strategy, construction can begin in the fall, opening traffic for the winter, and completing the rest of the construction the following spring.

Another strategy would be to maintain one lane of traffic throughout two separate construction phases. For the first phase of construction, the east side of the roundabout can be constructed while maintaining southbound traffic along Junction Avenue. The second phase would consist of constructing the west side of the roundabout, maintaining northbound Junction Avenue traffic. Having two separate phases will increase the cost of construction, take approximately twice as long to construct, and require detouring one direction of travel throughout construction.

**Estimate of Construction Duration**

This alternative can be completed within one construction season. Construction of this alternative will likely need to begin immediately following the annual Sturgis Motorcycle Rally. If the second option described above is pursued, phasing will need to be incorporated into the construction strategy throughout the winter shut-down months with construction resumed the following spring and completed prior to the rally of that same year.

*A3: Ballpark Road/Harmon Street & Junction Avenue (Peanut Roundabout)*

This alternative would consist of reconstructing both of the intersections at Ballpark Road and Harmon Street as a single-lane roundabout, connected into a configuration shaped as a peanut. Both intersections would also be reconstructed with upgraded pedestrian facilities (including sidewalks and ramps) to satisfy ADA standards. During project implementation (design), additional analysis is needed for year 2050 conditions to further consider the need for and benefits of an additional lane for southbound right-turning vehicles.

A conceptual illustration of this alternative is provided in Figure 4.

**Cost**

The estimated 2028 cost (assumes 10% annual inflation) of this alternative, inclusive of preliminary engineering and 30% contingency, is \$3,850,000.

**Benefits and Drawbacks**

A preliminary list of benefits and drawbacks of this alternative is provided below.

**Benefits**

- Roundabouts provide for a safe intersection treatment, for both vehicles and pedestrians; best addresses historical recurring crashes
- Addresses operational deficiencies at the Harmon Street intersection
- Addresses misalignment of Ballpark Road and Harmon Street
- Aesthetic enhancement opportunities

**Drawbacks**

- Impacts to private properties including the needed acquisition of one parcel (gas station)
- Traffic impacts (including potential detours) during construction

**Construction Phasing Strategy**

There are multiple phasing strategies for this alternative. One strategy would be to close both intersections for construction and reroute traffic while the peanut roundabout is being constructed. This would result in construction of the roundabout beginning immediately after the rally and completed

prior to rally of the following year. This is the most cost-effective phasing strategy and the one that can be completed in the shortest duration of time.

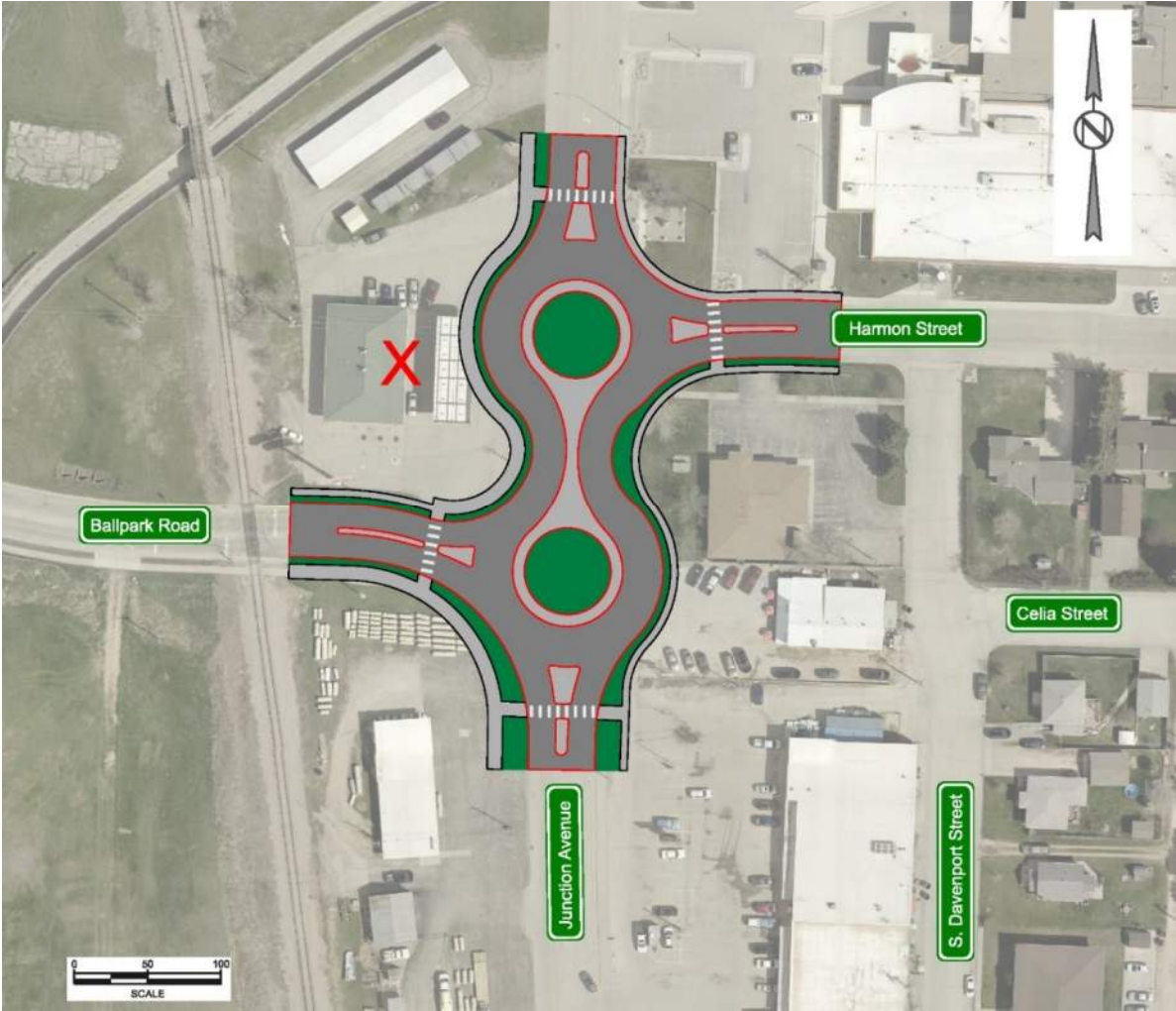


Figure 4 – Ballpark Road/Harmon Street & Junction Avenue (Peanut Roundabout)

Another strategy would be to complete the peanut roundabout in two separate phases. This would consist of building temporary surfacing along the west side of Junction Avenue to allow for two lanes of traffic during the first phase. While traffic is shifted, the east half of the roundabout would be constructed. Traffic would then get shifted to the east side of the newly constructed roundabout while the west side is constructed. This alternative will be more costly due to the additional surfacing needed for phased construction.

**Estimate of Construction Duration**

If both intersections were to be closed to traffic, construction of this alternative can be completed within one construction season with work beginning in the fall and completed the following spring. Otherwise, this alternative can be completed within two construction seasons.



*A4: Realignment of Ballpark Road to Celia Street*

This alternative would consist of realigning Ballpark Road to a location along Junction Avenue equivalent to the westward extension of existing Celia Street from S. Davenport Street. The resulting intersection could be operated under either signal or roundabout control. Construction of this alternative would be inclusive of upgraded pedestrian facilities (including sidewalks and ramps) to satisfy ADA standards and the closure and vacation of Harmon Street, and associated right-of-way, between Junction Avenue and S. Davenport Street.

It is recognized that the property immediately east of the existing Ballpark Road intersection at Junction Avenue was recently sold and purchased by the owner of the eye clinic located in the southeast quadrant of the Harmon Street intersection at Junction Avenue. Coordination with this owner and the future use of the recently purchased property would be necessary if this alternative were advanced to implementation.

A conceptual illustration of this alternative is provided in Figure 5.

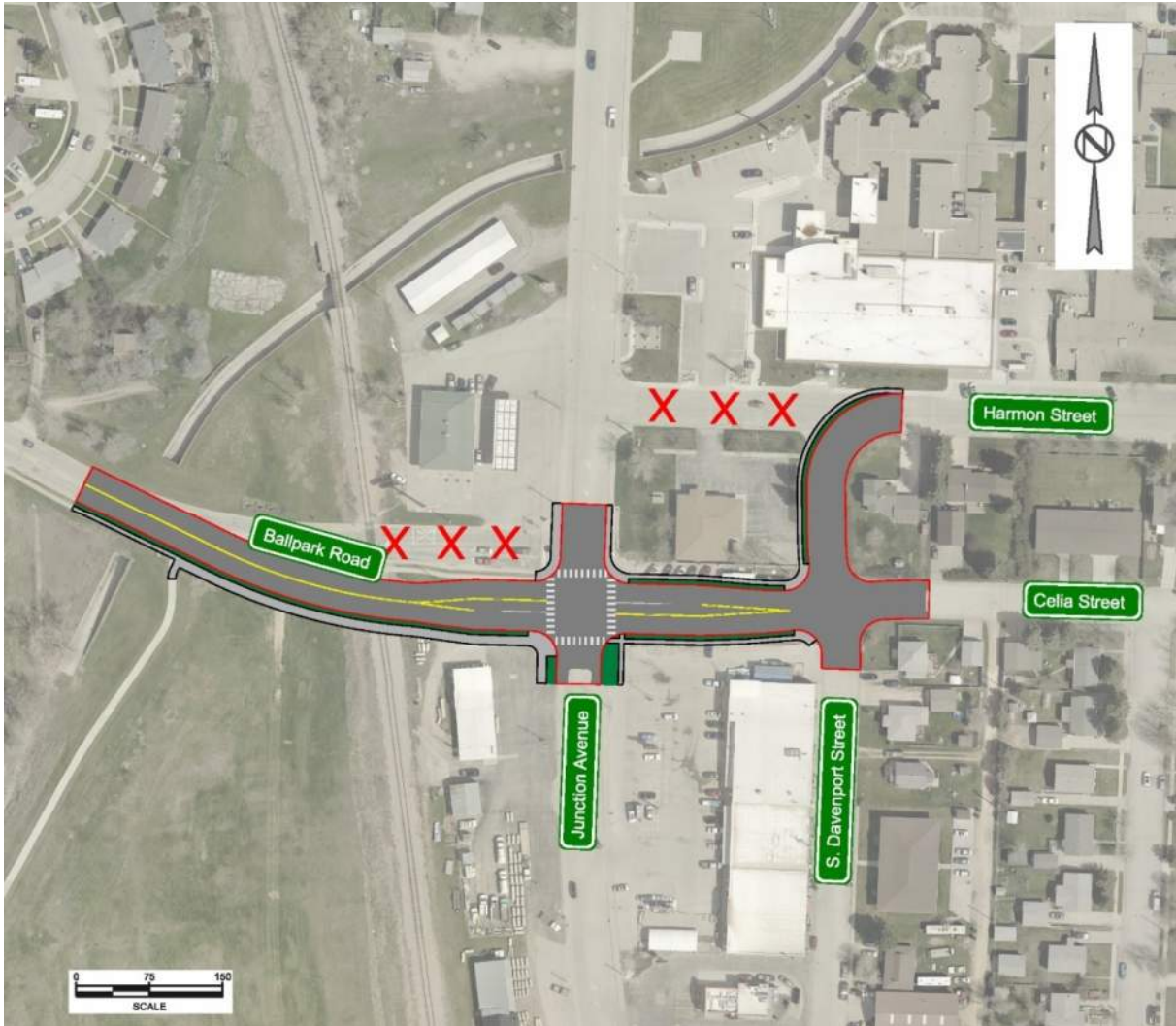


Figure 5 - Realignment of Ballpark Road to Celia Street

**Cost**

The estimated 2028 cost (assumes 10% annual inflation) of this alternative, inclusive of preliminary engineering and 30% contingency, ranges from \$3,970,000 (roundabout control) to \$4,030,000 (signal control).

**Benefits and Drawbacks**

A preliminary list of benefits and drawbacks of this alternative is provided below.

**Benefits**

- Removes the conflicts and operational deficiencies resulting from two, closely-spaced and offset “tee” intersections
- Addresses operational deficiencies at the Harmon Street intersection
- Roundabouts provide for a safe intersection treatment, for both vehicles and pedestrians; best addresses historical recurring crashes at Ballpark Road intersection. (if constructed as a roundabout)

**Drawbacks**

- Significant impacts to private properties<sup>1</sup>
- Traffic impacts (including potential detours) during construction (especially if resulting intersection constructed as a roundabout)

<sup>1</sup>Because of these impacts, this alternative was eliminated from further consideration.

**Construction Phasing Strategy**

Phasing for this alternative will first consist of constructing the new alignment for Ballpark Road and Celia Street. Once the construction of the new alignments are complete, Davenport Steet and Harmon Street will be reconstructed while local traffic is rerouted. Traffic will then be moved onto the new alignments while existing streets are removed. Phasing on Junction Avenue will consist of rebuilding the new intersection alignment, sidewalk, and ADA ramps. To complete this work, traffic will be shifted east and west in two separate phases.

**Estimate of Construction Duration**

This alternative can be completed within two construction seasons.

*A5: Realignment of Harmon Street to Ballpark Road*

This alternative would consist of realigning Harmon Street to the Ballpark Road intersection. The resulting intersection could be operated under either signal or roundabout control. Construction of this alternative would be inclusive of upgraded pedestrian facilities (including sidewalks and ramps) to satisfy ADA standards and the closure and vacation of Harmon Street, and associated right-of-way, east of Junction Avenue to east of S. Davenport Street.

A conceptual illustration of this alternative is provided in Figure 6.

**Cost**

The estimated 2028 cost (assumes 10% annual inflation) of this alternative, inclusive of preliminary engineering and 30% contingency, ranges from \$6,190,000 (roundabout control) to \$6,430,000 (signal control).

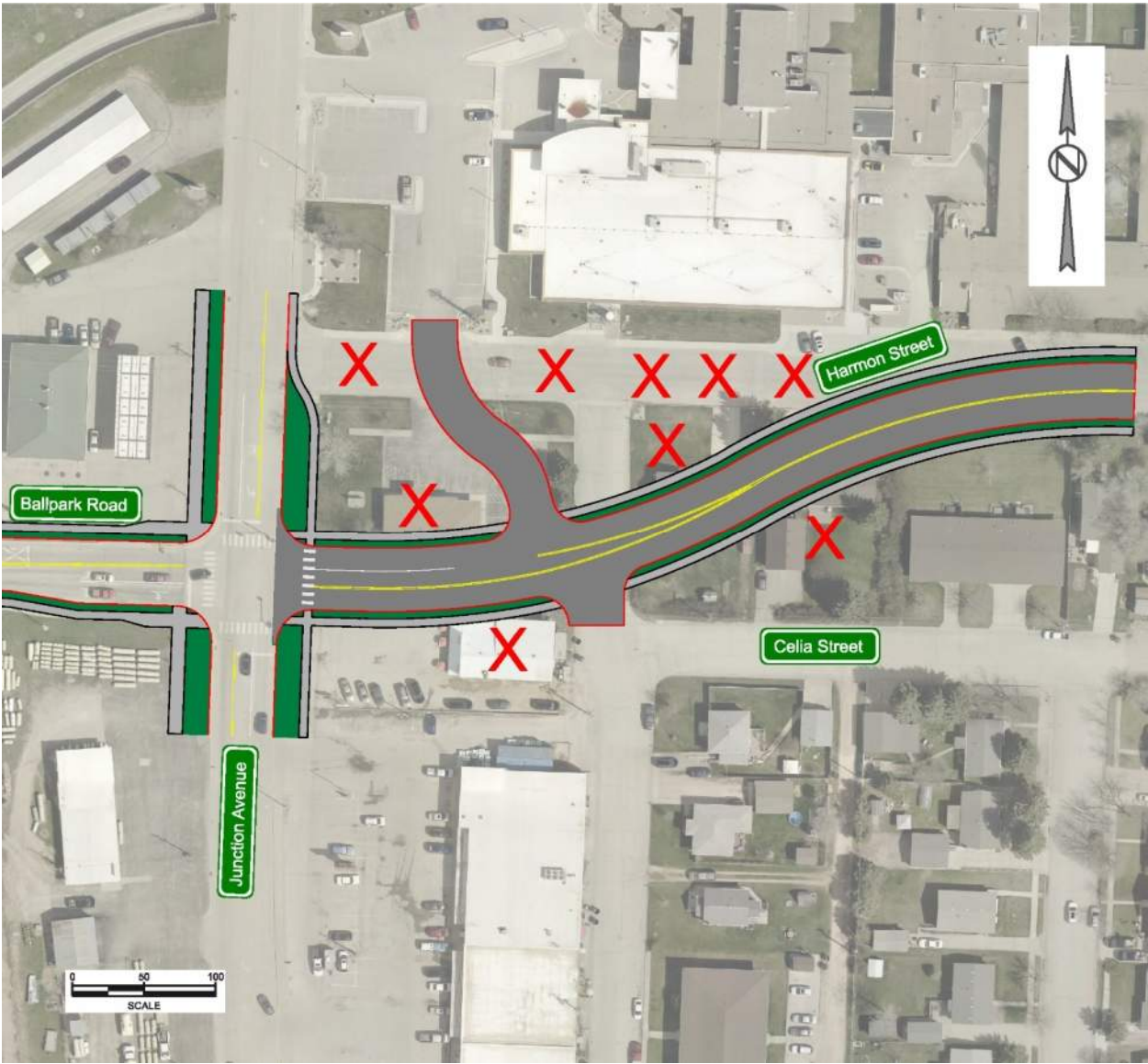


Figure 6 - Realignment of Harmon Street to Ballpark Road



**Benefits and Drawbacks**

A preliminary list of benefits and drawbacks of this alternative is provided below.

