ITEM#:	**AAMPO 2**
DATE:	**07-18-23**
DEPT:	**MPO**

TRANSPORTATION POLICY COMMITTEE ACTION FORM

SUBJECT: S DUFF AVENUE INTERCHANGE AND CORRIDOR STUDY FINDINGS

BACKGROUND:

Forward 2045, the Ames Area MPO's (AAMPO's) current Metropolitan Transportation Plan (MTP), identified the need for a study of the S Duff Avenue corridor from S 16th Street to Airport Road, including the interchange with US Highway 30 (see Figure 1).

Figure 1: Study Area

The study looked at current safety, traffic operations, and multi-modal deficiencies along this corridor and the projected growth of traffic due to anticipated future development south of the study area and expected traffic volume growth on US Highway 69 and US

Highway 30. The AAMPO and City of Ames programmed this study with the anticipation that its findings will guide future corridor and interchange project programming.

STUDY FINDINGS:

For this study (see attached presentation and report), the engineering consultant, HDR Engineering, Inc., conducted planning and conceptual-level engineering design services along the study corridor that included assessing traffic volumes, bicycle/pedestrian volumes, origin-destination data, evaluating traffic operations, and conducting safety analyses. Using data-driven processes and a combination of macroscopic and detailed traffic modeling, several initial interchange alternatives were identified and evaluated. Based on the estimated traffic operational performance of the initial alternatives, the City of Ames, AAMPO, and Iowa DOT chose to move forward two primary interchange alternatives for further analysis: a diverging diamond interchange (DDI) and a single-point urban interchange (SPUI).

The DDI and SPUI interchange alternatives were modeled with traffic simulation software, TransModeler, along with preferred intersection configurations at S Duff Avenue & Airport Road and S Duff Avenue & S 16th Street. These interchange configurations were also presented at a public open house on May 25, 2023, and were discussed with various stakeholders.

The following list summarizes the recommended improvements for the study area based upon an analysis of received public feedback, traffic operational performance, safety, ability to handle future growth and special event traffic, multi-modal connectivity, and cost.

- Modify the S Duff Avenue & US 30 Interchange to a DDI configuration
    - 6-lanes on S Duff Ave through the interchange
    - Dual WB right-turn lanes from US 30 unto NB S Duff Ave
- Maintain direct access from EB US 30 to Billy Sunday Road
- Add channelized EB right-turn lane at S Duff Ave & S 16th St
- Add dual NB left-turn lanes at S Duff Ave & S 16th St
- Offset NB/SB left-turn lanes at S Duff Ave & Airport Rd
- New accessible connection to CyRide stop north of S 16th St

Figure 2 shows a graphic of these recommended improvements, including the DDI interchange configuration**. The study recommends that all these improvements are to be implemented by 2035 to maintain acceptable traffic operations at the interchange and neighboring intersections**. Please note that Figure 2 also includes improvements currently being constructed at S. Duff Ave & S 16th Street as well as planned construction in 2024 for the Traffic System Capacity Improvements on Airport Road to the west of S. Duff.

Figure 2: Recommended Alternative Layout

Table 1 summarizes the planning-level construction costs (in 2023 dollars) for the recommended improvements along the study corridor. It is anticipated that these improvements will all be combined into a single project which will be coordinated with the expansion of the US 30 mainline through the interchange.

Table 1: Recommended Alternative Costs

Location	Cost
S Duff Ave & S 16th St	$2,000,000
S Duff Ave & US 30 Interchange*	Interchange - $10,500,000 US 30 Mainline Bridges - $10,300,000
S Duff Ave & Airport Rd	$3,200,000
TOTAL (2023 Dollars):	**$26,000,000**

*Excludes the cost of expanding the mainline of US-30 to 6-lanes through the interchange which will be accomplished by Iowa DOT. All 3 locations are expected to be implemented by 2035.

STAFF COMMENTS ON STUDY FINDINGS:

This corridor and interchange study coordinated the planning and conceptual design of the interchange of S Duff Avenue and US Highway 30 and the adjacent S Duff Avenue intersections with S 16th Street, Billy Sunday Road, and Airport Road. By evaluating all the improvements together, the Iowa DOT and City of Ames can ensure that the interchange design will integrate well with the surrounding intersections and the corridor as a whole.

The City of Ames and Iowa DOT will need to coordinate with each other to program the recommended interchange and corridor improvements and establish funding responsibilities. A conservative 50% cost sharing between the City of Ames and Iowa DOT was discussed in the study. However, the City of Ames' responsibility should be closer to 20% with potential federal and state program funding. The study identified which state and federal grant programs could be leveraged for this project. In similar interchange projects in the Des Moines metro, typically, the municipality has taken the lead on any competitive grant applications, with the Iowa DOT leading the project's letting and construction.

Note that the recommended design shown with this study is a planning-level conceptual layout. The interchange and adjacent intersection improvements will need to go through a separate design, right-of-way acquisition, and construction process as established by the Iowa DOT and City of Ames.

ALTERNATIVES:

1. Motion accepting the study findings as summarized in the study report.
2. Do not approve the findings of the study.

MPO ADMINISTRATOR'S RECOMMENDED ACTION:

This study was completed using transportation planning and traffic engineering best practices and was presented at a public meeting. The study findings will help guide the AAMPO, City of Ames, and Iowa DOT in the planning, programming, and design of future projects along this corridor. **Therefore, it is the recommendation of the MPO**

Administrator that the Transportation Policy Committee adopt Alternative No. 1, as noted above.

S Duff Avenue Corridor & Interchange Improvements Study

Mike Forsberg, HDR

Presentation to AAMPO Transportation Policy Committee
7/18/2023

Study Background

- S Duff between S 16th Street and Airport Road (including US 30 interchange)
- Most heavily traveled service interchange in Ames
- Inefficient operations in study area due to current interchange configuration
- Significant traffic growth expected over next 20-25 years on S Duff
  - 25,000 at US 30 currently
  - 35,000 at US 30 by year 2045
- Identify a recommended corridor and interchange alternative

PROJECT GOALS

- Reduce Delays and Queuing
- Improve Safety
- Prepare for Future Growth
- Improve Multi-modal Facilities
- Better Accommodate Event Traffic

Planned Improvements

S 16th Street Improvements
(S Grand Ave to Lark Ave)

- **Improvements:** Roadway widening, new sidewalk construction and traffic signal modifications
- **Schedule:** Construction complete Fall 2023

US 30 Expansion
(S Duff Ave to University Blvd)

- **Improvements:** Widen US 30 to six lanes
- **Schedule:** TBD (not currently programmed)

Airport Road Access Modifications
(Sam's Club intersection to S Duff Ave)

- **Improvements:** New traffic signal, access modifications and sidewalk enhancements
- **Schedule:** Construction in 2024

US 30 Expansion
(I-35 to S Duff Ave)

- **Improvements:** Widen US 30 to six lanes
- **Schedule:** Construction in 2025-2027

S Duff Avenue Expansion
(S 16th St to Airport Rd)

- **Improvements:** Widen to six lanes
- **Schedule:** TBD (not currently programmed)