**Benefits**

- Removes the conflicts and operational deficiencies resulting from two, closely-spaced offset “tee” intersections
- Addresses operational deficiencies at the Harmon Street intersection
- Roundabouts provide for a safe intersection treatment, for both vehicles and pedestrians; best addresses historical recurring crashes at Ballpark Road intersection. (if constructed as a roundabout)

**Drawbacks**

- Significant impacts to private properties<sup>1</sup>
- Traffic impacts (including potential detours) during construction (especially if resulting intersection constructed as a roundabout)

<sup>1</sup>Because of these impacts, this alternative was eliminated from further consideration.

**Construction Phasing Strategy**

Phasing of this alternative will consist of constructing the new alignment of Harmon Street while traffic remains on the existing Harmon Street. alignment. Traffic on Davenport Street, from Celia Street to Harmon Street, will need to be rerouted while this new alignment is being constructed. Once the new alignment is constructed, traffic will be shifted onto the new Harmon Street alignment and the remaining sidewalk and drive access will be constructed.

**Estimate of Construction Duration**

This alternative can be completed within two construction seasons.

*A6: Realignment of Ballpark Road to Harmon Street*

This alternative would consist of realigning Ballpark Road to the Harmon Street intersection. The resulting intersection could be operated under either signal or roundabout control. Construction of this alternative would be inclusive of upgraded pedestrian facilities (including sidewalks and ramps) to satisfy ADA standards and the closure and vacation of Ballpark Road, and associated right-of-way, west of Junction Avenue to west of the existing horizontal curves in Ballpark Road.

A conceptual illustration of this alternative is provided in Figure 7.

**Cost**

The estimated 2028 cost (assumes 10% annual inflation) of this alternative, inclusive of preliminary engineering and 30% contingency, ranges from \$6,600,000 (roundabout control) to \$6,780,000 (signal control).

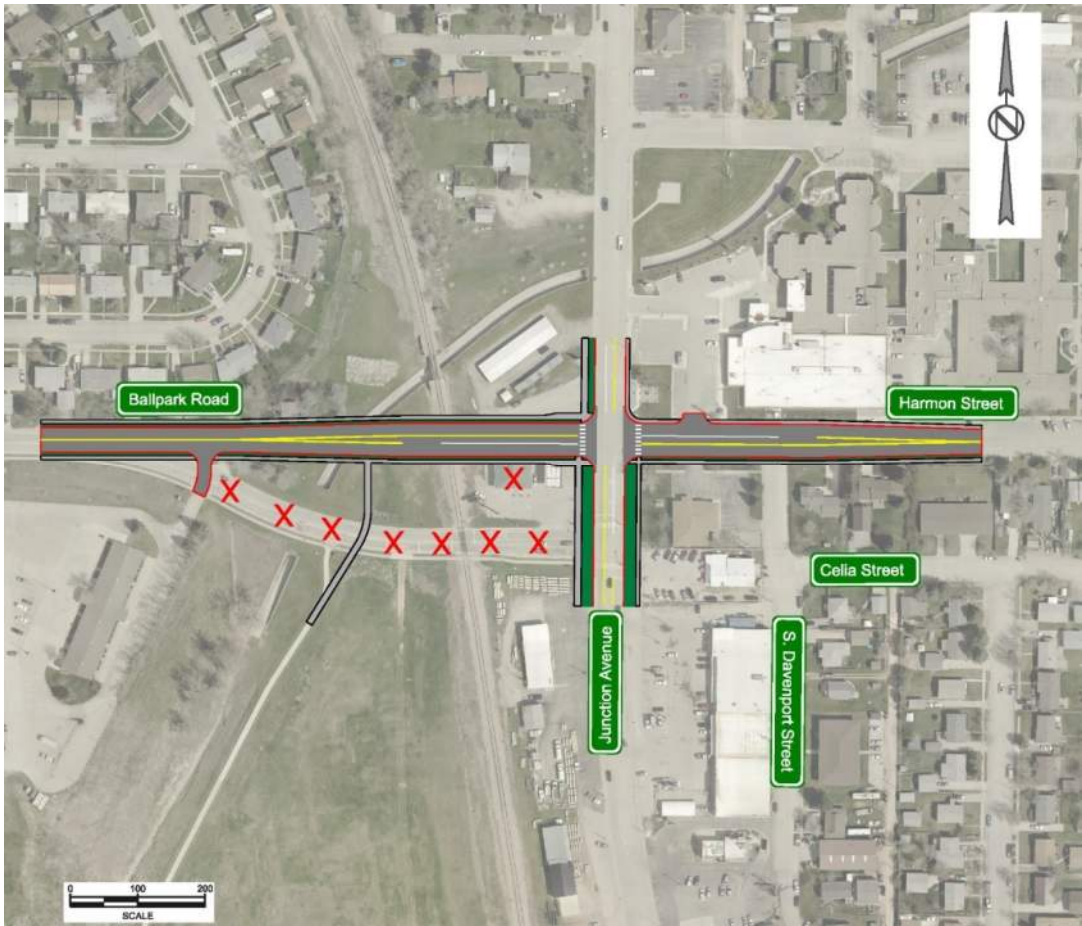


Figure 7 - Realignment of Ballpark Road to Harmon Street

**Benefits and Drawbacks**

A preliminary list of benefits and drawbacks of this alternative is provided below.

**Benefits**

- Removes the conflicts and operational deficiencies resulting from two, closely-spaced offset “tee” intersections
- Addresses operational deficiencies at the Harmon Street intersection
- Roundabouts provide for a safe intersection treatment, for both vehicles and pedestrians; best addresses historical recurring crashes at Ballpark Road intersection. (if constructed as a roundabout)

**Drawbacks**

- Significant impacts to private properties<sup>1</sup>
- Would require cost and coordination to relocate the railroad crossing.
- Would require cost and hydraulic analysis to relocate crossing of Deadman Gulch
- Traffic impacts (including potential detours) during construction (especially if resulting intersection constructed as a roundabout)

<sup>1</sup>Because of these impacts, this alternative was eliminated from further consideration.

## Construction Phasing Strategy

Phasing of this alternative would consist of first, constructing the new alignment of Ballpark Road and the new lanes for Harmon Street. Traffic along Harmon Street would need to be rerouted during the construction of the new lanes. Once the new alignment of Ballpark Road is complete, traffic would then be routed to the new alignment and the existing street will be removed. Lane closures and lane shifts will be needed to construct the new intersection. Sidewalk and access points will then be constructed.

## Estimate of Construction Duration

This alternative can be completed within two construction seasons.

## Summary of Alternatives

Table 4 provides a qualitative summary of whether each alternative satisfies the needs of this part of the study corridor.

**Table 4 - Satisfaction of Project Need, by Alternative**

Alternative	Does the Alternative Address the Need?			
	Recurring Crashes at Ballpark Road	Traffic Operations at Harmon Street	Pedestrian Accommodations	Misaligned Streets
<b>A0 No-build</b>	No	No	No	No
<b>A1 Ballpark Rd - Signal</b>	No	No	Yes	No
<b>A2 Ballpark Rd - Roundabout</b>	Yes	No	Yes	No
<b>A3 Peanut Roundabout</b>	Yes	Yes	Yes	Yes
<b>A4<sup>1</sup> Realignment of Ballpark Rd to Celia St</b>	Yes <sup>2</sup>	Yes	Yes	Yes
<b>A5<sup>1</sup> Realignment of Harmon St to Ballpark Rd</b>	Yes <sup>2</sup>	Yes	Yes	Yes
<b>A6<sup>1</sup> Realignment of Ballpark Rd to Harmon St</b>	Yes <sup>2</sup>	Yes	Yes	Yes

<sup>1</sup>Because of significant property impacts, alternative was eliminated from further consideration.

<sup>2</sup>Only if intersection is reconstructed as roundabout.

## Anna Street/Vanocker Canyon Road & Junction Avenue

### Definition of Need

The alternatives associated with these intersections were developed to address the following needs/deficiencies:

- Recurring, minor crashes at the Anna Street intersection
- Traffic operations on the stop-controlled approach of the Vanocker Canyon Road and Anna Street intersections, which are expected to experience peak hour LOS F by year 2035
- Lack of designated crossings, of Junction Avenue, other than at the Ballpark Road intersection
- Pedestrian facilities, namely sidewalks and ramps, that do not satisfy ADA standards
- Misaligned public streets (Vanocker Canyon Road and Anna Street) that form two, offset, “T” intersections
- Impacts of growth including degraded intersection operations and need for street connectivity and development access

### Priority of Need

Anticipated traffic growth along Anna Street, east of Junction Avenue, resulting from on-going development and the resulting operational and safety impacts to the Anna Street intersection is one of the most pressing needs identified during this corridor study. As such, the need for improvements at the intersection of Junction Avenue & Anna Street is considered **high-priority**, or within the next five years. These improvements would also address the need for additional designated crossing opportunities of Junction Avenue, beyond what is presently limited to just Ballpark Road, and also begin to address some of the pedestrian facility deficiencies. All remaining pedestrian facility deficiencies, namely sidewalks and ramps, should also be considered **high-priority** improvement needs.

While stop-controlled LOS at the Vanocker Canyon Road intersection is anticipated to worsen to LOS F by year 2035, the associated delay is experienced by a moderate volume of vehicles and certainly less volume than that at the Anna Street intersection. As such, the need for operational improvements at the intersection of Junction Avenue & Vanocker Canyon Road is considered **low to mid-priority**. However, should the decision be made to align Vanocker Canyon Road and Anna Street to a common intersection, the priority of improvements at Vanocker Canyon Road would rise to that of the Anna Street intersection, or, **high-priority**.

Later in this document, an alternative to construct a raised median in Junction Avenue, between Ballpark Road and Anna Street, is documented. In deciding the preferred alternative at the Anna Street intersection, consideration of the long-term solution throughout the greater Junction Avenue corridor (north of Anna Street) should be given. Specifically, if a raised median is to be implemented north of Anna Street to Ballpark Road, a roundabout should strongly be considered at Anna Street to facilitate the increase in u-turns necessary and resulting from the prohibition of left-turns in and out of driveways along Junction Avenue.

### Alternatives

The following alternatives were developed to address the above-referenced needs/deficiencies for the intersections at Vanocker Canyon Road and Anna Street.

*Bo: No-build*

This alternative would maintain existing intersection conditions including the lack of ADA-compliant sidewalk facilities (including ramps).

*B1: Vanocker Canyon Road & Junction Avenue (Signal)*

This alternative would consist of implementing traffic signal control and the upgrading of sidewalk facilities (including ramps) to satisfy ADA standards.

A conceptual illustration of this alternative is provided in Figure 8. (Note: When making decisions on the type of traffic control at the Vanocker Canyon Road and Anna Street intersections, it is not recommended that signal control be implemented at one intersection and roundabout control at the other. If operated other than stop-controlled, both intersections should either be signal controlled or constructed as roundabouts.)

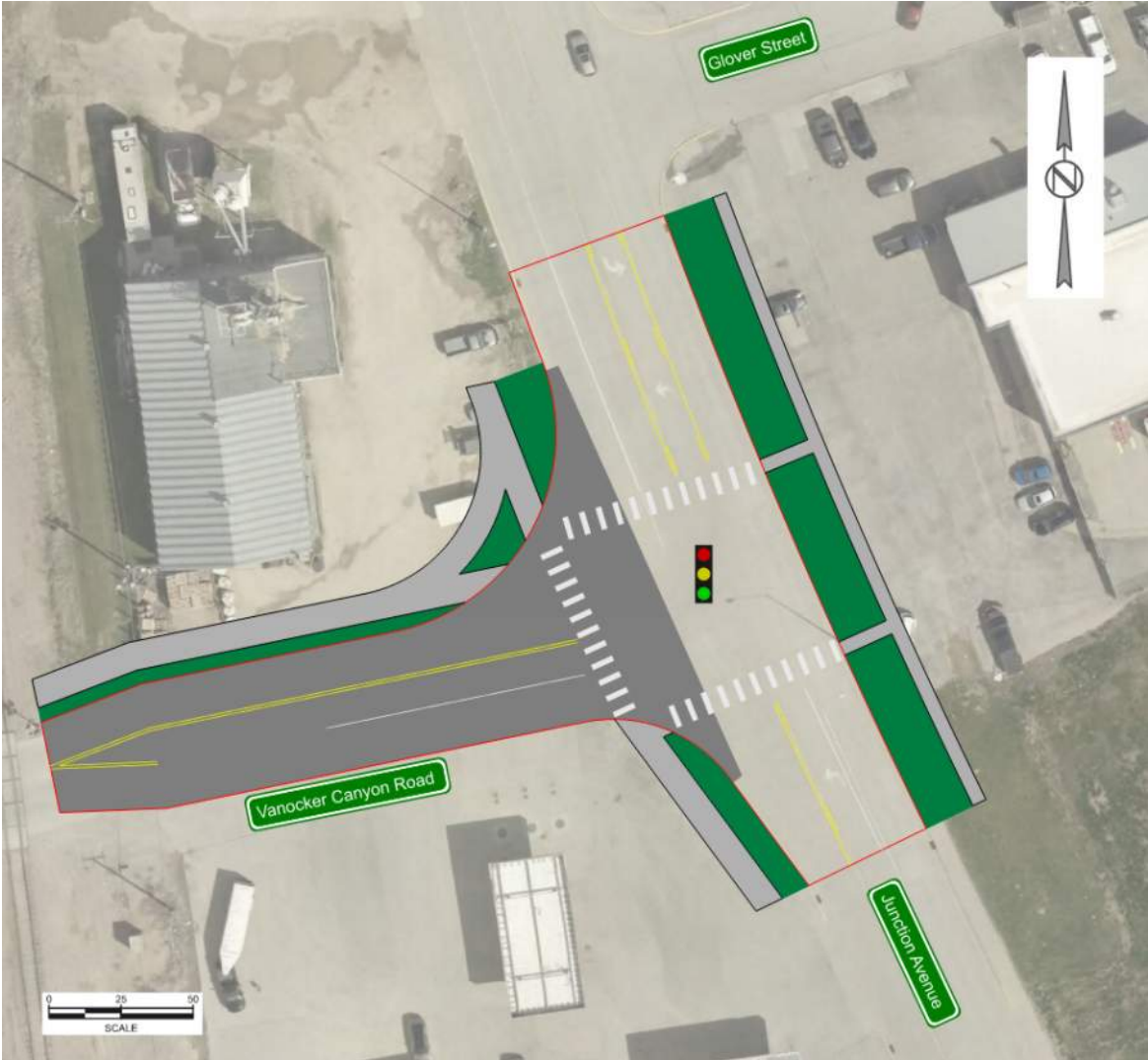


Figure 8 - Vanocker Canyon Road & Junction Avenue (signal)



**Cost**

The estimated 2028 cost (assumes 10% annual inflation) of this alternative, inclusive of preliminary engineering and 30% contingency, is \$1,470,000.

**Benefits and Drawbacks**

A preliminary list of benefits and drawbacks of this alternative is provided below.

**Benefits**

- Improved accessibility for persons with disabilities (sidewalk and ramp improvements)
- Improved intersection vehicle operations
- Controlled pedestrian crossings via pedestrian push buttons and signals

**Drawbacks**

- On-going, annual operation and maintenance costs of signal infrastructure
- Higher crash rates as compared to other alternative (roundabout)

**Construction Phasing Strategy**

Phasing for this alternative will consist of either closing Vanocker Canyon Road, while the new turn lanes are being constructed, or phased construction. The closing of Vanocker Canyon Road would consist of rerouting traffic to Dickson Drive.

Phasing the intersection would require temporary surfacing to push traffic closer to the gas station and Foothill Seed Inc. While eastbound and westbound traffic is pushed to the outside, the center of Vanocker Canyon Road can be constructed. Traffic will then be moved to the newly constructed center while the remaining pavement and sidewalk on the outside is built. Phasing construction will add expense due to the resulting longer timeline of construction and need for temporary surfacing.

**Estimate of Construction Duration**

This alternative can be completed within one construction season.

*B2: Vanocker Canyon Road & Junction Avenue (Roundabout)*

This alternative would consist of reconstructing the intersection as a single-lane roundabout with upgraded pedestrian facilities (including sidewalks and ramps) to satisfy ADA standards. During project implementation (design), additional analysis is needed for year 2035 conditions to further consider the need for and benefits of an additional lane for southbound right-turning vehicles.

A conceptual illustration of this alternative is provided in Figure 9. (Note: When making decisions on the type of traffic control at the Vanocker Canyon Road and Anna Street intersections, it is not recommended that signal control be implemented at one intersection and roundabout control at the other. If operated other than stop-controlled, both intersections should either be signal controlled or constructed as roundabouts.)