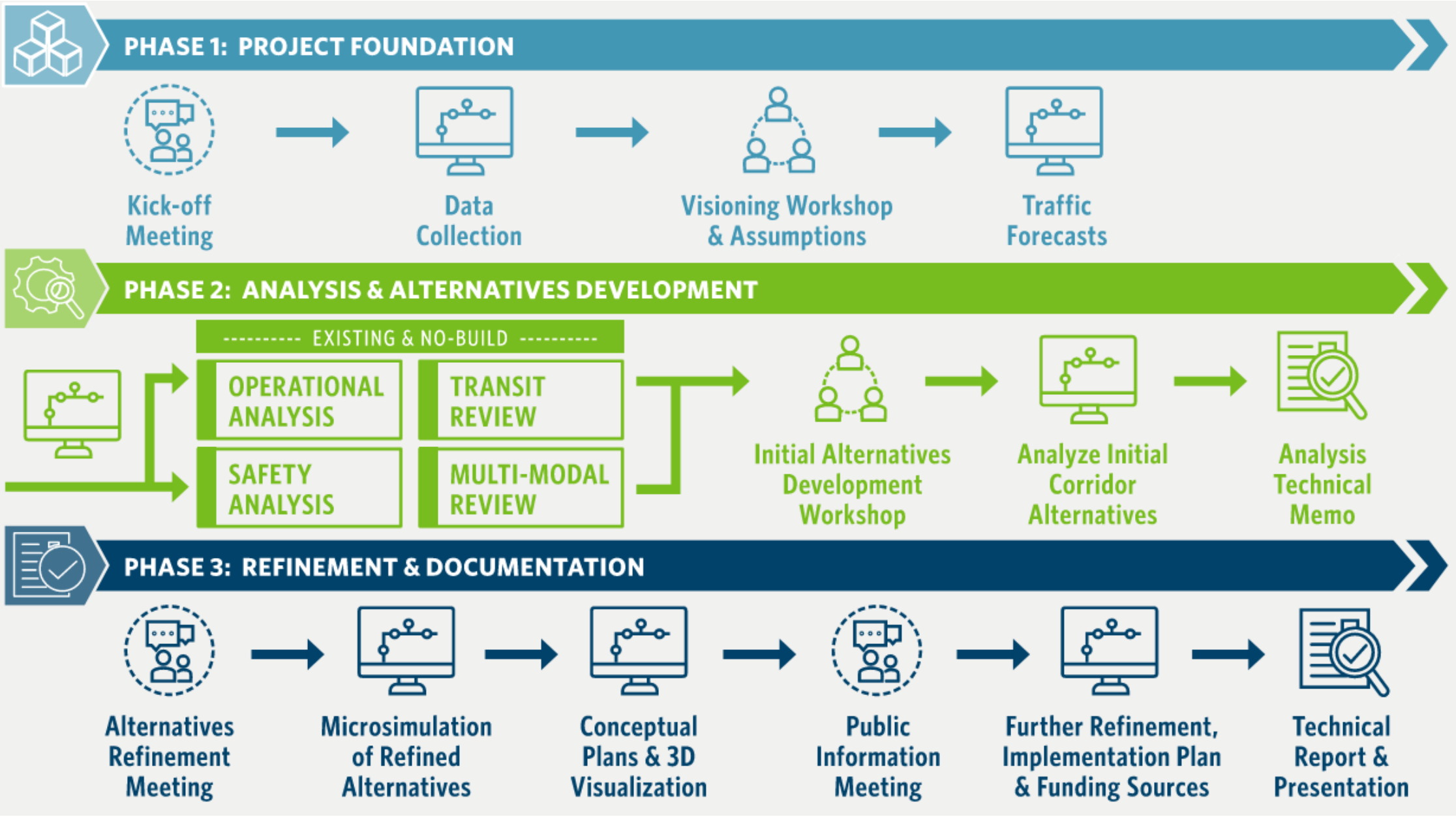
S Duff Avenue Expansion
(Airport Rd to Ken Maril Rd)

- **Improvements:** Widen to five lanes with center turn lane
- **Schedule:** TBD (not currently programmed)

Adaptive Signal Control Along S Duff Avenue *(13th Street to Crystal Street)*

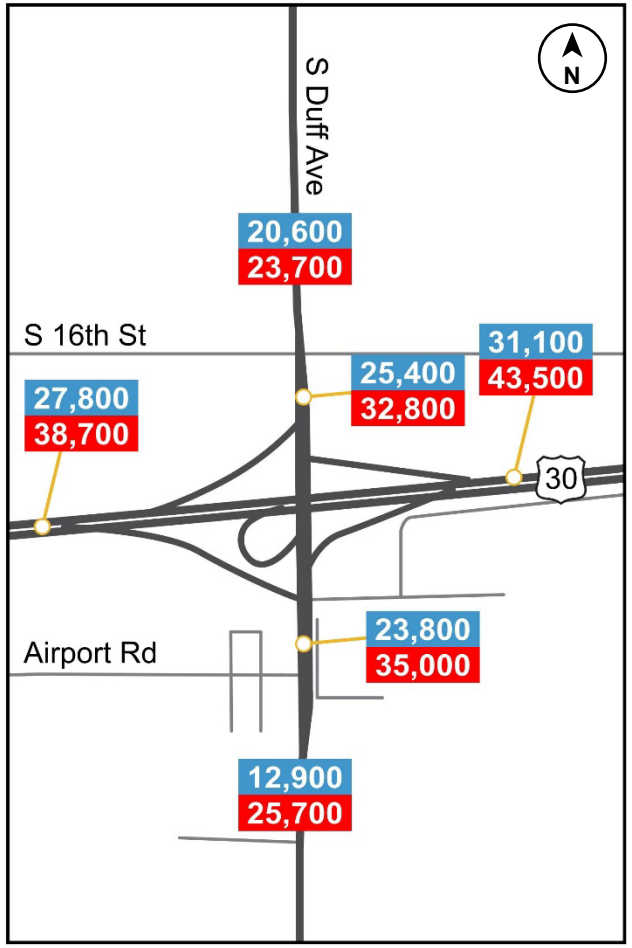
- **Improvements:** Adaptive Signal Control Technology
- **Schedule:** Anticipated completion Fall 2023

Study Methodology



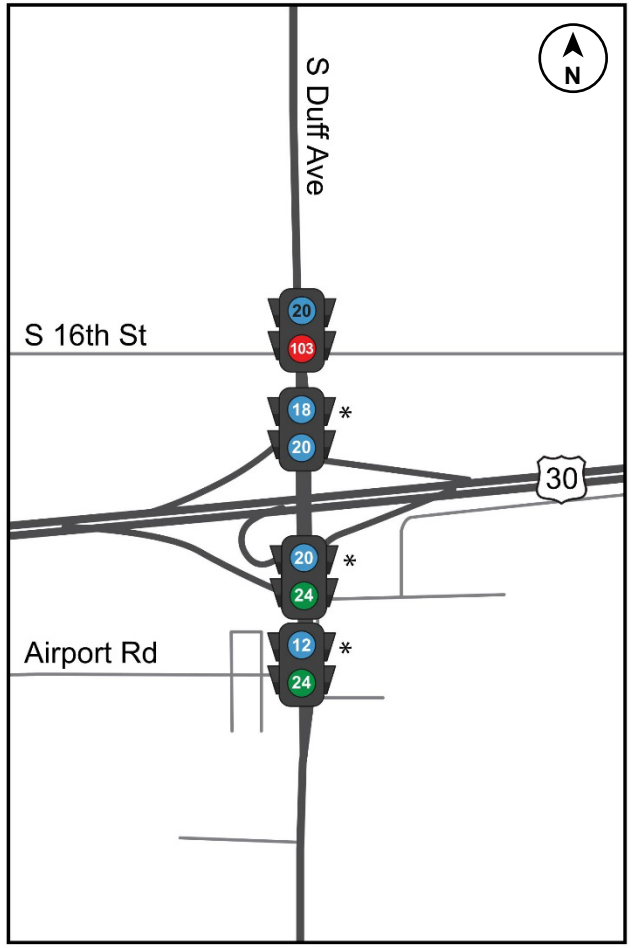
Corridor Assessment

Traffic Forecasts



Existing (Year 2022) Daily Volume
Year 2045 Daily Volume

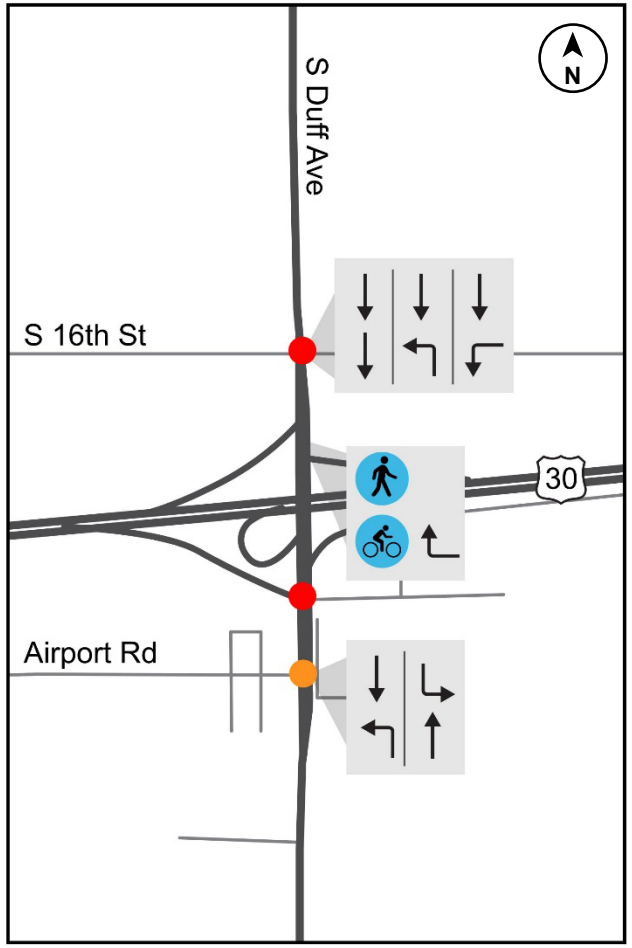
Operations



AM Peak Hour Signalized Intersection Delay
PM Peak Hour Signalized Intersection Delay

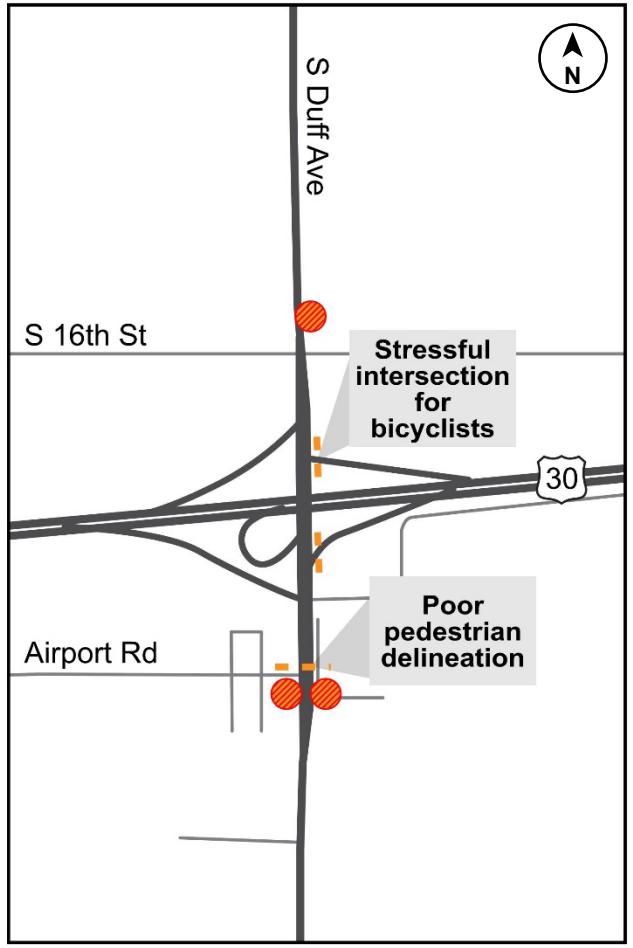
A B C D E F
Level of Service

Safety



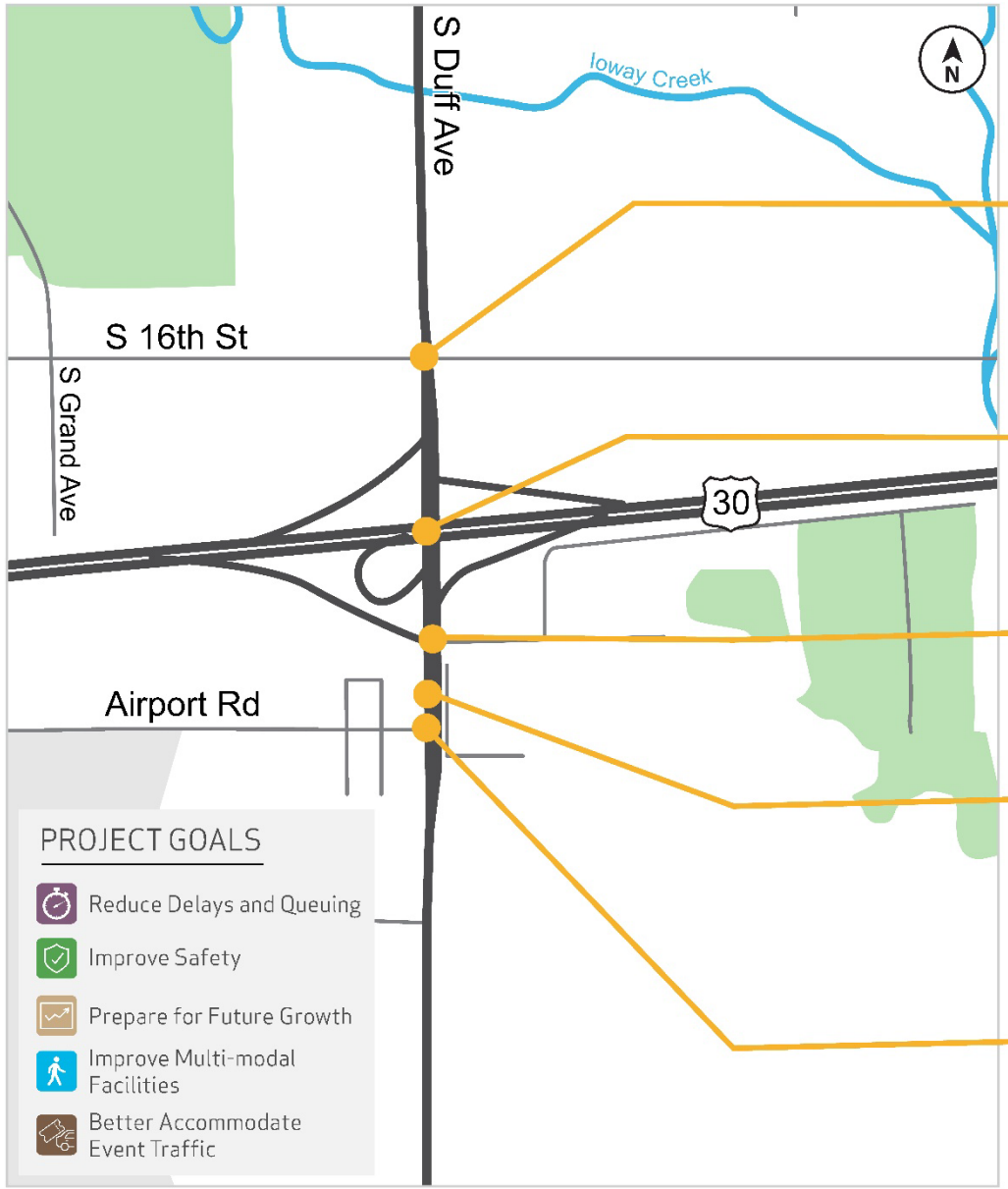
High PCR
Medium PCR
Crash Trend/Concern

Multimodal



CyRide Transit Stop No Boarding/ Alighting Area or Accessible Path
Crossing not ADA Compliant

Project Goals



- Reduce queue length for northbound, southbound, eastbound traffic
- Improve CyRide stop access
- Accommodate high turning traffic during events

- Reduce queue length for southbound traffic
- Improve pedestrian/bicycle safety crossing freeway ramps
- Accommodate high turning traffic during events

- Accommodate high turning traffic during events

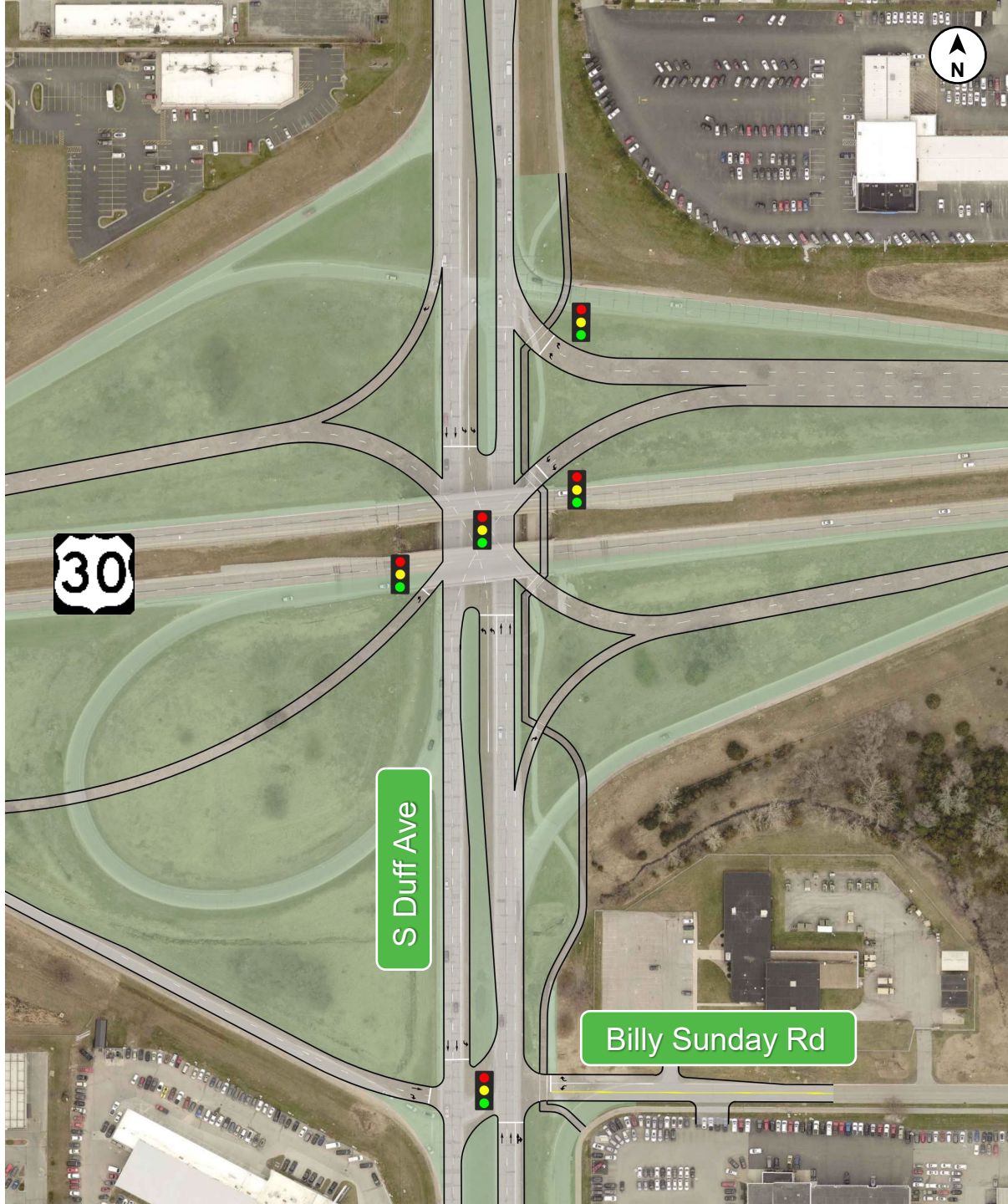
- Significant traffic volume growth expected on S Duff Avenue over next 20 years, with 30-50% growth around US 30