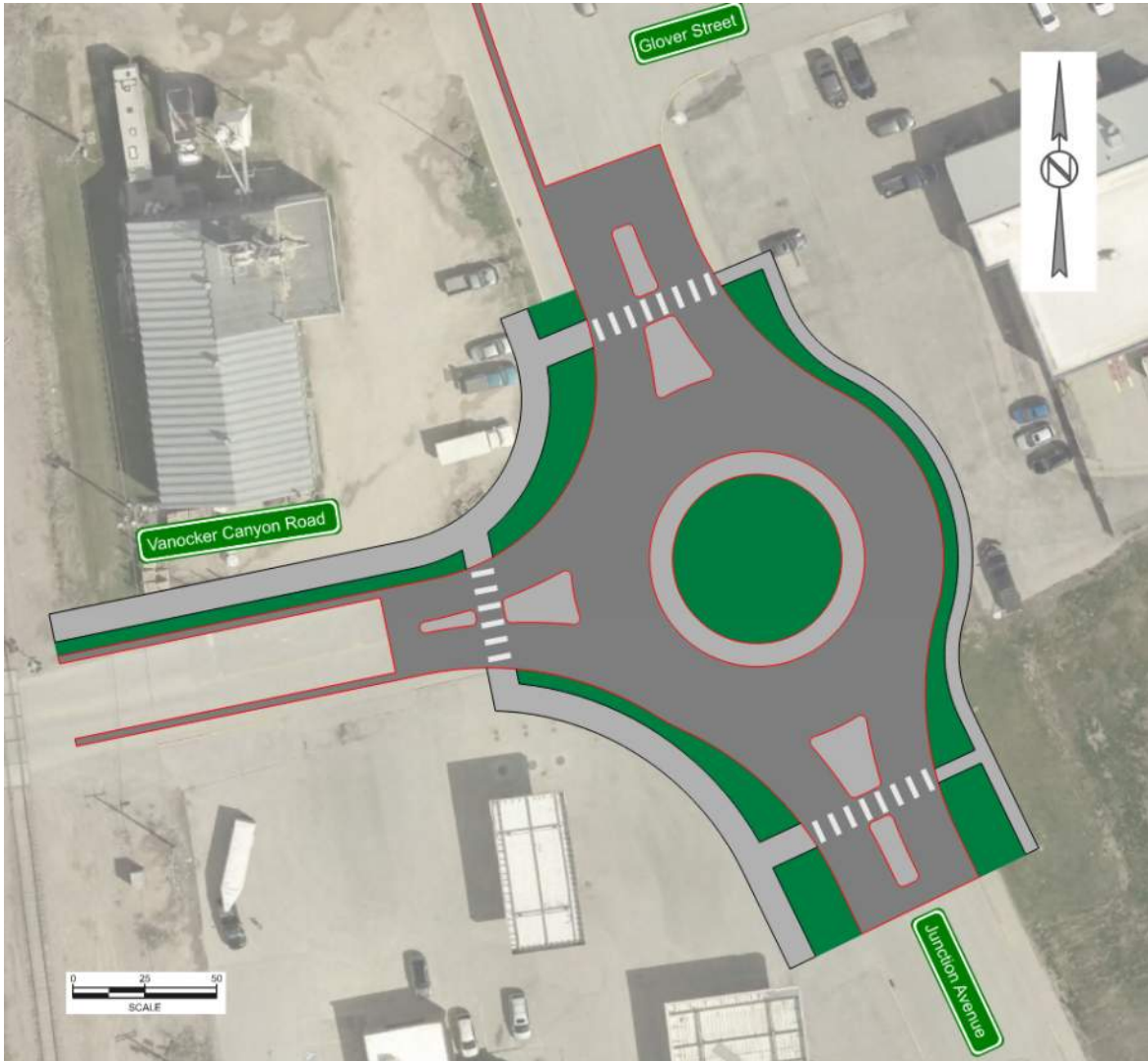


Figure 9 - Vanocker Canyon Road & Junction Avenue (roundabout)

**Cost**

The estimated 2028 cost (assumes 10% annual inflation) of this alternative, inclusive of preliminary engineering and 30% contingency, is \$1,680,000.

**Benefits and Drawbacks**

A preliminary list of benefits and drawbacks of this alternative is provided below.

**Benefits**

- Roundabouts provide for a safe intersection treatment, for both vehicles and pedestrians
- Accommodates u-turn movements that would be generated if a raised median is constructed between Ballpark Road and Anna Street

**Drawbacks**

- Multiple businesses would experience a loss or change in location of access
- Traffic impacts (including potential detours) during construction

**Construction Phasing Strategy**

Phasing for this alternative will consist of either closing Vanocker Canyon Road or phased construction of the roundabout, maintaining one lane of traffic at a time. Closing Vanocker Canyon Road and beginning construction of the new roundabout would begin immediately after the rally and then traffic would be opened on the roundabout during the winter. The remaining work will be completed in the spring prior to the rally of the following year. Closing the intersection would be the most cost-effective construction strategy.

Phasing the construction of the roundabout would consist of maintaining one lane of traffic at a time in each phase. For the first phase, northbound traffic will use the existing lane and the west side of the roundabout will be constructed while southbound traffic is rerouted. In the second phase, southbound traffic will be able to utilize the newly constructed roundabout while northbound traffic is rerouted. Phased construction will increase the cost of the alternative due to increasing the length of construction.

**Estimate of Construction Duration**

This alternative can be completed within one construction season if construction begins immediately following the Sturgis Motorcycle Rally and resumed the following spring.

*B3: Anna Street & Junction Avenue (Signal)*

This alternative would consist of implementing traffic signal control and the upgrading of sidewalk facilities (including ramps) to satisfy ADA standards.

A conceptual illustration of this alternative is provided in Figure 10. (Note: When making decisions on the type of traffic control at the Vanocker Canyon Road and Anna Street intersections, it is not recommended that signal control be implemented at one intersection and roundabout control at the other. If operated other than stop-controlled, both intersections should either be signal controlled or constructed as roundabouts.)

**Cost**

The estimated 2028 cost (assumes 10% annual inflation) of this alternative, inclusive of preliminary engineering and 30% contingency, is \$1,550,000.



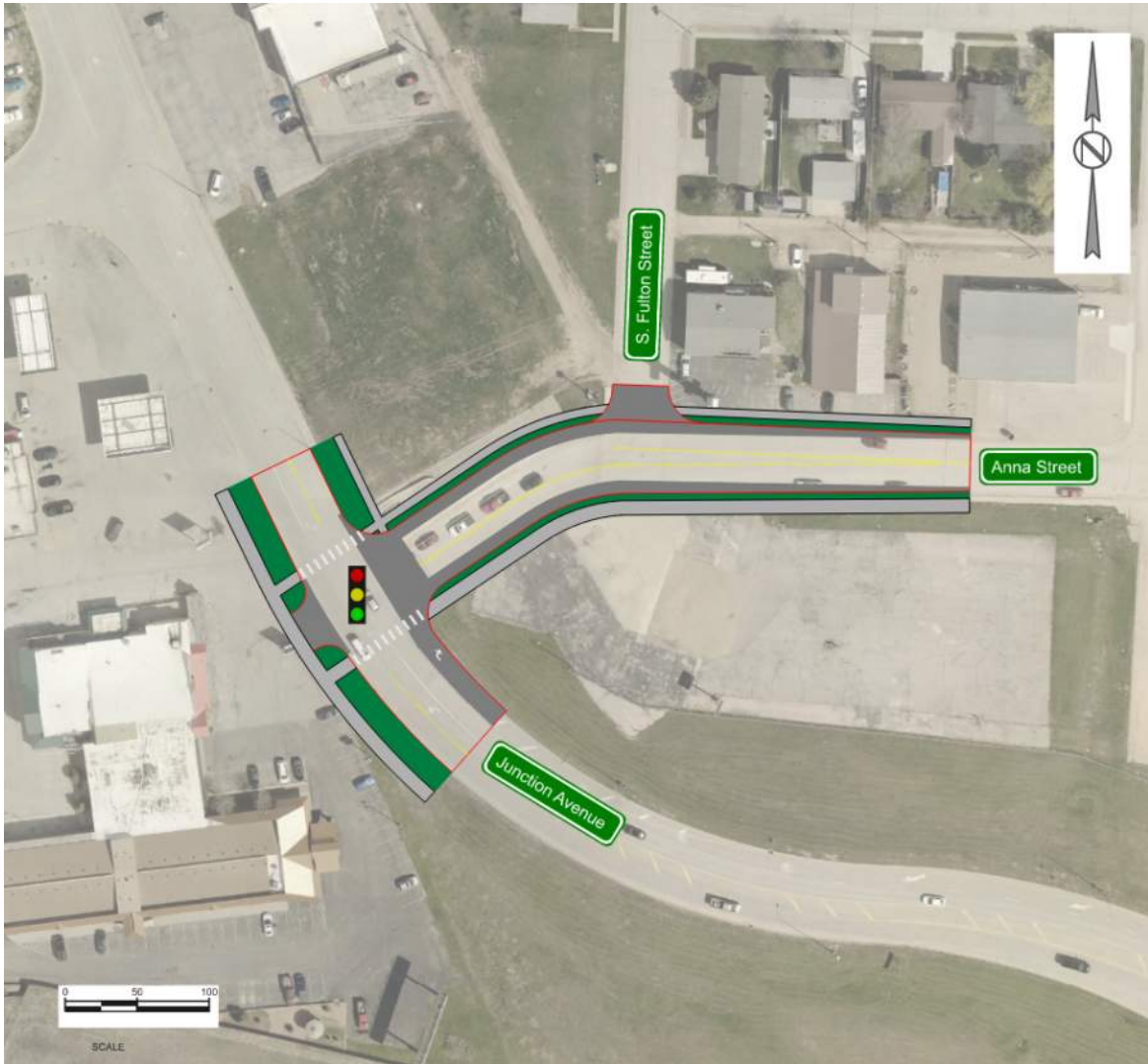


Figure 10 - Anna Street & Junction Avenue (signal)

**Benefits and Drawbacks**

A preliminary list of benefits and drawbacks of this alternative is provided below.

**Benefits**

- Improved accessibility for persons with disabilities (sidewalk and ramp improvements)
- Improved intersection vehicle operations
- Controlled pedestrian crossings via pedestrian push buttons and signals

**Drawbacks**

- On-going, annual operation and maintenance costs of signal infrastructure
- Higher crash rates as compared to other alternative (roundabout)

**Construction Phasing Strategy**

Phasing for this alternative will consist of maintaining two lanes of traffic while the new signal and pavement are being constructed. Traffic will be able to be shifted north and south to construct the additional pavement needed along Anna Street for the new left-turn lane.

**Estimate of Construction Duration**

This alternative can be completed within one construction season.

*B4: Anna Street & Junction Avenue (Roundabout)*

This alternative would consist of reconstructing the intersection as a single-lane roundabout with upgraded pedestrian facilities (including sidewalks and ramps) to satisfy ADA standards. During project implementation (design), additional analysis is needed for year 2050 conditions to further consider the need for and benefits of an additional lane for southbound left-turning vehicles.

A conceptual illustration of this alternative is provided in Figure 11. (Note: When making decisions on the type of traffic control at the Vanocker Canyon Road and Anna Street intersections, it is not recommended that signal control be implemented at one intersection and roundabout control at the other. If operated other than stop-controlled, both intersections should either be signal controlled or constructed as roundabouts.)

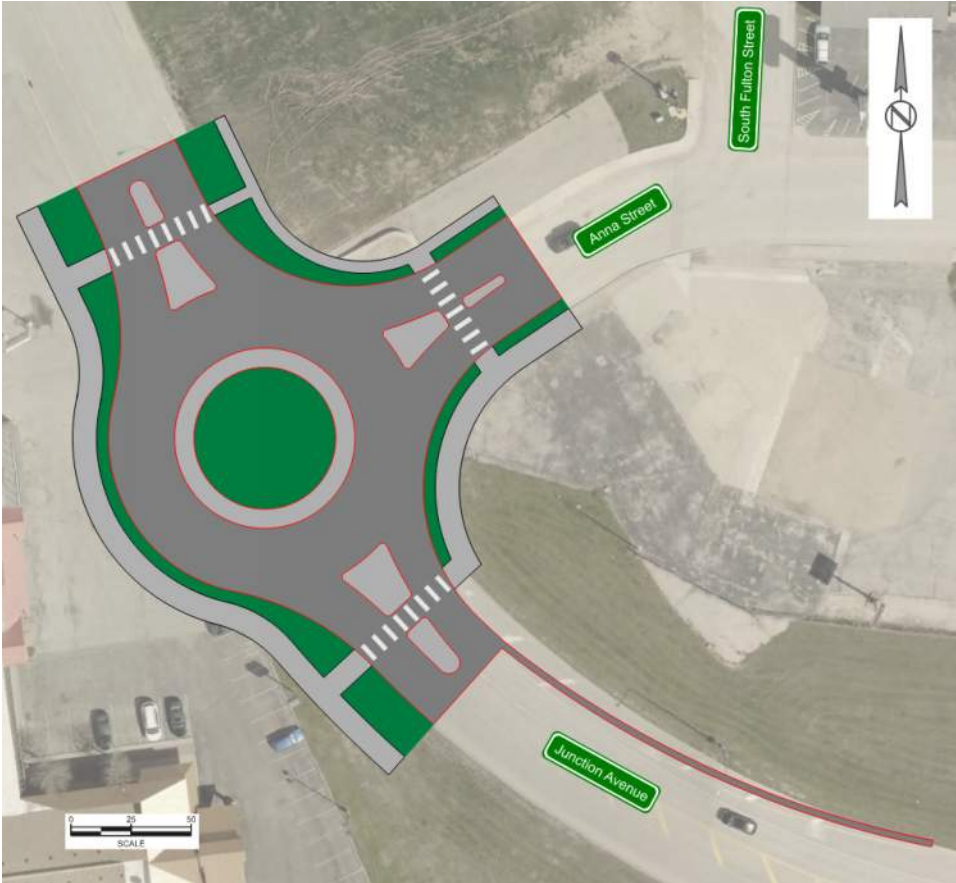


Figure 11 - Anna Street & Junction Avenue (roundabout)

**Cost**

The estimated 2028 cost (assumes 10% annual inflation) of this alternative, inclusive of preliminary engineering and 30% contingency, is \$1,490,000.

**Benefits and Drawbacks**

A preliminary list of benefits and drawbacks of this alternative is provided below.

**Benefits**

- Roundabouts provide for a safe intersection treatment, for both vehicles and pedestrians
- Accommodates u-turn movements that would be generated if a raised median is constructed between Ballpark Road and Anna Street

**Drawbacks**

- Multiple businesses would experience a loss or change in location of access
- Traffic impacts (including potential detours) during construction

**Construction Phasing Strategy**

Multiple phasing strategies will need to be considered for this alternative. One phasing strategy would consist of closing the intersection of Junction Avenue & Anna Street. Due to its proximity to the I-90 interchange and being the first intersection north of interchange ramps, northbound traffic off of I-90 will need to be rerouted to Exit 30. Closing the intersection and rerouting local traffic will be the most cost-effective strategy in constructing this alternative.

Another phasing strategy would consist of constructing temporary surfacing on the east side of Junction Avenue. Due to not having any impacts on the rally, the temporary surfacing can be constructed at any time; however, it is recommended that it be constructed prior to the rally so that traffic can be shifted immediately following the rally and construction can begin. The roundabout will then be built while two lanes of traffic are maintained. This phasing strategy will include additional costs due to the temporary surfacing needed to shift traffic around construction.

Yet another phasing strategy would consist of phased construction and maintaining one lane of traffic during each phase. For the first phase, northbound traffic would use the existing lane and the west side of the roundabout will be constructed while southbound traffic is rerouted. In the second phase, southbound traffic would be able to utilize the newly constructed roundabout while northbound traffic is rerouted. Phased construction will increase the cost of the roundabout due to increasing the length of construction.

**Estimate of Construction Duration**

This alternative can be completed within one construction season if construction begins immediately following the Sturgis Motorcycle Rally and resumed the following spring.



*B5: Anna Street/Vanocker Canyon Road & Junction Avenue (Double Roundabout)*

For all practical purposes, this alternative is a combination of alternatives B2 and B4 and would result in a system of single-lane roundabouts at both of the Vanocker Canyon Road and Anna Street intersections with upgraded pedestrian facilities (including sidewalks and ramps) to satisfy ADA standards. During project implementation (design), additional analysis is needed for year 2035 and 2050 conditions to further consider the need for and benefits of an additional lane for southbound right-turning vehicles at Vanocker Canyon Road, an additional lane for southbound left-turning vehicles at Anna Street, and an additional lane for northbound right-turning vehicles at Anna Street.

A conceptual illustration of this alternative is provided in Figure 12. This concept illustrates a raised median between the two roundabouts. In doing so, left-turn movements from both Vanocker Canyon Road and Anna Street would experience additional, out-of-direction travel. As such, during project implementation (design), additional analysis is needed to consider the ability for left-turn movements onto Junction Avenue to occur at each intersection rather than traversing through both intersections.