- Reduce queue length for eastbound traffic
- Reduce intersection crashes
- Improve pedestrian connectivitiy and access to CyRide stops

Build Alternatives

Single Point Urban Interchange

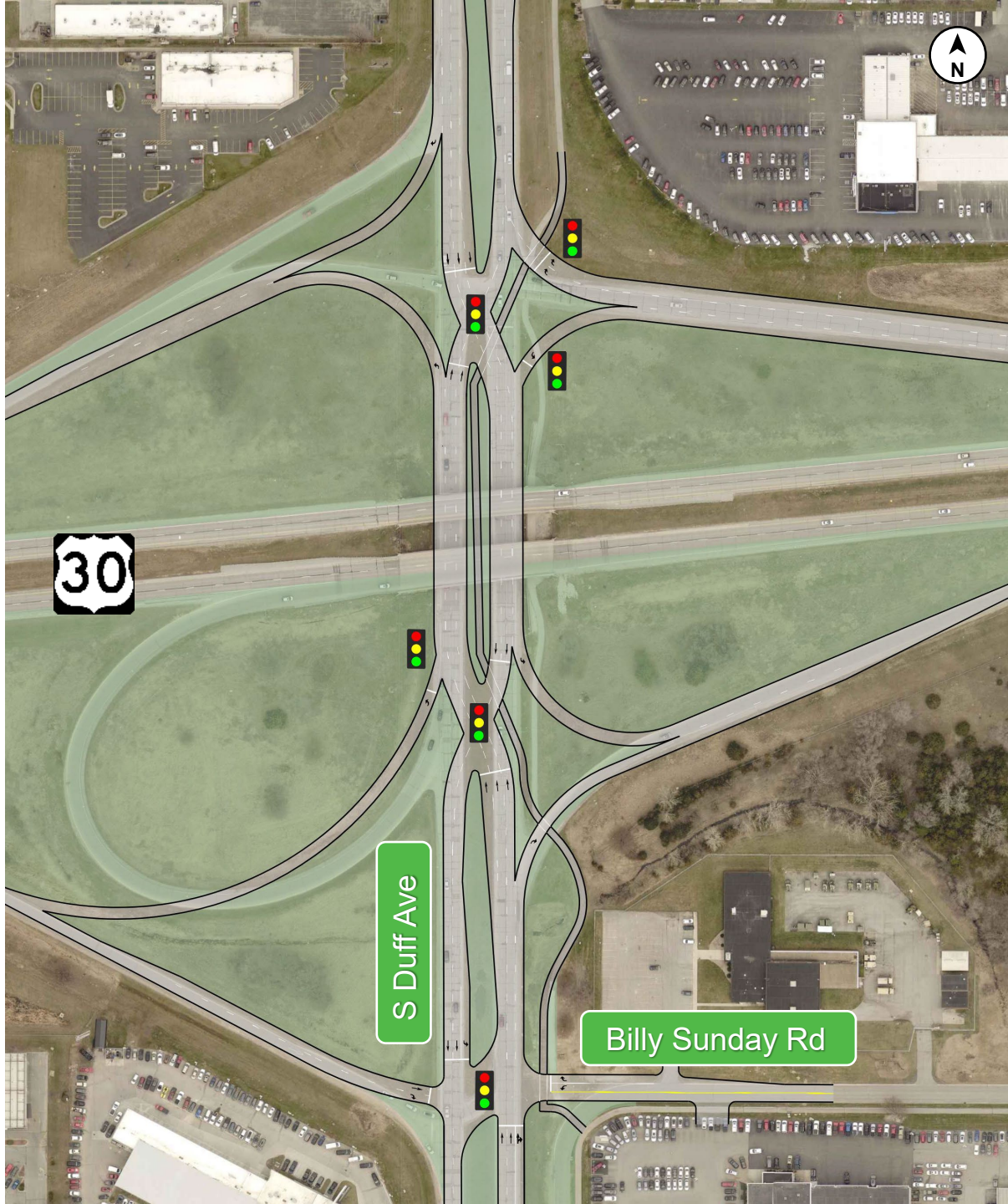
- Combine left-turn movements to/from US 30 to single intersection
- Remove SB-to-EB loop
- Direct access from EB US 30 to Billy Sunday
- Protected trail crossings and LPIs
- US 30 grade raise 9 feet for clearance
- Planning-level costs
  - Interchange (excluding US 30 mainline): $11.1M
  - US 30 bridges $15.7M



Build Alternatives

Diverging Diamond Interchange

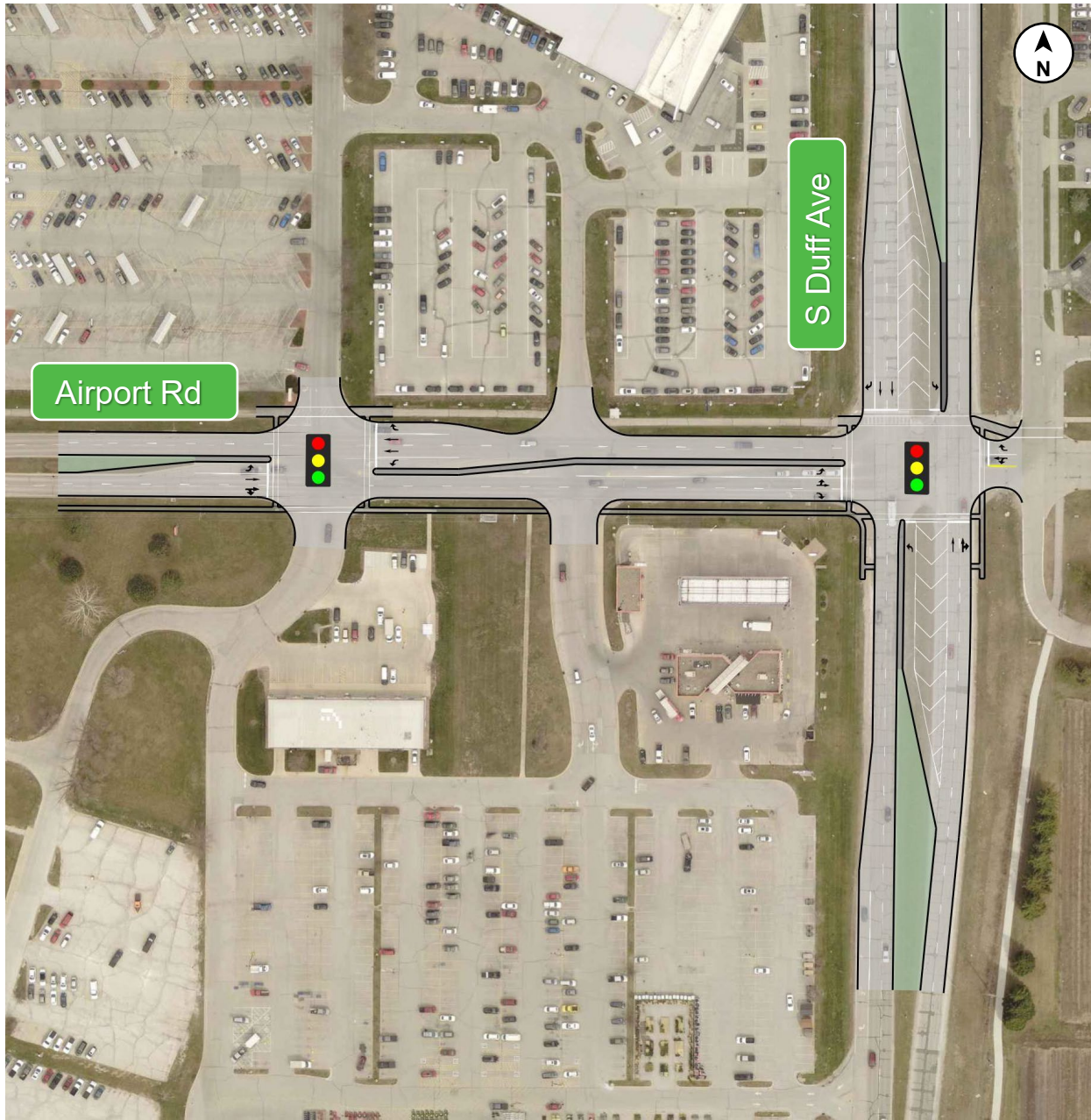
- NB/SB through traffic flips to opposite side of road through interchange
- Remove SB-to-EB loop
- Direct access from EB US 30 to Billy Sunday
- Protected trail crossings and LPIs
- US 30 grade raise 4 feet for clearance
- Planning-level costs
  - Interchange (excluding US 30 mainline): $10.5M
  - US 30 bridges $10.3M



Build Alternatives

Airport Road

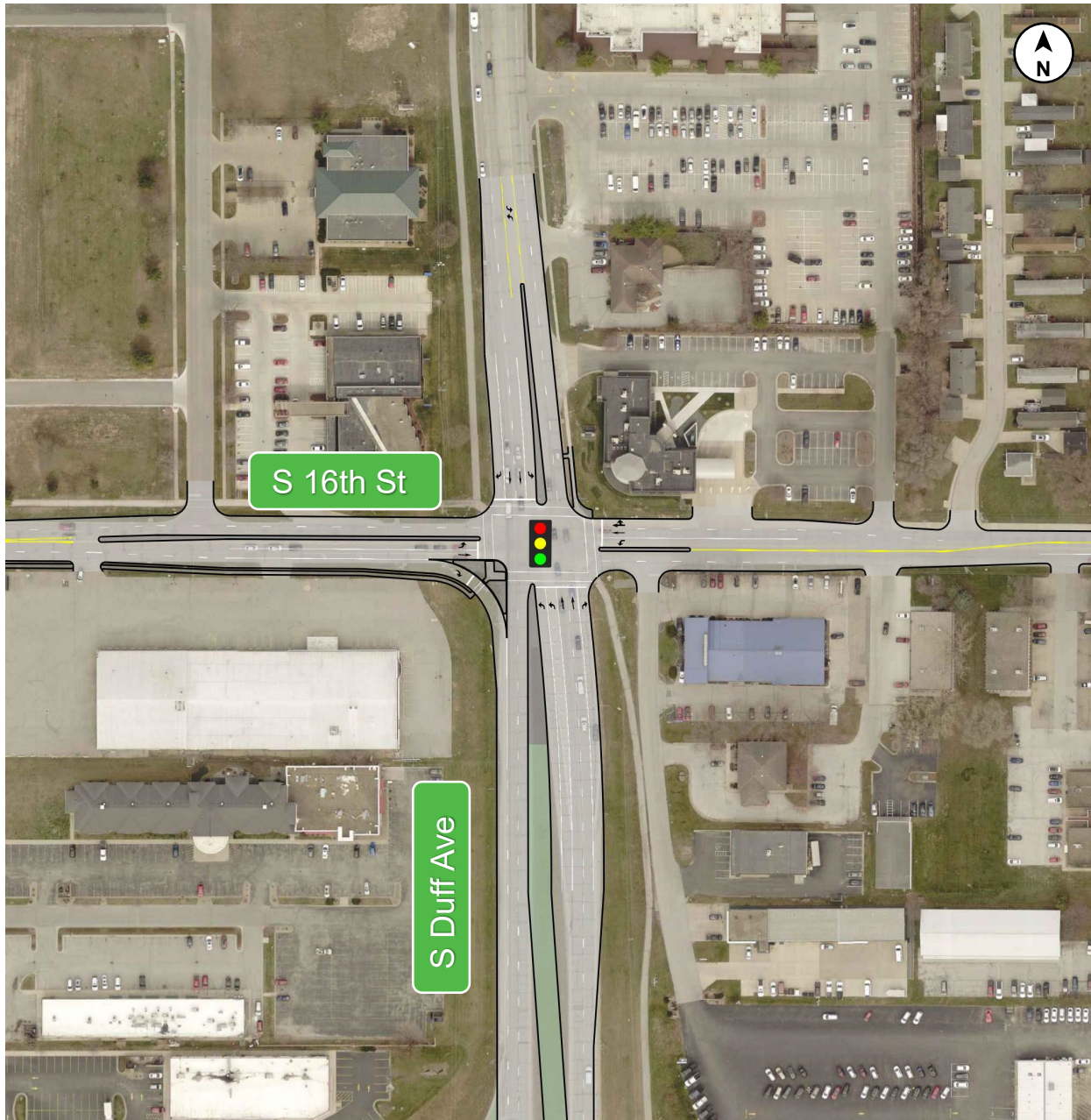
- New traffic signal at Sam's/Lowe's access (2024)
- Continuous raised median (2024)
- New sidewalk connections with CyRide stop access and LPIs (2024)
- Offset NB/SB left-turn lanes on S Duff (future construction)
- Planning-level costs
  - $3.2M (excludes 2024 construction)



Build Alternatives

S 16th Street

- Add EB/WB left-turn lanes (2023)
- New sidewalk connections and LPIs (2023)
- Channelized EB right-turn lane (future construction)
- Dual NB left-turn lane (future construction)
- CyRide stop access (future construction)
- Planning-level costs
  - $2.0M (excludes 2023 construction)



Evaluation Summary

Alternative	Project Goals					Fuel Efficiency / Emissions	Public Acceptance	Planning-Level Construction Cost	Overall Rank
	Reduce Delays and Queuing	Improve Safety	Prepare for Future Growth	Improve Multimodal Facilities	Better Accommodate Event Traffic				
No-Build	Rank 3	Rank 3	Rank 3	Rank 3	Rank 3	Rank 3	Rank 3	Rank 1	3
Single Point Urban Interchange	Rank 1	Rank 1	Rank 1	Rank 1	Rank 1	Rank 1	Rank 1	Rank 3	2
Diverging Diamond Interchange	Rank 1	Rank 1	Rank 1	Rank 1	Rank 2	Rank 2	Rank 2	Rank 2	1

Improvements Recommendation

- US 30 Interchange
  - DDI
  - Direct access from EB US 30 to Billy Sunday
- S 16th Street
  - Channelized EB right-turn lane to added lane on SB S Duff
  - Dual NB left-turn lanes
  - Accessible connection to CyRide stop
- Airport Road
  - Offset NB/SB left-turn lanes on S Duff
  - Accessible connection to CyRide stops

Funding

Planning-Level Cost Estimates

Location	Cost
S Duff Ave & US 30 Interchange	Interchange = $10,500,000 US Mainline Bridges = $10,300,000
S Duff Ave & Airport Road	$3,200,000
S Duff Ave & S 16th St	$2,000,000
TOTAL (2023 Dollars)	**$26,000,000**

- Cost share between City of Ames and Iowa DOT
  - City's potential cost share responsibility:
    - 50% - Conservative estimate
    - 20% - Higher percentage of State and Federal apportioned funds or project is awarded a State or Federal grant)

Funding

- City of Ames CIP
- Iowa DOT / AAMPO
  - National Highway Performance Program (NHPP)
  - Surface Transportation Block Grant (STBG)
  - Iowa Clean Air Attainment Program (ICAAP)
  - Traffic Safety Improvement Project (TSIP)
  - Urban-State Traffic Engineering Program (U-STEP)
  - Transportation Alternatives Program (TAP)
- Federal Discretionary Grants
  - Rebuilding American Infrastructure with Sustainability and Equity (RAISE) – Partnership between City and State
  - Safe Streets and Roads for All (SS4A)