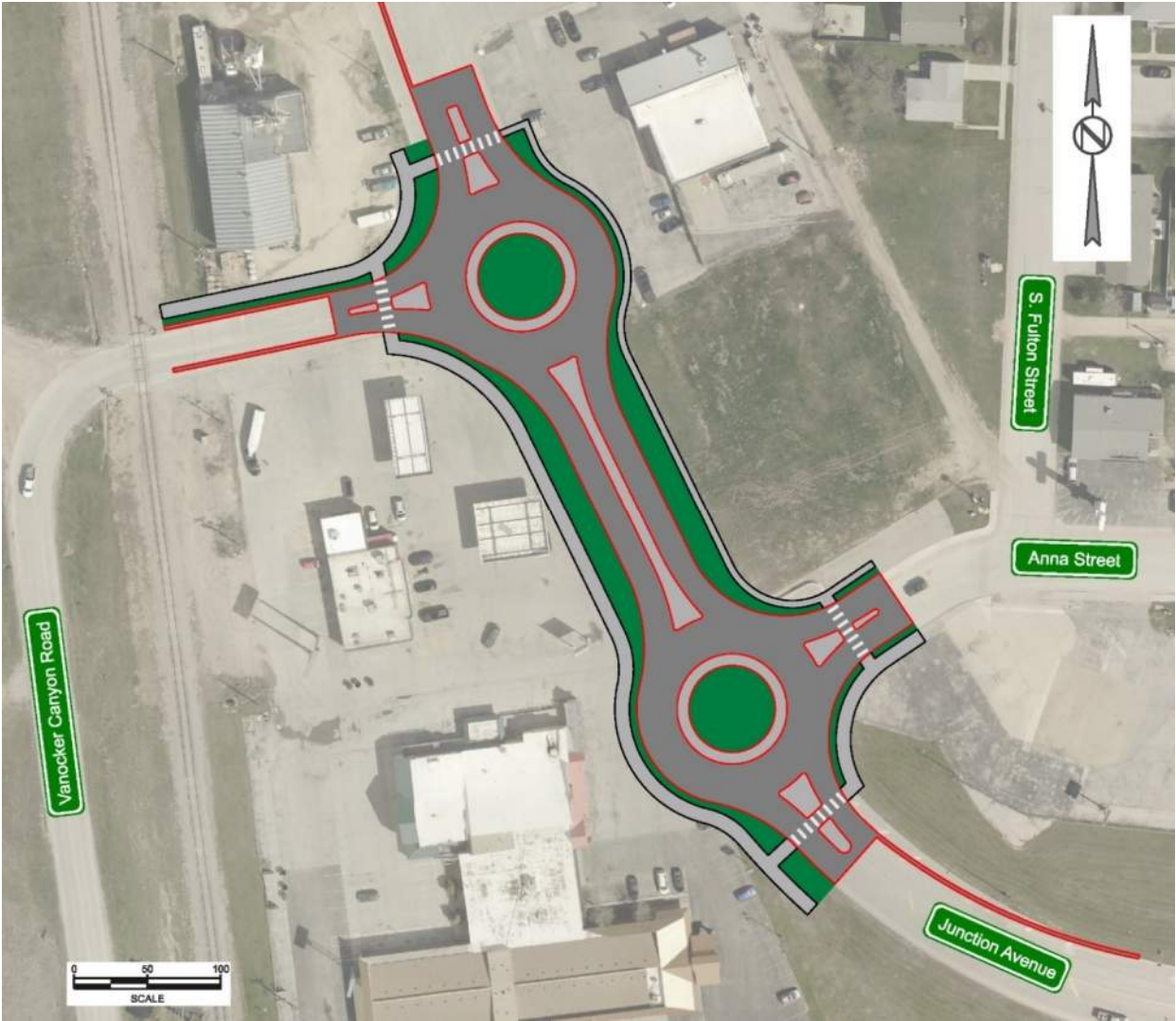


Figure 12 - Anna Street/Vanocker Canyon Road & Junction Avenue (Double Roundabout)

**Cost**

The estimated 2028 cost (assumes 10% annual inflation) of this alternative, inclusive of preliminary engineering and 30% contingency, is \$3,260,000.

**Benefits and Drawbacks**

A preliminary list of benefits and drawbacks of this alternative is provided below.

**Benefits**

- Roundabouts provide for a safe intersection treatment, for both vehicles and pedestrians
- Accommodates u-turn movements that would be generated if a raised median is constructed between Ballpark Road and Anna Street

**Drawbacks**

- Out-of-direction travel if constructed as shown in Figure 12
- Auxiliary lanes may be needed to accommodate future traffic volumes.
- Multiple businesses would experience a loss or change in location of access
- Traffic impacts (including potential detours) during construction

**Construction Phasing Strategy**

To construct the double roundabout at Vanocker Canyon Road and Anna Street, construction over multiple seasons will be necessary in order to not interrupt Sturgis Motorcycle Rally traffic. There are multiple phasing strategies that can be considered to construct this alternative. Since the individual roundabouts will be constructed in separate seasons, phasing strategies described for Alternatives B2 and B4 also apply to this alternative.

To construct the roundabout at Vanocker Canyon Road, two phasing strategies could be utilized. These consist of closing the intersection of Junction Avenue & Vanocker Canyon Road and rerouting traffic or phasing the roundabout construction and maintaining a single lane in each direction open during separate phases.

To construct the roundabout at Anna Street, multiple phasing strategies could be utilized. These consist of closing the intersection of Junction Avenue & Anna Street and rerouting traffic, building temporary surfacing to the east of the intersection, or phasing construction and maintaining one lane of traffic open for each phase.

**Estimate of Construction Duration**

This alternative can be completed within two construction seasons.

*B6: Realignment of Anna Street to Vanocker Canyon Road (Signal)*

This alternative would consist of realigning Anna Street to the Vanocker Canyon Road intersection. In the case of Alternative B6, the resulting intersection would be operated under signal control. Construction of this alternative would be inclusive of upgraded pedestrian facilities (including sidewalks and ramps) to satisfy ADA standards and the closure and vacation of a short segment of existing Anna Street, and associated right-of-way, immediately east of Junction Avenue.

A conceptual illustration of this alternative is provided in Figure 13.

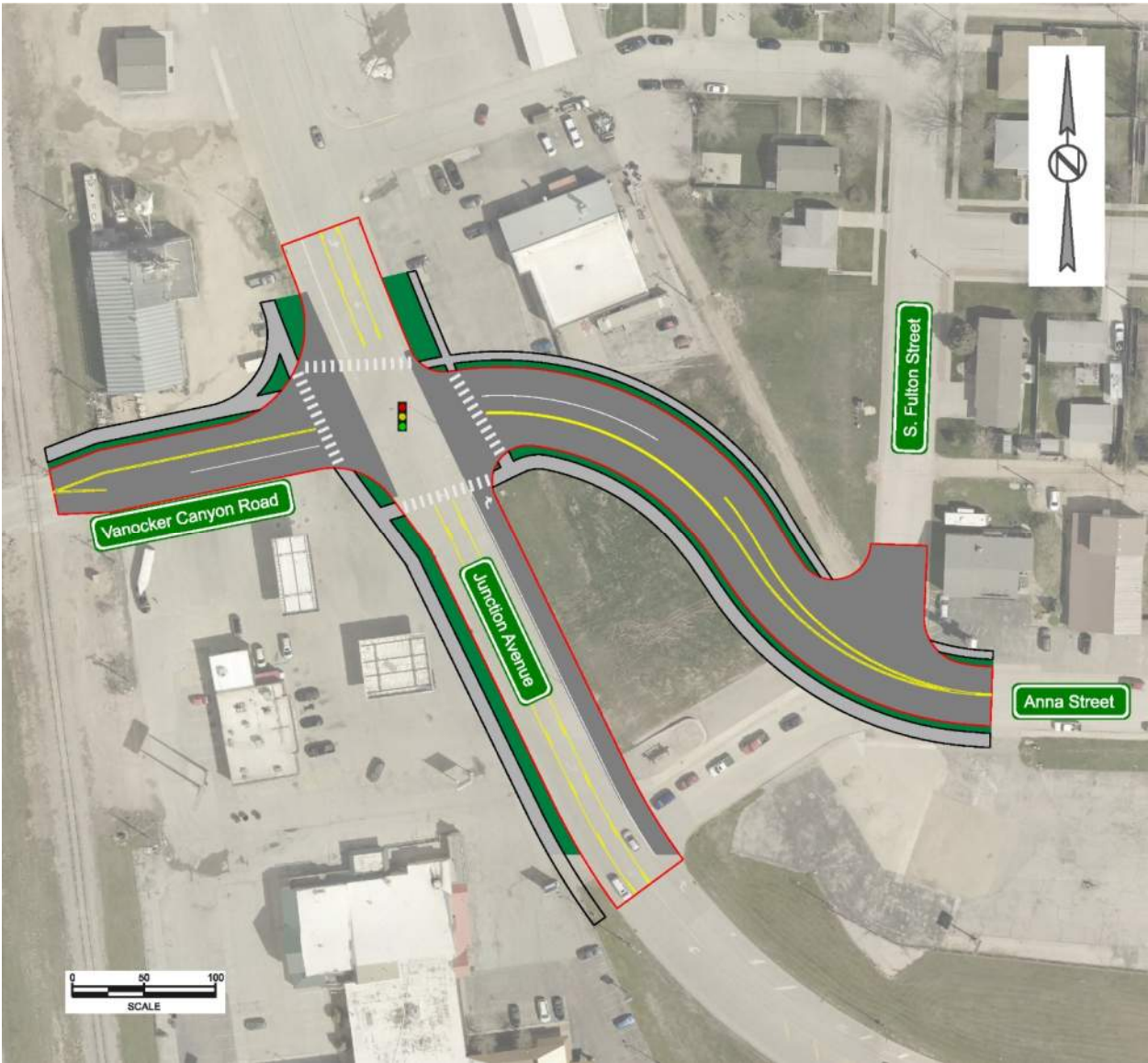


Figure 13 – Realignment of Anna Street to Vanocker Canyon Road (Signal)

**Cost**

The estimated 2028 cost (assumes 10% annual inflation) of this alternative, inclusive of preliminary engineering and 30% contingency, is \$4,030,000.

**Benefits and Drawbacks**

A preliminary list of benefits and drawbacks of this alternative is provided below.

**Benefits**

- Removes the conflicts and operational deficiencies resulting from two, closely-spaced offset “tee” intersections
- Addresses operational deficiencies at both intersections

**Drawbacks**

- Significant impacts to private property
- Slightly skewed intersection approach angle along Anna Street from the east
- Multiple businesses would experience a loss or change in location of access

**Construction Phasing Strategy**

Phasing for this alternative will first consist of constructing the new Anna Street alignment and constructing the new lanes on Vanocker Canyon Road. In order to maintain traffic along Vanocker Canyon Road, construction will need to be phased. Phasing Vanocker Canyon Road will consist of shifting traffic to the north and south while the middle section is constructed, then shifting traffic to the center while the outside lanes and curb are being constructed. Once the Vanocker Canyon Road and the new Anna Street alignments are constructed, traffic from Anna Street can then be shifted onto the new alignment while the old Anna Street is removed.

**Estimate of Construction Duration**

This alternative can be completed within one construction season.

*B7: Realignment of Anna Street to Vanocker Canyon Road (Roundabout)*

This alternative would consist of realigning Anna Street to the Vanocker Canyon Road intersection. In the case of Alternative B7, the resulting intersection would be operated under roundabout control. Construction of this alternative would be inclusive of upgraded pedestrian facilities (including sidewalks and ramps) to satisfy ADA standards and the closure and vacation of a short segment of existing Anna Street, and associated right-of-way, immediately east of Junction Avenue.

A conceptual illustration of this alternative is provided in Figure 14.

**Cost**

The estimated 2028 cost (assumes 10% annual inflation) of this alternative, inclusive of preliminary engineering and 30% contingency, is \$3,560,000.

**Benefits and Drawbacks**

A preliminary list of benefits and drawbacks of this alternative is provided below.

**Benefits**

- Removes the conflicts and operational deficiencies resulting from two, closely-spaced offset “tee” intersections
- Addresses operational deficiencies at both intersections
- Roundabouts provide for a safe intersection treatment, for both vehicles and pedestrians; best addresses historical recurring crashes

**Drawbacks**

- Significant impacts to private property
- Multiple businesses would experience a loss or change in location of access
- Traffic impacts (including potential detours) during construction



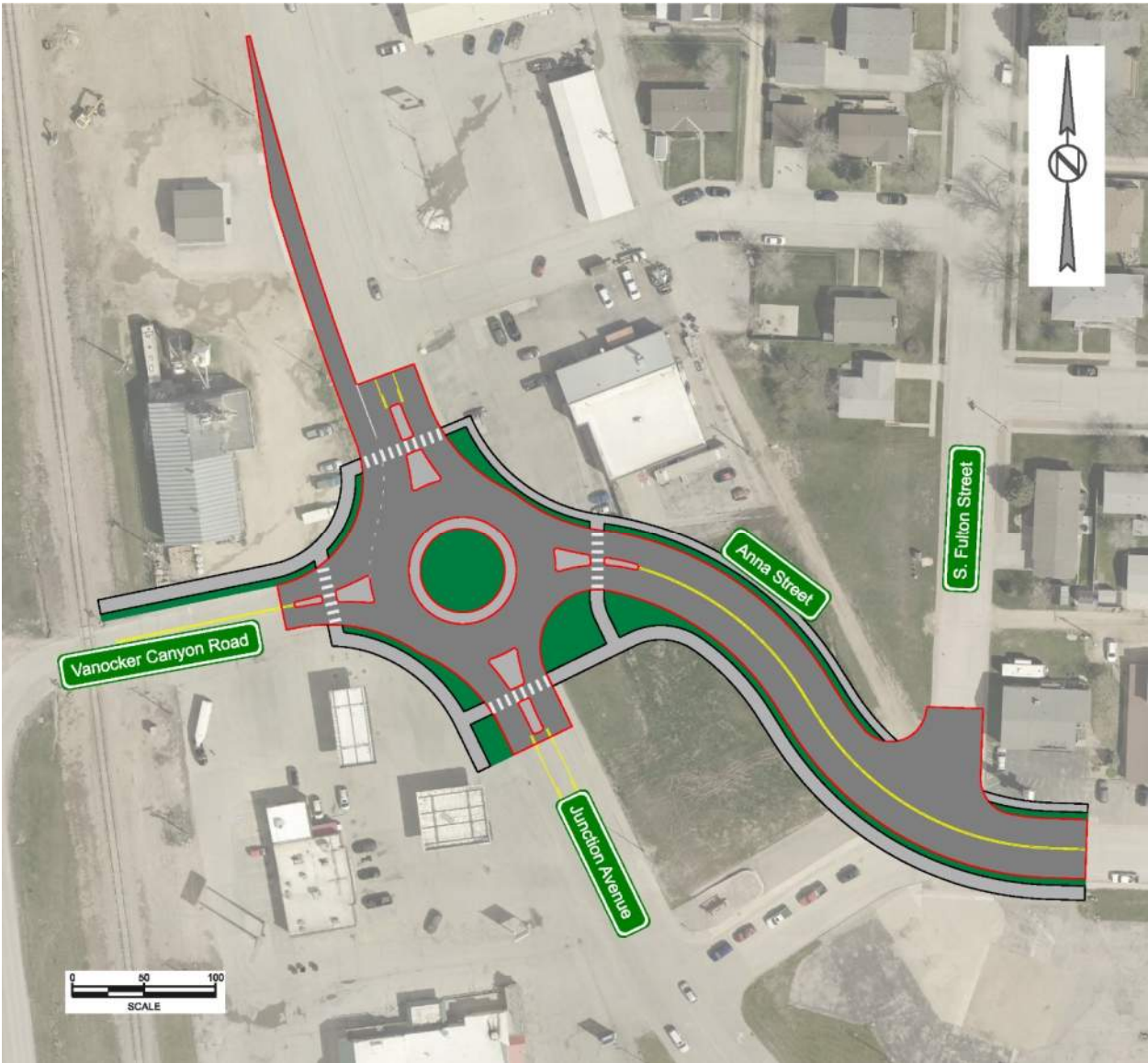


Figure 14 - Realignment of Anna Street to Vanocker Canyon Road (Roundabout)

**Construction Phasing Strategy**

Like the phasing strategy for Alternative B6, the new alignment for Anna Street can be constructed first. To construct the roundabout, similar strategies that were documented at the roundabouts for Vanocker Canyon Road will need to be considered. These phasing strategies consist of closing the intersection of Junction Avenue & Vanocker Canyon Road and rerouting traffic or maintaining one lane of traffic for each phase of construction.

**Estimate of Construction Duration**

This alternative can be completed within two construction seasons.



*B8: Realignment of Vanocker Canyon Road to Anna Street (Signal)*

This alternative would consist of realigning Vanocker Canyon Road to the Anna Street intersection. In the case of Alternative B8, the resulting intersection would be operated under signal control. Construction of this alternative would be inclusive of upgraded pedestrian facilities (including sidewalks and ramps) to satisfy ADA standards and the closure and potential vacation of existing Vanocker Canyon Road, and associated right-of-way, between Junction Avenue and the railroad crossing.

A conceptual illustration of this alternative is provided in Figure 15.

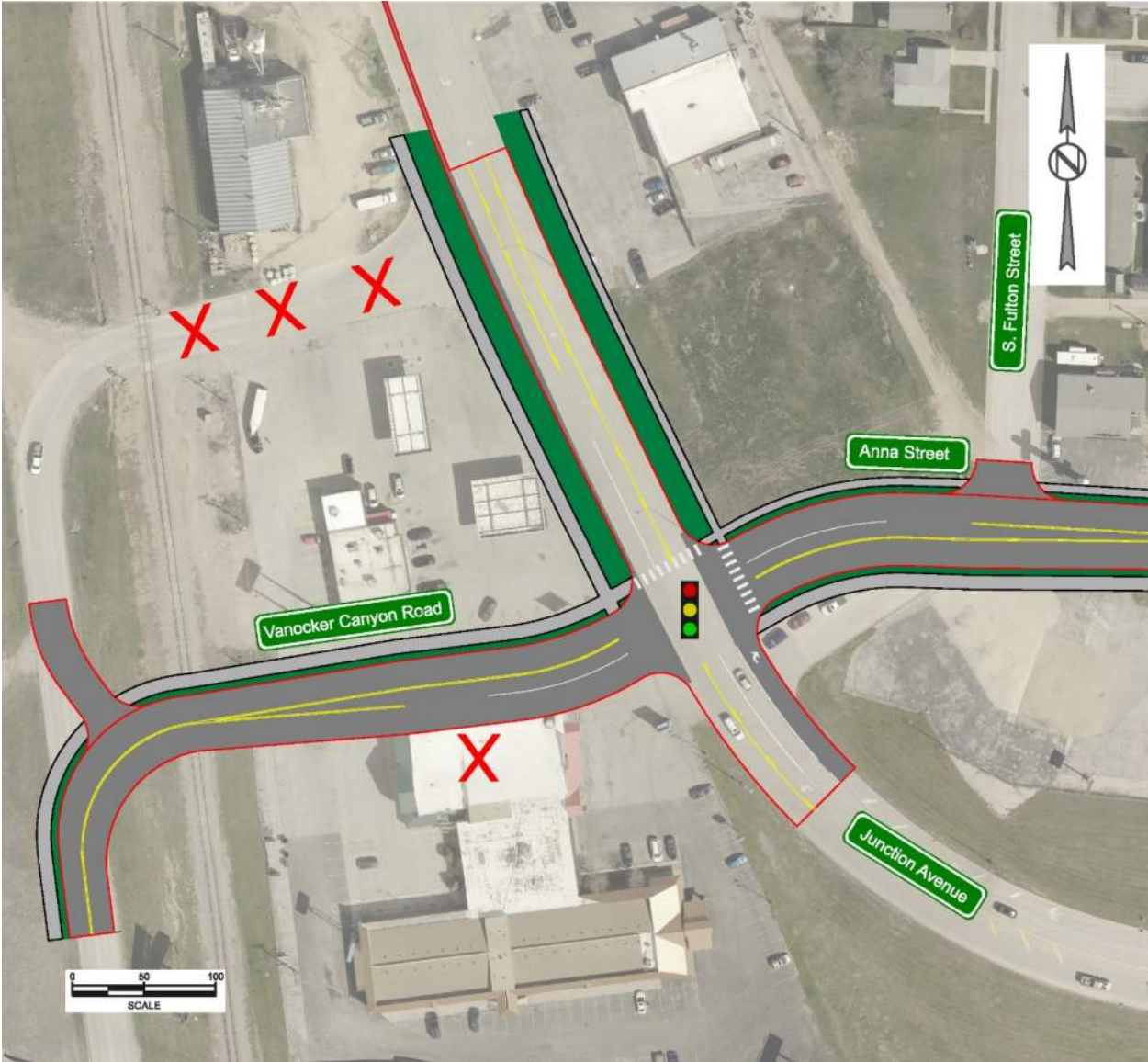


Figure 15 - Realignment of Vanocker Canyon Road to Anna Street (Signal)

**Cost**

The estimated 2028 cost (assumes 10% annual inflation) of this alternative, inclusive of preliminary engineering and 30% contingency, is \$4,700,000.

**Benefits and Drawbacks**

A preliminary list of benefits and drawbacks of this alternative is provided below.

**Benefits**

- Removes the conflicts and operational deficiencies resulting from two, closely-spaced offset “tee” intersections
- Addresses operational deficiencies at both intersections

**Drawbacks**

- Significant impacts to private property
- Requires cost and coordination to relocate railroad crossing
- Higher crash rates as compared to other alternative (roundabout)

**Construction Phasing Strategy**

Phasing for this alternative will consist of constructing the new Vanocker Canyon Road alignment while traffic is maintained on existing Vanocker Canyon Road. Once the new alignment is completed, traffic can be moved onto the new alignment. With this alternative, the Anna Street alignment is shifted north to better align with the new Vanocker Canyon Road alignment. Therefore, phasing on Anna Street will consist of shifting traffic to the south while the new intersection and alignment is constructed. Once completed, traffic can be shifted onto the new alignment while the south portion of Anna Street is constructed.

**Estimate of Construction Duration**

This alternative can be completed within one construction season.

*B9: Realignment of Vanocker Canyon Road to Anna Street (Roundabout)*

This alternative would consist of realigning Vanocker Canyon Road to the Anna Street intersection. In the case of Alternative B9, the resulting intersection would be operated under roundabout control. Construction of this alternative would be inclusive of upgraded pedestrian facilities (including sidewalks and ramps) to satisfy ADA standards and the closure and potential vacation of existing Vanocker Canyon Road, and associated right-of-way, between Junction Avenue and the railroad crossing.

A conceptual illustration of this alternative is provided in Figure 16.

**Cost**

The estimated 2028 cost (assumes 10% annual inflation) of this alternative, inclusive of preliminary engineering and 30% contingency, is \$3,910,000.

**Benefits and Drawbacks**

A preliminary list of benefits and drawbacks of this alternative is provided below.

**Benefits**

- Removes the conflicts and operational deficiencies resulting from two, closely-spaced offset “tee” intersections.
- Addresses operational deficiencies at both intersections.
- Roundabouts provide for a safe intersection treatment, for both vehicles and pedestrians; best addresses historical recurring crashes.

**Drawbacks**

- Significant impacts to private property.
- Requires cost and coordination to relocate railroad crossing.
- Traffic impacts (including potential detours) during construction
- Multiple businesses would experience a loss or change in location of access

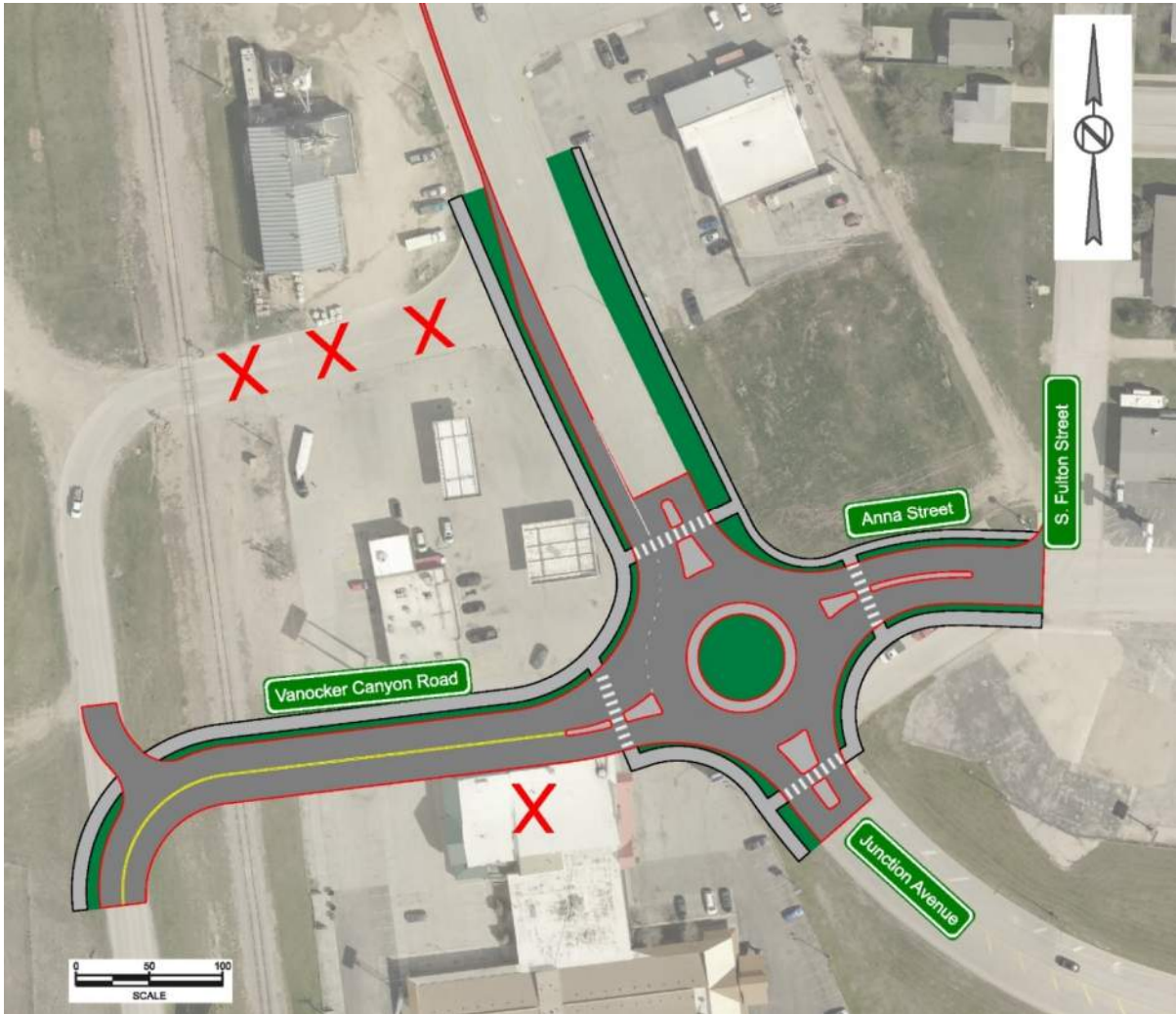


Figure 16 – Realignment of Vanocker Canyon Road to Anna Street (Roundabout)

**Construction Phasing Strategy**

Phasing for this alternative will consist of similar strategies proposed in alternatives B4 and B8. Due to the new alignments for Vanocker Canyon Road and Anna Street, traffic can be maintained on the existing alignments while the new are being constructed. To construct the roundabout, there will be three different strategies that can be incorporated. Those consist of closing the intersection of Junction Avenue & Anna Street, constructing temporary surfacing on the east side of Junction Avenue, and phasing construction and maintaining one lane of traffic.

**Estimate of Construction Duration**

This alternative can be completed within two construction seasons.

**Summary of Alternatives**

Table 5 provides a qualitative summary of whether each alternative satisfies the needs of this part of the study corridor.

Table 5 – Satisfaction of Project Need, by Alternative

Alternative	Does the Alternative Address the Need?						
	Recurring Crashes at Anna Street	Traffic Operations at Vanocker Canyon Road	Traffic Operations at Anna Street	Lack of Designated Crossings	ADA standards	Misaligned Streets	Impacts of Growth
<b>B0 No-build</b>	No	No	No	No	No	No	No
<b>B1 Vanocker Canyon Road &amp; Junction Avenue (signal)</b>	No	Yes	No	Yes	Yes	No	No
<b>B2 Vanocker Canyon Road &amp; Junction Avenue (roundabout)</b>	No	Yes	No	Yes	Yes	No	No
<b>B3 Anna Street &amp; Junction Avenue (signal)</b>	Yes	No	Yes	Yes	Yes	No	Yes
<b>B4 Anna Street &amp; Junction Avenue (roundabout)</b>	Yes	No	Yes	Yes	Yes	No	Yes
<b>B5 Anna St/Vanocker Canyon Rd &amp; Junction Ave (Double Roundabout)</b>	Yes	Yes	Yes	Yes	Yes	No	Yes
<b>B6 Realignment of Anna St to Vanocker Canyon Rd (signal)</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>B7 Realignment of Anna St to Vanocker Canyon Rd (roundabout)</b>	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Alternative	Does the Alternative Address the Need?						
	Recurring Crashes at Anna Street	Traffic Operations at Vanocker Canyon Road	Traffic Operations at Anna Street	Lack of Designated Crossings	ADA standards	Misaligned Streets	Impacts of Growth
<b>B8</b> Realignment of Vanocker Canyon Rd to Anna St (signal)	Yes	Yes	Yes	Yes	Yes	Yes	Yes
<b>B9</b> Realignment of Vanocker Canyon Rd to Anna St (roundabout)	Yes	Yes	Yes	Yes	Yes	Yes	Yes



## Junction Avenue: Ballpark Road to Anna Street

### Definition of Need

The alternatives associated with this segment of the study corridor were developed to address the following needs/deficiencies:

- Sidewalk deficiencies including narrow width, location (with respect to back of curb) and gaps in the overall sidewalk network
- Missing links to the city-wide bike path (trail) network
- High density of private driveways north of Anna Street
- Impacts of growth including degraded intersection operations and need for street connectivity and development access

### Priority of Need

As traffic volumes along Junction Avenue increase in the future as a result of the on-going and proposed development in the area, additional conflicts will be experienced because of left-turning traffic in and out of the numerous private driveways that access Junction Avenue. As this issue is addressed, the other needs and deficiencies listed above could be addressed as part of the same project. Though each of these issues could be addressed individually, collectively they are deemed a **mid-priority**. However, if there are specific ADA deficiencies that are identified, these should be addressed from the perspective of **high-priority**.

### Alternatives

The following alternatives were developed to address the above-referenced needs/deficiencies for the segment of Junction Avenue between Anna Street and Ballpark Road. For both of the build alternatives described below, additional enhancements can be incorporated as described in the section of this document titled "Additional Corridor Enhancements."

#### *Co: No-build*

This alternative would maintain existing characteristics of the corridor including number and location of private driveways.

#### *C1: Two-way Left-turn Lane*

This alternative would retain the existing two-way, left-turn lane and permit left-turns between Junction Avenue and the private driveways throughout this segment. However, to reduce the number of conflicts resulting from these left-turn movements, the removal or consolidation of driveways would be discussed with respective property owners during project design. Additional characteristics of this alternative (identical to Alternative C2) include sidewalk or trail on both sides of the street.

A conceptual illustration of this alternative is provided in Figure 17.

#### Cost

The estimated 2028 cost (assumes 10% annual inflation) of this alternative, inclusive of preliminary engineering and 30% contingency, is \$910,000.



Figure 17 - Two-way Left-turn Lane

**Benefits and Drawbacks**

A preliminary list of benefits and drawbacks of this alternative is provided below.

**Benefits**

- Provides continuous sidewalk or trail on both sides of Junction Avenue.

**Drawbacks**

- Retains the conflicts of left-turning vehicles at private drive access points

**Construction Phasing Strategy**

Phasing for this alternative will consist of maintaining two lanes of traffic along Junction Avenue while the existing drives are removed and the new drives are constructed.

**Estimate of Construction Duration**

This alternative can be completed within one construction season.

*C2: Raised Median*

This alternative would replace the existing two-way, left-turn lane with a raised median, separating northbound and southbound vehicles. With this alternative, the existing number and location of driveways would be retained. Additional characteristics of this alternative (identical to Alternative C1) include sidewalk or trail on both sides of the street.

A conceptual illustration of this alternative is provided in Figure 18

**Cost**

The estimated 2028 cost (assumes 10% annual inflation) of this alternative, inclusive of preliminary engineering and 30% contingency, is \$1,370,000.

**Benefits and Drawbacks**

A preliminary list of benefits and drawbacks of this alternative is provided below.

**Benefits**

- Removes conflicts associated with left-turning vehicles at public street intersections and private drive access points, thus improving safety
- Provides continuous sidewalk or trail on both sides of Junction Avenue.
- Improved safety with raised median separating opposing lanes of travel

**Drawbacks**

- May have negative impacts to traffic conditions during the Sturgis Motorcycle Rally
- Reduced access at some public streets and private driveways will induce out-of-direction travel

**Construction Phasing Strategy**

Phasing for this alternative will consist of maintaining two lanes of traffic on Junction Avenue while the raised median is constructed. Outside lanes will be made narrower to be able to construct the median and left turn movements will not be allowed during construction.

**Estimate of Construction Duration**

This alternative can be completed within one construction season.





Figure 18 - Raised Median

## Junction Avenue: Anna Street to Exit 32

### Definition of Need

The alternative associated with this segment of the study corridor was developed to address the following need/deficiency:

- Two roadway horizontal curves, between the I-90 (Exit 32) WB ramp terminal and Anna Street that do not satisfy design criteria

### Priority of Need

Although minimum radius and superelevation design criteria is not satisfied for either of the horizontal curves between the Exit 32 westbound ramps and Anna Street, no operational or safety deficiencies have been reported that would be attributed to these deficiencies. Therefore, the need for improvements is considered **low-priority**. An opportune time to implement any improvements would be when the intersection at Anna Street is reconstructed, especially if reconstructed as a roundabout.

### Alternatives

The following alternatives were developed to address the above-referenced needs/deficiencies for the segment of Junction Avenue between the Exit 32 westbound ramps and Anna Street.