All improvements

Offset turn lanes at Airport Road

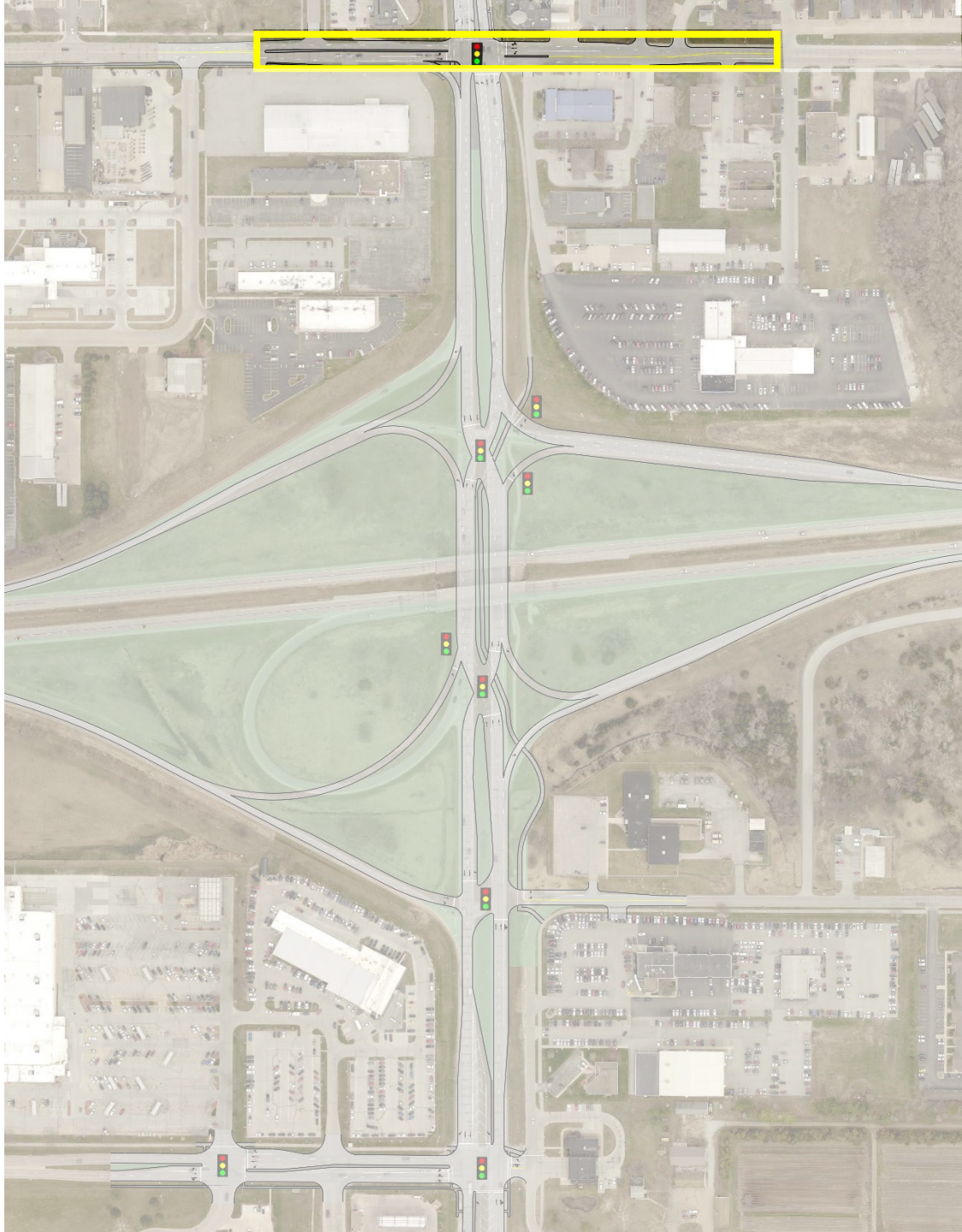
Trail improvements

All improvements

Offset turn lanes at Airport Road

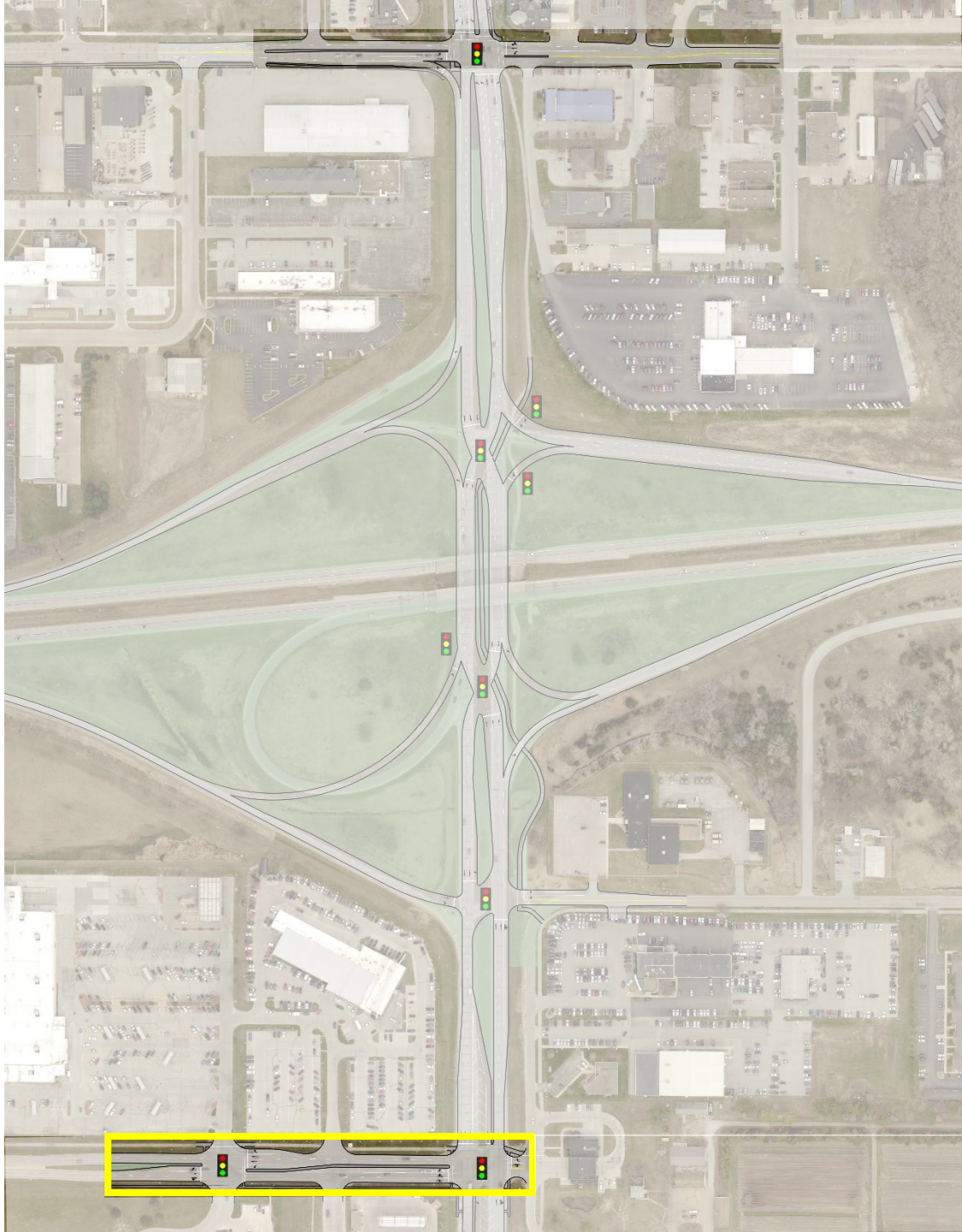
Next Steps

- Ongoing improvements
  - S 16th Street left-turn lanes and sidewalk connections at S Duff
- 2024 (anticipated)
  - Airport Road median, sidewalks and signal at Sam's/Lowe's
- By 2035
  - DDI interchange
  - Offset NB/SB left-turn lanes at S Duff & Airport Road
  - Additional turn lane improvements at S 16th