#### *DO: No-build*

This alternative would maintain existing roadway geometry with no modifications to horizontal curvature or roadway superelevation.

#### *D1: Realignment*

This alternative would realign Junction Avenue such that all SDDOT design criteria are satisfied. Because of the increased traffic anticipated to use Anna Street, it is recommended that a continuous second northbound lane be constructed between Exit 32 westbound ramps and Anna Street, dropping the lane as a right-turn lane drop at Anna Street.

A conceptual illustration of this alternative is provided in Figure 20.

### Cost

The estimated 2028 cost (assumes 10% annual inflation) of this alternative, inclusive of preliminary engineering and 30% contingency, is \$2,850,000.

### Benefits and Drawbacks

A preliminary list of benefits and drawbacks of this alternative is provided below.

#### Benefits

- Reduces the risk of crashes due to horizontal curve design deficiencies

#### Drawbacks

- None



Figure 19 – Realignment of Junction Avenue, Anna Street to Exit 32

**Construction Phasing Strategy**

Phasing for this alternative will consist of maintaining two lanes of traffic on Junction Avenue. While the north section of the curves is being constructed, traffic can be shifted to the south side. Once the north side of the new curves are constructed, traffic will then be shifted and the south section will be constructed.

**Estimate of Construction Duration**

This alternative can be completed within one construction season.

## Additional Corridor Enhancements

### Definition of Need

Though not formally documented in the study document *Evaluation of Existing and Future No-build Conditions; Identification of Needs*, additional needs and desires were expressed throughout the study via public comment and discussions during SAT meetings. These include:

- Enhanced aesthetics of the corridor, namely north of Exit 32 serving, in part, as an attractive gateway into Sturgis
- Safety issues created by the current location of the “Welcome to Sturgis” sign at the Junction Avenue & Anna Street intersection

Of the additional needs identified above, the one that is most easily addressed as a stand-alone issue is that associated with the existing “Welcome to Sturgis” sign. If any development/redevelopment activity were to occur on either of the corners on the east side of the Junction Avenue & Anna Street intersection, coordination of a new sign location in conjunction with that activity would be opportunistic. Otherwise, as a stand-alone project, this issue is considered a **mid-to-high** priority.

### Alternatives

The following alternatives were developed to address the above-referenced needs/deficiencies for the segment of Junction Avenue between Anna Street and Ballpark Road. These alternatives correspond to the transportation alternatives C0, C1 and C2.

#### *E0: No-build*

This alternative would maintain existing characteristics of the corridor including number and location of private driveways, use of public right-of-way, width and location of sidewalks, and lack of aesthetic treatment.

#### *E1: Two-way Left-turn Lane*

Additional characteristics of this alternative, beyond those described under Alternative C1, include the reclaiming of public right-of-way from past and current private use and aesthetic enhancements of the corridor.

A conceptual illustration of this alternative is provided in Figure 20. (See also Figure 22.)

#### *E2: Raised Median*

Additional characteristics of this alternative, beyond those described under Alternative C1, include the reclaiming of public right-of-way from past and current private use and aesthetic enhancements of the corridor.

A conceptual illustration of this alternative is provided in Figure 21. (See also Figure 22.)

While beautification/aesthetic enhancements can be incorporated with either of these two alternatives, elements of what could be incorporated with Alternative E2 are illustrated in Figure 23.



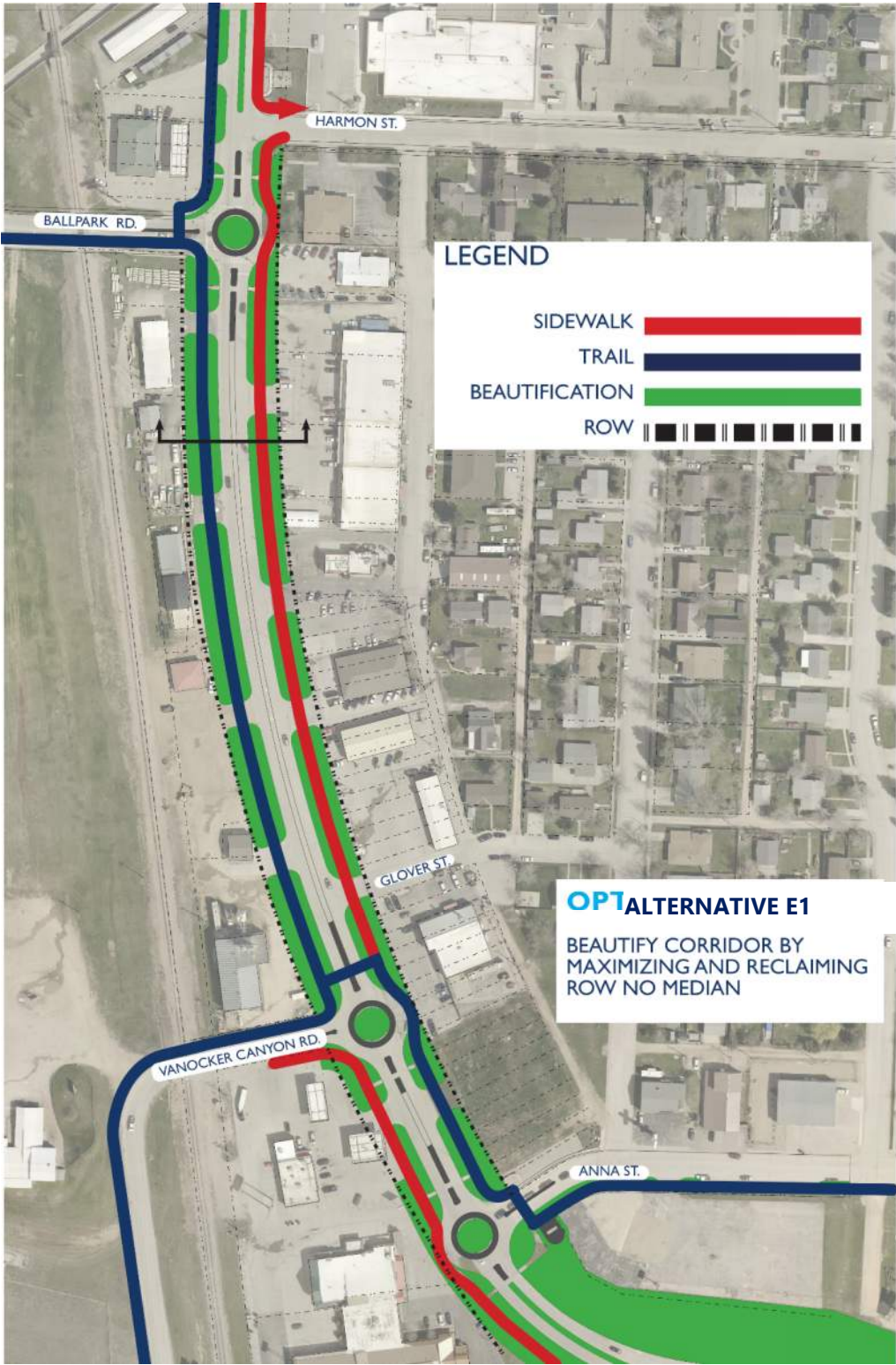


Figure 20 - Two-way Left-turn Lane

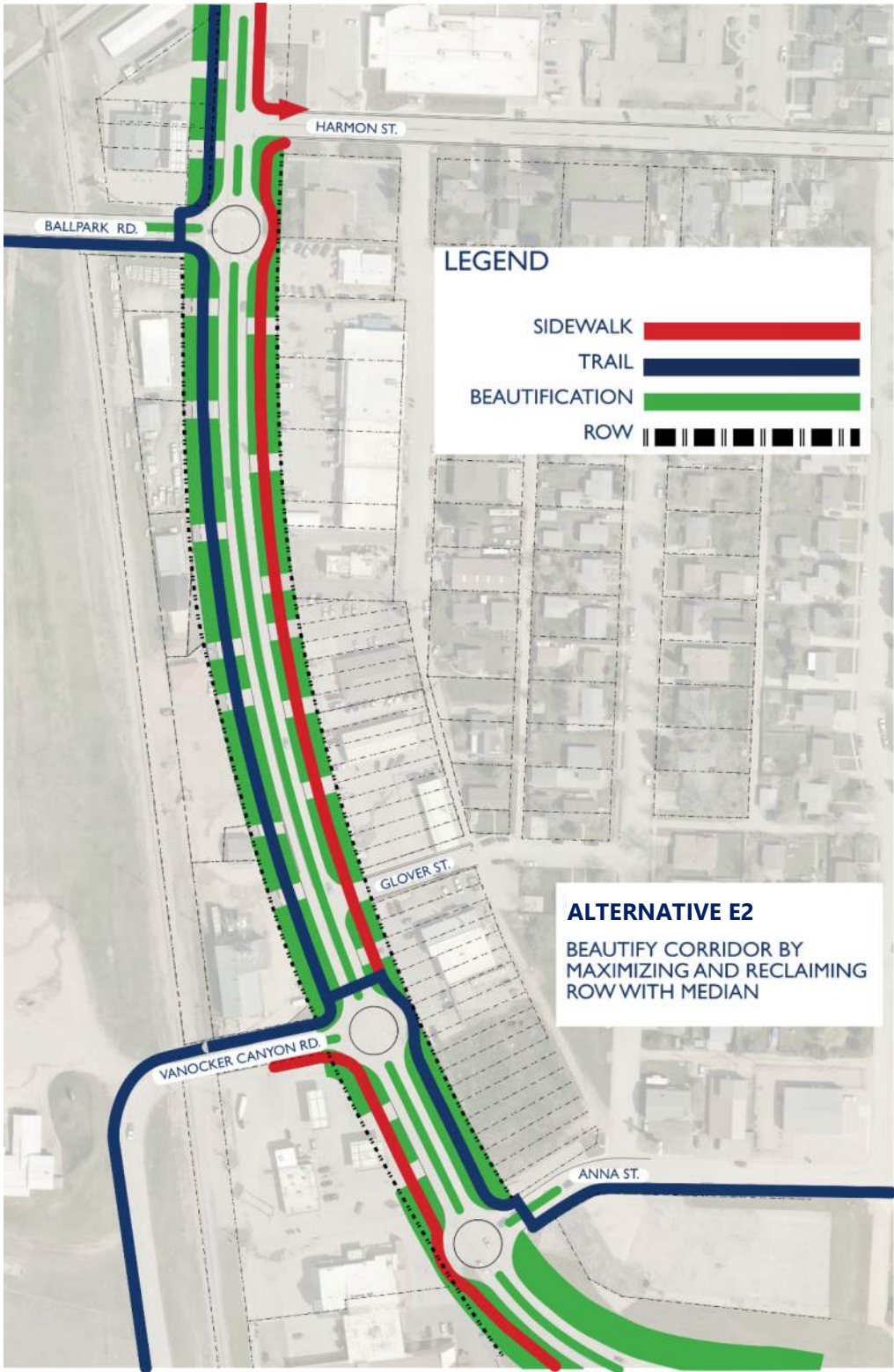
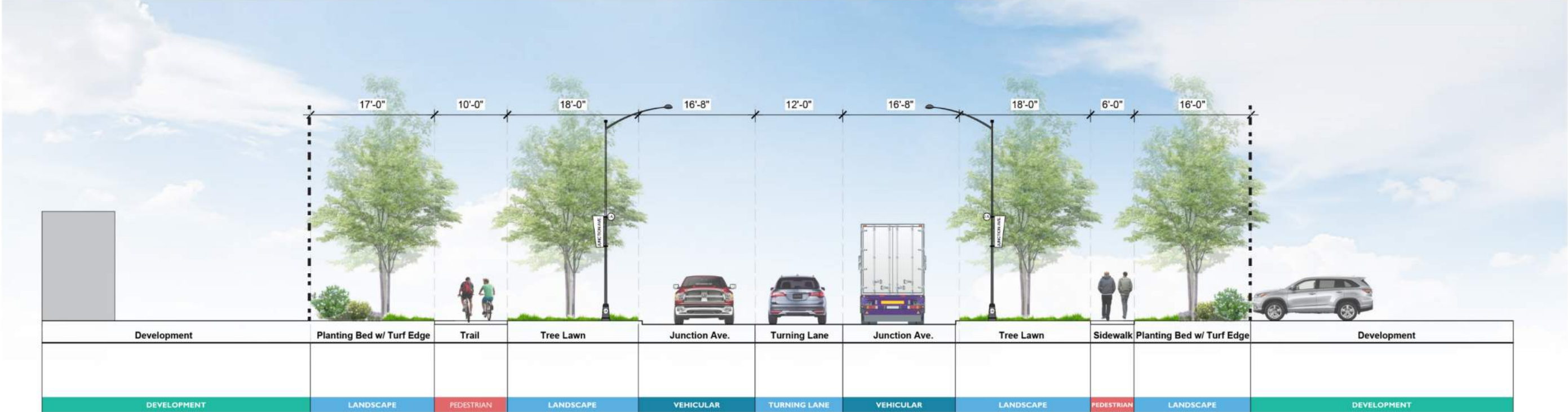


Figure 21 - Raised Median



E1: Two-way Left-turn Lane



E2: Raised Median

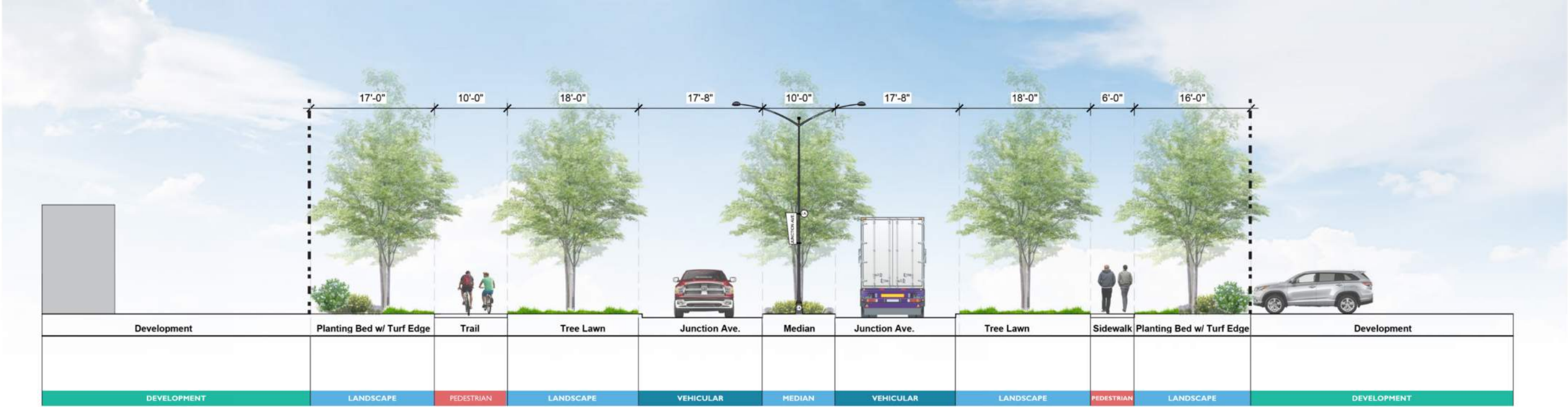


Figure 22 - Corridor Enhancement Alternatives



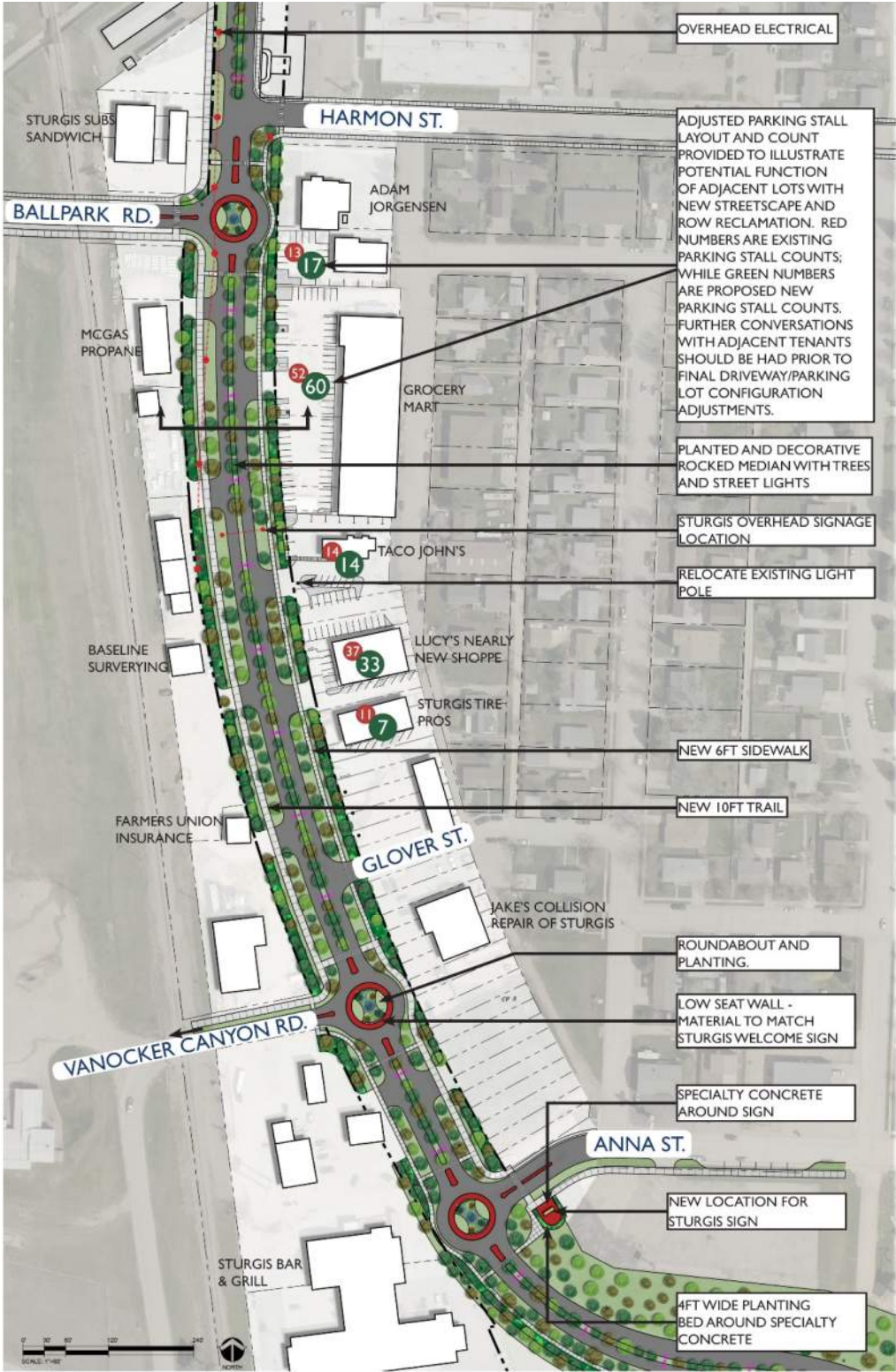


Figure 23 - Corridor Beautification Elements (Alternative E2)

Cost

A summary of costs associated with the additional corridor enhancements is provided in Table 6.

Table 6 – Additional Corridor Enhancements – Summary of Estimated Costs

Location	Element	Estimated Cost
North of Anna Street – back of curb (both sides) <sup>1</sup>	Beautification	\$1,925,000
	Ornamental lighting <sup>2</sup>	\$435,000
North of Anna Street – median only	Beautification	\$410,000
	Ornamental lighting <sup>2</sup>	\$620,000
Junction Avenue & Anna Street intersection	Relocation of Sturgis “Welcome” sign	\$885,000
Roundabout central island (each)	Beautification	\$235,000
Anna Street to Exit 32 WB ramps	Beautification	\$715,000

<sup>1</sup>Sidewalk/trail costs included in costs for alternatives C1 and C2.

<sup>2</sup>Median light poles include two luminaire/banner arms; Back of Curb light poles include single luminaire/banner arm.

Benefits of Additional Corridor Enhancements

The City of Sturgis will benefit from drawing additional natural street and landscape features into their continued developing community. The benefits of incorporating landscaping into the transportation facilities experienced daily (along streets, within parking lots, around buildings, and even the protection of natural areas within our developed areas) include reducing levels of surface temperatures, providing cooling relief, creating inviting public spaces that encourage and attract people, adding habitat for animals and pollinators, health benefits such as relaxing both mind and body, increasing overall shade, and reducing air pollutants. The City of Sturgis should consider incorporating more landscaping requirements in their zoning code and subdivision regulations for new development to play a role in helping achieve these benefits for the greater community. Items to consider could include:

- Requirement of landscaped green buffers between parking lots and public right of way.
  - Provide buffer when a parking lot is located within fifty (50') of the right-of-way and there are no intervening buildings between the parking lot and the right-of-way. Buffer should be at least 7' wide and be planted with at least one large deciduous tree per 30 linear feet (clustering trees is OK). Additionally, a low-profile (no taller than 30") screen (such as a masonry wall, fence, shrubs or a combination) must be provided within the buffer.
- Interior parking lot landscaping standards.
  - Medium or large trees should only be allowed in these spaces as to provide the largest tree canopies possible to offer shade to paved surfaces below.
  - Plant trees every 10 stalls in appropriate soil volume based on tree size (see soil volumes below).
  - Require a minimum percentage of interior landscape requirements per size of parking lot.
- Tree size definitions and guidance on proper tree selection based on location.
  - Small trees are defined as a tree reaching a mature height of less than 20'
  - Medium trees are defined as a tree reaching a mature height between 20'-40'.

- Large trees are defined as a tree reaching a mature height of 40' or more.
- Large trees are best for breaking down the size of scale in large areas of paving, wide roadways, and building masses. Medium trees closer to 40' can also work for this application. However, trees that are <30' in height (smaller-medium trees and small trees) are best in areas as supplemental tree plantings to other medium and large trees, such as large open spaces.
- Columnar trees do not make for the best tree selection along streets nor parking lots, and should be avoided in these locations.
- Requirements for minimum soil volume for trees to ensure the best growing environments.
  - Minimum 300 cubic feet for small trees (<20' mature height)
  - Minimum 600 cubic feet for medium trees (20-40' mature height)
  - Minimum 1000 cubic feet for large trees. (40'+ mature height)
- Requirements for additional open space.
  - A portion of the total site should be dedicated to open space.
  - Consider articulation of passive versus active active spaces, and apply a percentage required per land use.
  - Encourage landscaping to be organic in nature, with trees and shrubs clumped together versus equally distributed.
  - Native plant material should be prioritized in proposed planting plans.

Incorporating landscaping and stormwater management solutions provides many benefits to the community other than just added beauty and storing runoff, including providing places for nature to permeate our build habitat, boost the local economy and improve our overall quality of life. These solutions allow for incorporation of street trees, pollinator gardens, and human-scale spaces that reinforce a pedestrian friendly environment.

At a minimum, future development along the Junction Avenue corridor should consider the following:

- Integrate sustainable and low-impact design storm drainage treatment practices into site design, such as but not limited to:
  - Bioretention / bioswale / rain gardens
  - Minimize impervious surfaces by using permeable pavers/pavement
  - Rain harvesting
  - Vegetated roofs (green roofs)
- All on-site drainage and detention facilities designed as added amenities (i.e. accessible to pedestrians and benefit the greater community).
- Prohibit encroachment upon, or filling or destruction of streams, drainage systems or floodplains.
- Landscape solutions that focus on variety of native trees and plants ,and discourage and prohibit use of invasive species.
- Natural landscape solutions such as minimization of impervious surfaces, undisturbed buffers and filter strips are preferred over structural solutions such as detention ponds.
- Stormwater management plans submitted to the City illustrate how stormwater will be managed on site, equivalent to one inch of precipitation generated on the lot, without allowing such stormwater to flow into any public stormwater drainage system.

## Bike Paths

### Definition of Need

The alternatives associated with this component of the study corridor were developed to address the following need/deficiency:

- Missing links to the city-wide bike path (trail) network

### Priority of Need

The City of Sturgis is presently in the design process of developing the Sturgis Aquatic Adventure Park, positioned on the east side of Junction Avenue between Pine View Drive and the railroad tracks. As such, the top priority as related to bike paths is providing a connection from the existing trails network, and other locations like the on-going development along Anna Street to the adventure park. Therefore, these connections would be considered **high-priority** while all other connections are part of the build out of the City's bike path network and can be considered **mid-priority**.

### Alternatives

The following alternatives were developed to address the need/deficiency related to the City's bike path network.

#### *FO: No-build*

This alternative would maintain the existing bike path network.

All of the bike path build alternatives are illustrated in Figure 24 located at the end of this section.

#### *F1: Junction Avenue Trail*

This alternative would construct a bike path along Junction Avenue, between Pine View Drive and Ballpark Road, and connect to the existing Vanocker Canyon Bike Path along Ballpark Road. The connection along Ballpark Road does allow for the consideration of using the existing, 5-ft. sidewalk or reconstructing this approximately 375-ft. segment with a wider bike path.

#### **Cost**

The estimated 2028 cost (assumes 10% annual inflation) of this alternative, inclusive of preliminary engineering and 30% contingency, is \$1,310,000.

#### **Considerations**

As related to this alternative, items to be considered during the selection and implementation of the overall bike path network include:

- Depending on what other bike paths are to be constructed, all of this particular bike path alternatives would not need to be constructed.
- The number of driveways, and resulting conflicts between vehicles and bike path users, through the portion of the corridor between Ballpark Road and Vanocker Canyon Road. This may lead to one side of Junction Avenue being preferred to the other.

- The volume of turning vehicles onto and off of I-90 at the Exit 32 interchange create conflicts and safety concerns of a bike path traversing this segment of the corridor. Bike path crossings at the two ramp terminal intersections would require careful consideration of the signing and signalization requirements and might also require the elimination of free-flowing right-turn movements (e.g., the westbound off-ramp movement onto northbound Junction Avenue). A method to avoid these conflicts while constructing this segment of the Junction Avenue bike path would be to construct grade-separated pedestrian crossings under the respective on- and off-ramps.
- Coordination with the Rapid City, Pierre & Eastern (RCPE) Railroad would be necessary at the crossing of the railroad tracks. This could lead to additional schedule delays or increased implementation cost.
- Based on preliminary concept illustrations of the proposed adventure park (dated May 4, 2023), bike path is shown along the east side of Junction Avenue from Pine View Drive to just south of the railroad tracks.

### *F2: Vanocker Canyon Road Trail*

This alternative would construct a bike path along Vanocker Canyon Road between Junction Avenue and Dickson Drive/Otter Road and would serve as an extension of the recently constructed bike path along Vanocker Canyon Road south of Dickson Drive/Otter Road into the Garden Grove Development.

#### **Cost**

The estimated 2028 cost (assumes 10% annual inflation) of this alternative, inclusive of preliminary engineering and 30% contingency, is \$550,000.

#### **Considerations**

As related to this alternative, items to be considered during the selection and implementation of the overall bike path network include:

- Coordination with the Rapid City, Pierre & Eastern (RCPE) Railroad would be necessary at the crossing of the railroad tracks. This could lead to additional schedule delays or increased implementation cost.
- Underneath I-90, the location of the bridge piers would likely require the bike path to be constructed along the east side of Vanocker Canyon Road, north of Dickson Drive/Otter Road. Because the existing Vanocker Canyon bike path south of Dickson Drive/Otter Road is located on the west side of Vanocker Canyon Road, the proper location for the crossing of Vanocker Canyon Road would need to be evaluated during project design and implementation.

### *F3: Anna Street Trail*

This alternative would construct a bike path along Anna Street, from Junction Avenue to Starline Avenue.

#### **Cost**

The estimated 2028 cost (assumes 10% annual inflation) of this alternative, inclusive of preliminary engineering and 30% contingency, is \$690,000.

#### **Considerations**

As related to this alternative, items to be considered during the selection and implementation of the overall bike path network include:



- An approximate 300-ft segment of trail was recently constructed along the south side of Anna Street, immediately east of Baldwin Street.

### *F4: Dickson Drive Trail*

This alternative would construct a bike path along Dickson Drive, between Vanocker Canyon Road and Junction Avenue.

#### **Cost**

The estimated 2028 cost (assumes 10% annual inflation) of this alternative, inclusive of preliminary engineering and 30% contingency, is \$580,000.

#### **Considerations**

As related to this alternative, items to be considered during the selection and implementation of the overall bike path network include:

- Coordination with the Rapid City, Pierre & Eastern (RCPE) Railroad would be necessary at the crossing of the railroad tracks. This could lead to additional schedule delays or increased implementation cost.
- The typical section of this alternative includes ditches along either or both sides of Dickson Drive which would require earthwork and other improvements necessary to accommodate the bike path.
- Utility conflicts not yet evaluated could deem this alternative infeasible.
- In order to safely access the proposed adventure park, users will likely be required to cross Junction Avenue at a mid-block (i.e., non-intersection) location. Careful consideration of the proper treatment of this crossing should be given during project design/implementation.
- Though not the only treatment available, one alternative includes a designated (signed and marked) crosswalks supplemented by a rectangular rapid flashing beacon (RRFB).

### *F5: Railroad Trail*

This alternative would construct a bike path parallel to the existing railroad tracks, but outside of railroad right-of-way, between Dickson Drive and Junction Avenue. This alternative would also require a short segment of trail along Dickson Drive between Vanocker Canyon Road and the railroad tracks.

#### **Cost**

The estimated 2028 cost (assumes 10% annual inflation) of this alternative, inclusive of preliminary engineering and 30% contingency, is \$1,210,000.

#### **Considerations**

As related to this alternative, items to be considered during the selection and implementation of the overall bike path network include:

- Coordination with the Rapid City, Pierre & Eastern (RCPE) Railroad would be necessary at the crossing of the railroad tracks and to construct the trail parallel to the tracks. This could lead to additional schedule delays or increased implementation cost, including the potential for constructing a fence between the bike path and the tracks to prevent users of the bike path from trespassing onto railroad property.
- Coordination with property owners to acquire property for the trail alignment.

- In order to safely access the proposed adventure park, users will likely be required to cross Junction Avenue at a mid-block (i.e., non-intersection) location. Careful consideration of the proper treatment of this crossing should be given during project design/implementation.
- Though not the only treatment available, one alternative includes a designated (signed and marked) crosswalks supplemented by a rectangular rapid flashing beacon (RRFB).

### *F6: Vanocker to Junction Trail*

This alternative would construct a bike path through property presently undeveloped. The bike path could generally follow a diagonal alignment from generally the intersection of Vanocker Canyon Road & 1<sup>st</sup> Avenue to the existing driveway returns along Junction Avenue, located approximately 550-ft. north of Pine View Drive.

#### **Cost**

The estimated 2028 cost (assumes 10% annual inflation) of this alternative, inclusive of preliminary engineering and 30% contingency, is \$1,110,000.

#### **Considerations**

As related to this alternative, items to be considered during the selection and implementation of the overall bike path network include:

- Coordination with property owners to acquire property for the trail alignment. This could potentially be accomplished through some form of an easement.
- In order to safely access the proposed adventure park, users will likely be required to cross Junction Avenue at a mid-block (i.e., non-intersection) location. Careful consideration of the proper treatment of this crossing should be given during project design/implementation.
- Though not the only treatment available, one alternative includes a designated (signed and marked) crosswalks supplemented by a rectangular rapid flashing beacon (RRFB).

### *F7: Pine View Drive Trail*

This alternative would construct a bike path along Pine View Drive, from Vanocker Canyon Road to Junction Avenue.

#### **Cost**

The estimated 2028 cost (assumes 10% annual inflation) of this alternative, inclusive of preliminary engineering and 30% contingency, is \$420,000.

#### **Considerations**

As related to this alternative, items to be considered during the selection and implementation of the overall bike path network include:

- The typical section of this alternative includes ditches along either or both sides of Dickson Drive which would require earthwork and other improvements necessary to accommodate the bike path.
- In order to safely access the proposed adventure park, users will likely be required to cross Junction Avenue at a mid-block (i.e., non-intersection) location. Careful consideration of the proper treatment of this crossing should be given during project design/implementation.
- Though not the only treatment available, one alternative includes a designated (signed and marked) crosswalks supplemented by a rectangular rapid flashing beacon (RRFB).



Figure 24 - Bike Path Alternatives

# Project Implementation Plan

A summary of the information presented in the previous section is provided on the following pages. The three tables that follow categorize the corridor needs as high-, mid-, and low-priority projects.

While the majority of the projects identified as a result of this study focus on addressing needs north of I-90, consideration of the remainder of the study corridor should not be forgotten. As development continues, resulting in a growing community, it is recommended that the City of Sturgis continue to promote good access management practices along this southern segment of the corridor. This includes the requirement of proper intersection spacing, evaluating alternatives for safe and efficient intersection traffic control, and configuration of street/driveway connections in response to ongoing or changes in development patterns. Doing so will best ensure that desirable traffic safety and operational characteristics of this current segment are maintained into the future. (See “Access Management” section beginning on page 59 of this report.)

Table 7 - Project Implementation Plan – High-Priority

Project Reference No.	Corridor Need/Deficiency	Location	Most Feasible Alternative(s) to Address Need	2028 Project Cost <sup>1</sup>
1	A) Recurring crashes	Junction Ave & Anna St intersection <sup>2</sup>	A) Construct roundabout <sup>3</sup>	\$1,490,000 – \$4,700,000 <sup>3</sup>
	B) Traffic operations which experience peak hour LOS D, or worse		B) Construct roundabout or traffic signal <sup>3,4</sup>	
	C) Lack of designated crossings, of Junction Avenue, other than at the Ballpark Road intersection	Junction Ave – Anna St to Ballpark Rd	C) Construct roundabout or traffic signal at the Anna Street intersection <sup>3,4</sup>	
2	Pedestrian facilities that do not satisfy ADA standards	corridor-wide	Other than with other projects included within this implementation plan, upgrade pedestrian facilities proactively or opportunistically	varies by location <sup>5</sup>
3	Missing links to the city-wide bike path (trail) network; specifically, connections to Anna Street development and the proposed adventure park	corridor-wide	Refer to Figure 25 for recommended bike path network	\$420,000 – \$1,310,000 per project; \$3.36M total
4	Impacts of growth including degraded intersection operations and need for street connectivity and development access	corridor-wide	See Project Nos. 1, 3, 5, 7 and 9 (see also Access Management section later in this document)	-
5	Safety issues created by the current location of the “Welcome to Sturgis” sign at the Junction Avenue & Anna Street intersection	Junction Ave & Anna St intersection	See discussion under “Priority of Need” on page 39	\$885,000

<sup>1</sup> Project cost includes 2023 construction cost inflated 10% per year plus 30% contingency, right-of-way, and engineering. (Details provided in Appendix D.)