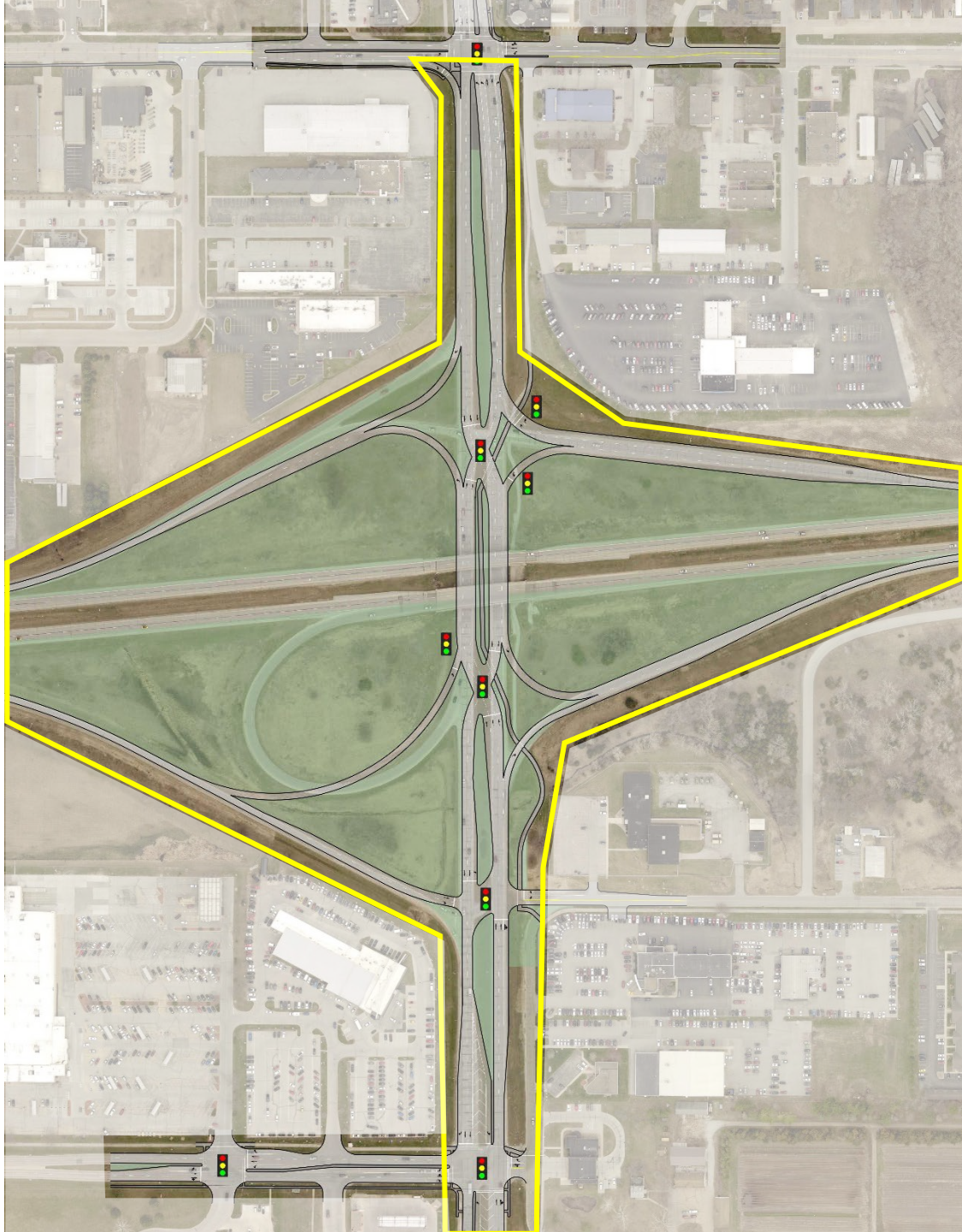
Next Steps

- Ongoing improvements
  - S 16th Street left-turn lanes and sidewalk connections at S Duff
- 2024 (anticipated)
  - Airport Road median, sidewalks and signal at Sam's/Lowe's
- By 2035
  - DDI interchange
  - Offset NB/SB left-turn lanes at S Duff & Airport Road
  - Additional turn lane improvements at S 16th



Next Steps

- Ongoing improvements
  - S 16th Street left-turn lanes and sidewalk connections at S Duff
- 2024 (anticipated)
  - Airport Road median, sidewalks and signal at Sam's/Lowe's
- By 2035
  - DDI interchange
  - Offset NB/SB left-turn lanes at S Duff & Airport Road
  - Additional turn lane improvements at S 16th




S DUFF AV
JCT
30


US 30 West
Iowa State
University
Boone
LOW CLEARANCE 14'3"

Questions?

S Duff Avenue Corridor & Interchange Study

July 12, 2023

Report accepted by
Ames Area MPO
Transportation Policy
Committee on DATE

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Figures

Tables

List of Abbreviations

- **AAMPO**: Ames Area Metropolitan Planning Organization
- **ADA**: Americans with Disabilities Act
- **CIP**: Capital Improvements Plan
- **CMAQ**: Congestion Mitigation and Air Quality
- **DDI**: Diverging Diamond Interchange
- **DOT**: Department of Transportation
- **FY**: Fiscal Year
- **HCM**: Highway Capacity Manual
- **ICAAP**: Iowa Clean Air Attainment Program
- **ICAT**: Iowa Crash Analysis Tool
- **IIJA**: Infrastructure Investment and Jobs Act
- **LOS**: Level of Service
- **LPI**: Leading Pedestrian Interval
- **MTP**: Metropolitan Transportation Plan
- **NHPP**: National Highway Performance Program
- **NHS**: National Highway System
- **PCR**: Potential for Crash Reduction
- **RAISE**: Rebuilding American Infrastructure with Sustainability and Equity
- **SPUI**: Single Point Urban Interchange
- **SS4A**: Safe Streets and Roads for All
- **STBG**: Surface Transportation Block Grant
- **TAP**: Transportation Alternatives Program
- **TDM**: Travel Demand Model
- **TSIP**: Traffic Safety Improvement Project
- **U-STEP**: Urban-State Traffic Engineering Program

1. Introduction

The S Duff Avenue & US 30 interchange is the most heavily utilized service interchange within the Ames metro area. It serves a variety of modes and trip purposes and acts as a front door to Ames visitors. S Duff Avenue near US 30 serves approximately 25,000 vehicles per day and traffic demand is expected to grow to 35,000 by year 2045. Corridor and interchange improvements are needed to address existing deficiencies and accommodate expected future traffic growth. This study was completed to identify a recommended alternative for corridor and interchange improvements that meet the following project goals:

- Reduce delays and queuing
- Improve safety
- Prepare for future growth
- Improve multimodal facilities
- Better accommodate event traffic

The study area (**Figure 1**) was selected based on previous planning efforts that identified improvements needed at the S Duff Avenue & US 30 interchange and surrounding intersections. Previously planned improvements in the area are noted in **Figure 2**. These improvements are documented in the *City of Ames 2022-2027 Capital Improvement Plan (CIP)* and *Ames Area Metropolitan Planning Organization (AAMPO) Forward 2045: Metropolitan Transportation Plan (MTP)*.

This study developed a plan for improvements that balance multimodal mobility and safety needs of the corridor with regional travel characteristics in accordance with the City's Complete Streets Plan and other applicable standards. The study was coordinated with the Iowa Department of Transportation (DOT) to inform identified improvements that align with the Iowa DOT's plans for improvements at the interchange. This plan addresses existing deficiencies while also positioning the corridor for future needs.