<sup>2</sup>Should the decision be made to align Vanocker Canyon Road and Anna Street to a common intersection, the priority of improvements at Vanocker Canyon Road (Project #7) would rise to that of the Anna Street intersection.

<sup>3</sup>Could be implemented with or without the realignment of Vanocker Canyon Road and Anna Street to a common intersection along Junction Avenue.

<sup>4</sup>Before traffic signal is constructed, MUTCD warrant criteria shall be satisfied for current, or near-current conditions.

<sup>5</sup>A more thorough inventory of all accessible ramps and sidewalks is needed prior to determining total project cost.





Figure 25 - Recommended Bike Path Network

Table 8 - Project Implementation Plan – Mid-Priority

Project Reference No.	Corridor Need/Deficiency	Location	Most Feasible Alternative(s) to Address Need	2028 Project Cost <sup>1</sup>
6	Recurring crashes	Junction Ave & Ballpark Rd intersection	Construct roundabout	\$1,820,000
7	Traffic operations which experience peak hour LOS D, or worse	Junction Ave & Vanocker Canyon Rd intersection <sup>2</sup>	Construct roundabout or traffic signal <sup>3,4</sup>	\$1,470,000 - \$4,700,000
8	Sidewalk deficiencies including narrow width, location (with respect to back of curb) and gaps in the overall sidewalk network	corridor-wide	Other than with other projects included within this implementation plan, address sidewalk deficiencies proactively or opportunistically	varies by location <sup>5</sup>
9	High density of private driveways north of Anna Street	Junction Ave – Anna St to Ballpark Rd	Construct raised median or reduce number of private driveways through removal or consolidation efforts in coordination with property owners <sup>6</sup>	\$910,000 - \$1,370,000
10	Misaligned public streets that form offset, “T” intersections	Vanocker Canyon Rd and Anna St intersections	Realignment of Anna St or Vanocker Canyon Rd to connect to the other at a common intersection along Junction Avenue	\$3,560,000 - \$4,700,000

<sup>1</sup> Project cost includes 2023 construction cost inflated 10% per year plus 30% contingency, right-of-way, and engineering. (Details provided in Appendix D.)

<sup>2</sup> Could be implemented with or without the realignment of Vanocker Canyon Road and Anna Street to a common intersection along Junction Avenue.

<sup>3</sup> Before traffic signal is constructed, MUTCD warrant criteria shall be satisfied for current, or near-current conditions.

<sup>4</sup> In the descriptions provided previously in this document, this need was identified as a mid-to-low priority.

<sup>5</sup> A more thorough inventory of the corridor’s sidewalk network is needed prior to determining total project cost.

<sup>6</sup> If raised median is constructed, implementation of roundabouts at the intersections of Anna Street (project #1), Ballpark Road (project #6), and Vanocker Canyon Road (project #7) should be considered to accommodate the increase in u-turn volumes resulting from the elimination of left-turn movements to/from driveways.

Table 9 - Project Implementation Plan – Low-Priority

Project Reference No.	Corridor Need/Deficiency	Location	Most Feasible Alternative(s) to Address Need	2028 Project Cost <sup>1</sup>
11	Traffic operations which experience peak hour LOS D, or worse	Junction Ave & Harmon St intersection	The only alternatives developed to address operational issues at the Harmon St. intersection were the peanut roundabout and those incorporating street realignment. Because the operational issues are experienced by a relatively low volume of vehicles, this need is considered a very low priority.	\$3,850,000 - \$6,780,000
12	Traffic operations which experience peak hour LOS D, or worse	Junction Ave & Glover St intersection	This need is considered a very low priority as the operational issues are experienced by a relatively low volume of vehicles. No alternatives were developed to address this need.	-
13	Traffic operations which experience peak hour LOS D, or worse	Junction Ave & Dickson Rd intersection	This need is considered a very low priority as the operational issues are experienced by a relatively low volume of vehicles. No alternatives were developed to address this need.	-
14	Misaligned public streets that form offset, “T” intersections	Harmon St and Ballpark Rd intersections	All alternatives were considered not feasible due to resulting impacts to private properties and associated cost.	\$3,850,000 - \$6,780,000
15	Two roadway horizontal curves that do not satisfy design criteria	Junction Ave – Exit 32 westbound ramps to Anna St	Realign/reconstruct Junction Avenue	\$2,850,000

<sup>1</sup> Project cost includes 2023 construction cost inflated 10% per year plus 30% contingency, right-of-way, and engineering. (Details provided in Appendix D.)

# Funding

## Street Improvement Projects

The successful implementation of any street improvements resulting from this corridor study heavily relies on identifying appropriate funding sources. This section provides an overview of potential funding options that can be explored to support the proposed projects summarized in tables 4-6.

## Municipal Funding Sources

The City of Sturgis can explore various municipal funding sources to finance street improvements. These sources may include:

### *General Fund*

The General Fund is a primary source of revenue for municipalities and can be allocated towards street improvements. The City can allocate a portion of its annual budget from property taxes, sales taxes, and other revenue streams to fund street projects.

### *Special Assessments*

Special assessments are charges levied on property owners within a defined improvement district to fund specific projects. Sturgis can establish improvement districts and collect assessments from property owners benefiting from the street improvements.

### *Bond Issuance*

The City can consider issuing bonds to fund street projects. Bonds allow the City to borrow money upfront and repay it over time, with interest. The repayment can be funded through property taxes, sales taxes, or other revenue sources.

## State and Federal Funding Sources

Sturgis can explore various state and federal funding programs to supplement its municipal funding efforts. These sources may include:

### *State Infrastructure Grants*

South Dakota offers infrastructure grants through various programs, such as the Community Access Road Program, Transportation Alternatives Program, and the State Infrastructure Bank. These grants can provide financial assistance for street improvements.

### *State Revolving Fund*

The State Revolving Fund (SRF) provides low-interest loans and grants for eligible water and wastewater infrastructure projects. While primarily focused on utilities, the SRF may offer funding opportunities for street improvement projects that have a nexus with water or wastewater systems.

### *Federal Transportation Funding*

The city can leverage federal transportation funding programs sponsored by the Federal Highway Administration (FHWA). This funding can come in the form of both formula-based programs and discretionary grants. Examples of formula-based programs include the Surface Transportation Program (STP) and the Highway Safety Improvement Program (HSIP). Examples of discretionary grants include Safe Streets for All (SS4A), Strengthening Mobility and Revolutionizing Transportation (SMART), Rebuilding American Infrastructure with Sustainability and Equity (RAISE), and the Rural Surface Transportation Grant Program.

### Public-Private Partnerships

Public-private partnerships (PPPs) offer an alternative funding mechanism for street improvements. Sturgis can explore opportunities to engage with private entities, such as developers or businesses, to jointly fund and deliver street projects. This collaborative approach can help leverage private sector expertise and resources while sharing both the positive benefits of good street infrastructure and the financial burden to deliver projects.

### Local Initiatives and Grants

Sturgis can seek funding through local initiatives and grants offered by foundations, non-profit organizations, and regional entities. These grants may focus on community development, sustainable transportation, or other related areas. In addition, initiatives such as a local option sales tax is used by communities at times to help raise funds for specific projects or initiatives such as street improvements. These are typically appended onto a bases sales tax rate and are dedicated for a certain length of time as supported by the community. By actively pursuing such funding opportunities, the city can diversify its funding sources and enhance the likelihood of securing additional financial support.

### Trail/Bike Path Projects

In addition to street improvements, the development and maintenance of trails and bike paths play a vital role in enhancing Sturgis, South Dakota's transportation network and recreational opportunities. This section focuses on identifying potential funding sources specifically tailored to trails and bike paths within the city.

### Grants from State and Federal Agencies

#### *State Trails Grants*

South Dakota offers grants specifically designed to support trail development projects. The South Dakota Department of Game, Fish, and Parks (GFP) administers the Recreational Trails Program (RTP), which provides financial assistance for the planning, construction, and maintenance of trails. Sturgis can explore this program to secure funding for its trail projects.

#### *Federal Transportation Programs*

The FHWA administers various grant programs that can be utilized for trail and bike path projects. The Transportation Alternatives Program (TAP) focuses on funding projects that enhance non-motorized transportation, including trails and bike paths. Sturgis can apply for grants under TAP or other similar federal programs.



### Non-Profit Organizations and Foundations

#### *Private Foundations*

Sturgis can research and apply for grants from private foundations that support trail development and outdoor recreation. Organizations such as the National Recreation Foundation, the Rails-to-Trails Conservancy, and the Outdoor Foundation may offer grants or funding opportunities to support trail projects in the community.

#### *Non-Profit Organizations*

Local or regional non-profit organizations focused on promoting outdoor activities and trail networks could be potential partners for funding and support. Collaborating with these organizations, such as bike or hiking clubs, can help access resources and grant opportunities dedicated to trails and bike paths.

### Local Initiatives and Fundraising

#### *Local Bond Measures or Ballot Initiatives*

Sturgis may consider proposing local bond measures or ballot initiatives to generate funding specifically for trail and bike path development. These initiatives would require support from the community and could allocate funds from property taxes or other local revenue sources to finance the projects.

#### *Corporate Sponsorships and Partnerships*

Engaging with local businesses and corporations can be a valuable avenue for securing funding for trails and bike paths. Sturgis can explore sponsorship opportunities, naming rights, or partnerships with businesses that have an interest in promoting outdoor recreation and healthy lifestyles.

### Public-Private Partnerships

Public-private partnerships (PPPs) can also be a viable funding mechanism for trail and bike path projects. Sturgis can collaborate with private entities, such as land developers, tourism organizations, or outdoor equipment retailers, to jointly invest in and maintain trails and bike paths. These partnerships can provide financial resources, expertise, and ongoing support for the projects.

## Summary

Securing appropriate funding is essential to undertake and complete capital improvement projects in Sturgis, South Dakota. By combining municipal funding sources, exploring state and federal programs, considering public-private partnerships, and pursuing local initiatives and grants, the city can increase the financial resources available for the planned corridor improvements. It is crucial for Sturgis to develop a comprehensive funding strategy that aligns with its goals, engages relevant stakeholders, and maximizes the chances of successfully implementing the street improvement projects.

## Access Management

For the undeveloped and developing portions of the study corridor, namely that area south of the railroad tracks, it is important to protect the functionality and safety of the corresponding street network. One of the methods of maintaining the integrity and intended functionality of the public street network is to apply the basic tenants of controlling access between the public right-of-way and private developments. The information contained herein is intended to serve as guideline for the design and placement of driveway access on the public street network supplementary to current City of Sturgis ordinances and design standards. Furthermore, the guidelines presented apply not only to private driveways but also the overall public street network connectivity.

According to the SDDOT's *Road Design Manual*, "access management is the process of providing safe, efficient ways of getting on and off our streets and highways." In essence, access management is finding the right balance between traffic mobility and access to adjacent properties along a given transportation facility of a certain classification. Classifications range from roadways aimed at providing a high degree of access with less concern for mobility to roadways focused on mobility and limiting access to key locations along the facility. Typically, as access density increases, not only does mobility decrease but crashes are usually found to increase.

The purpose of access management is to apply a wide range of design and planning methods to promote the efficient and safe flow of all modes of transportation by reducing conflicts on the street network. Examples of access management techniques include the following:

- Driveway designs that minimize conflicts at the entry/exit to the public street network and accommodate operating speeds consistent with the adjacent roadway.
- Limitation of direct access to major roadways, which can reduce operational efficiency and safety, by encouraging driveway sharing, on-site cross access, and taking access off the minor cross street.
- Enforcement of appropriate driveway spacing to reduce conflict points for drivers.
- Restriction of driveways within the vicinity of signalized/unsignalized intersections to reduce intersection conflicts and crash risks.
- Alignment of driveways across from each other to reduce left-turn conflicts and crash risks.
- Construction of left- and right-turn lanes, where warranted, that will remove slow or stopped vehicles from the through lanes.
- Enforcement of appropriately spaced signal control at intersections to promote efficient traffic throughput.
- Construction of medians to limit exposure of through vehicles, pedestrians, and bicycles to left-turning vehicles into a facility.

Guidance in how these principals can be applied to the Junction Avenue corridor is provided below.

## Driveway and Intersection Spacing

The following sections provide policy and guidance on maintaining appropriate corner clearances, driveway spacing, and signalized/unsignalized intersection spacing.

### Intersection, Driveway, and Median Opening Spacing

Every intersection has both a physical area and a functional area. The functional area of an intersection extends both upstream and downstream from the physical intersection where driver behavior is dictated by the intersection operations. Furthermore, the more conflicts and decision points introduced within these areas, the more likely intersection operation will be less efficient and safe. One way to reduce conflicts and decision points is to restrict the placement of driveways and intersections within these functional areas. Minimum intersection and driveway spacing are summarized in Table 10 by functional classification and posted speed.

Table 10 – Spacing Standards for Unsignalized Intersections and Driveways

Minimum Intersection/Driveway Spacing (feet; measured centerline to centerline) <sup>1</sup>				
Posted Speed (MPH)	Principal Arterial <sup>2</sup>	Minor Arterial <sup>2</sup>	Collector <sup>3,4</sup>	Local <sup>4</sup>
25	660	150	100	50
30	660	330	100	50
35	660	330	125	50
40	1,320	660	150	NA
45	1,320	660	180	NA
50	1,320	660	NA	NA
55	1,320	660	NA	NA

<sup>1</sup>In some cases, existing conditions such as short block lengths that tend to occur in Central Business District areas may preclude the feasibility of compliance with these spacing thresholds. These situations will require further consideration.

<sup>2</sup>May be partial access only.

<sup>3</sup>Commercial/industrial driveways only. Single residences will be allowed one driveway per residential lot.

<sup>4</sup>Distance from adjoining public street. Access will be allowed to individual properties, but shall not be less than 25' to back of curb of public street.

Signals spaced too closely can significantly increase delays and travel times especially when approach queues back up through an adjacent signal. Therefore, to ensure efficient flow and progression on signalized street corridors, minimum signal spacing requirements have been established and are shown in Table 11.

Table 11 – Desirable and Minimum Signal Spacing

Roadway Classification	Preferred Signalized Intersection Spacing (ft.)	
	Desirable	Minimum
Principal Arterial/ Minor Arterial	2,640	1,320
Collector	2,640	660
Local	NA <sup>2</sup>	

<sup>1</sup>In some cases, existing conditions such as short block lengths that tend to occur in Central Business District Areas may preclude the feasibility of compliance with these spacing thresholds. These situations will require consideration on a case-by-case basis.

<sup>2</sup>Typical signalized corridors and raised medians are not present on local streets.

Offset of Opposing Driveways

Opposing driveways with poor offsets tend to create opposing left-turn conflicts which can lead to crashes. An example of this left-turn conflict potential is shown in Figure 26.

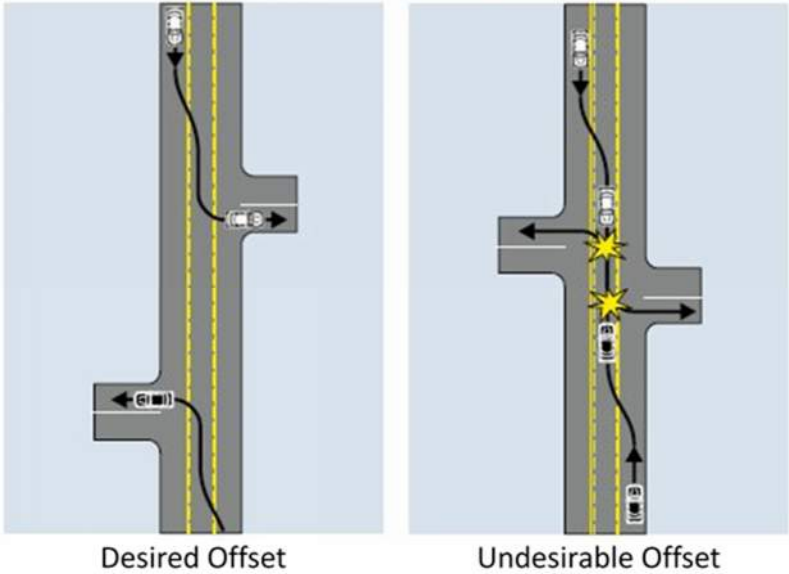


Figure 26 - Opposing Driveway Offsets  
(Source: FHWA’s Access Management in the Vicinity of Intersections)

It should also be noted that opposing driveways should be offset in a manner that avoids overlapping left-turn movements. Figure 25 also indicates the desired direction of offset versus the non-desirable condition. To avoid left-turn conflicts, driveways should be aligned with each other where possible or, if the alignment is not feasible, spaced appropriately based on the operating speed of the roadway.