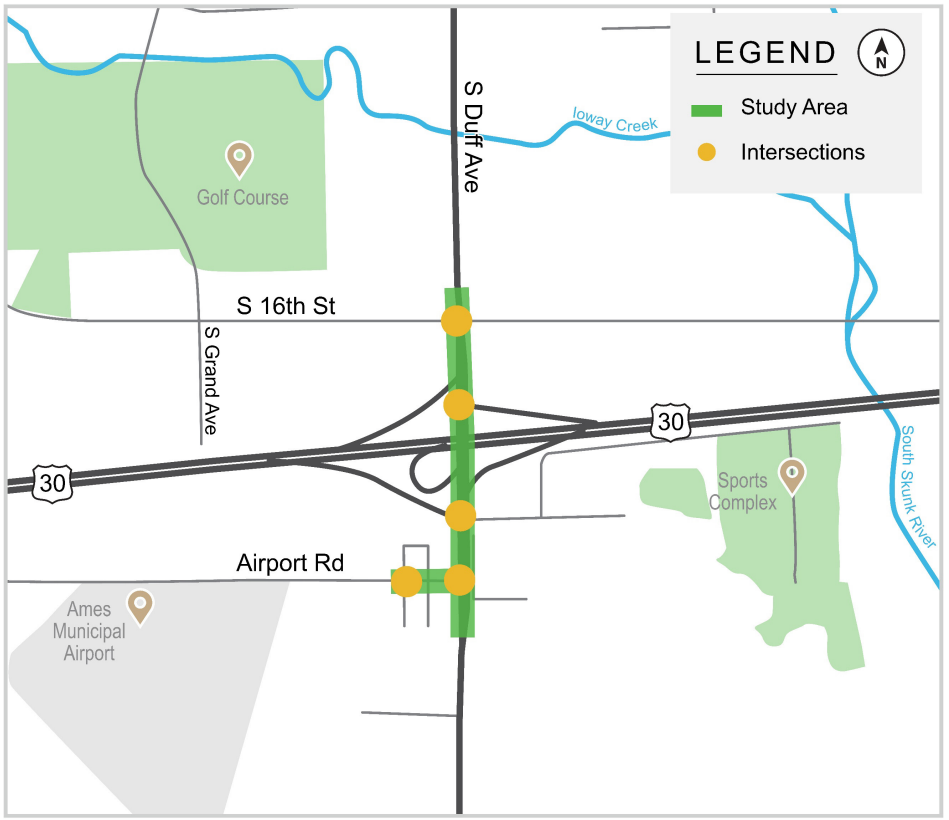
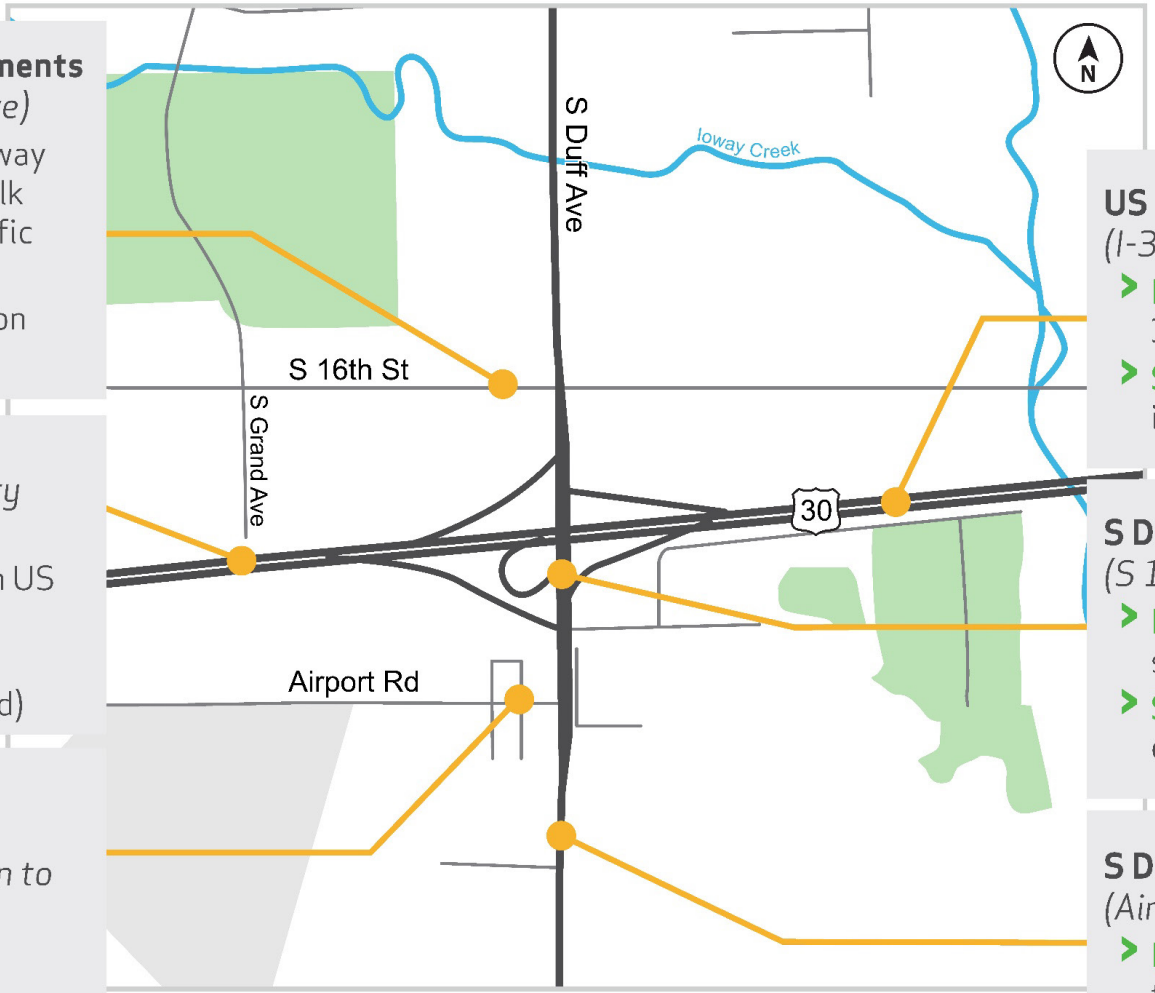


Figure 1. Study Area

S 16th Street Improvements
(S Grand Ave to Lark Ave)
- **Improvements:** Roadway widening, new sidewalk construction and traffic signal modifications
- **Schedule:** Construction complete Fall 2023

US 30 Expansion
(S Duff Ave to University Blvd)
- **Improvements:** Widen US 30 to six lanes
- **Schedule:** TBD (not currently programmed)

Airport Road Access Modifications
(Sam's Club intersection to S Duff Ave)
- **Improvements:** New traffic signal, access modifications and sidewalk enhancements
- **Schedule:** Construction in 2024



US 30 Expansion
(I-35 to S Duff Ave)
- **Improvements:** Widen US 30 to six lanes
- **Schedule:** Construction in 2025-2027

S Duff Avenue Expansion
(S 16th St to Airport Rd)
- **Improvements:** Widen to six lanes
- **Schedule:** TBD (not currently programmed)

S Duff Avenue Expansion
(Airport Rd to Ken Maril Rd)
- **Improvements:** Widen to five lanes with center turn lane
- **Schedule:** TBD (not currently programmed)

Adaptive Signal Control Along S Duff Avenue *(13th Street to Crystal Street)*
- **Improvements:** Adaptive Signal Control Technology
- **Schedule:** Anticipated completion Fall 2023

Figure 2. Planned Improvements

2. Study Methodology

The study was completed through assessment of corridor conditions, alternatives development and evaluation, Iowa DOT coordination, funding review and public outreach.

Traffic Volumes

Future daily and peak hour traffic demands were estimated to evaluate operations and identify improvements that will adequately service future traffic needs. Traffic counts were gathered from Iowa DOT (2019), City of Ames (2022) and StreetLight (2022) to develop existing traffic volumes in the study area. The AAMPO MTP Year 2045 travel demand model (TDM) was used as the basis to forecast traffic growth in the study area through the project horizon year of 2045. StreetLight data informed travel patterns through the study area to better understand linked movements that influence queuing and alternatives development.

Operations Analysis

Operations analysis was completed with Synchro and TransModeler microscopic simulation software. Synchro replicates the procedures of the Highway Capacity Manual (HCM) and was used to perform spot analysis of initial build concepts for year 2045 peak hour analysis. TransModeler software models individual vehicles and their movement based on vehicle performance, algorithms for specific tasks such as car following and lane changing, and their interaction with each other and other modes. TransModeler operations analysis was completed for AM and PM peak hours of year 2045 no-build conditions and build conditions for two build alternatives. The no-build conditions model incorporated ongoing improvements at the S Duff Avenue & S 16th Street intersection to add eastbound and westbound left-turn lanes. TransModeler analysis was also completed for two volume sensitivity scenarios of the PM peak hour with 10% and 20% growth beyond the forecast 2045 PM peak hour volumes to assess the ability of each build alternative to accommodate additional future traffic demand.

Safety Analysis

Safety analysis was conducted for study area intersection to determine locations with high crash frequencies and crash trends. This information was used to identify safety improvements for incorporation into build alternatives. Historical crashes were collected from 2017 to 2021 using the Iowa DOT's Iowa Crash Analysis Tool (ICAT) and reviewed to identify crash patterns. Iowa DOT's evaluation of roadways and intersections across the state to determine Potential for Crash Reduction (PCR) was investigated to identify study intersections that have relatively poor safety performance and garner attention for safety improvements. With this methodology, the following tiers of rated safety performance for intersections were used to focus on locations with the greatest potential for crash reduction following improvements:

- **High PCR**: PCR > 1 – Likely for safety improvement
- **Medium PCR**: 0.2 ≤ PCR ≤ 1 – Potential for safety improvement
- **Negligible PCR**: PCR < 0.2 – Performing better than predicted

Multimodal Review

Multimodal review was completed through an assessment of existing corridor accessibility for pedestrians, bicyclists and transit. Pedestrian and bicycle accommodations along the corridor were reviewed for presence and condition of sidewalks, trails and roadway crossings. Information provided by CyRide was used to assess service and accessibility at stops within the study area.

Alternatives Development

Corridor and interchange concepts were developed to address current and expected deficiencies. Various US 30 interchange configurations were developed and combined with a range of conceptual improvements adjacent to the interchange within the study area to form initial concepts. Reviews with City of Ames staff and the Iowa DOT were used to screen concepts, develop initial alternatives and identify those for further development as refined alternatives with more detailed operations analysis.

Iowa DOT Coordination

The project included coordination with the Iowa DOT throughout the project due to the presence of two corridors on the Iowa DOT highway system: S Duff Avenue (US 69) and US 30. The Iowa DOT provided concurrence of study methodology and input on selection of refined alternatives and recommended alternative that align with future DOT projects at and near the study area.

Funding Review

Allocated City of Ames funding for transportation projects, potential cost share with the Iowa DOT and grant opportunities were reviewed to identify potential funding for the recommended alternative. The City of Ames 2022-2027 CIP was reviewed to identify annual average funding and sources for transportation

improvements. State and Federal grants were reviewed for potential alignment with recommended improvements.

Public Outreach

A public open house was on Thursday, May 25th to share project background and build improvements and gather feedback. Public comments were incorporated into alternative summaries for future advancement of a recommended build alternative.

3. Corridor Assessment for No-Build Conditions

Existing and future year no-build corridor assessments combined with a general understanding of needs related to event traffic were used to identify specific locations with deficiencies and form the following project goals to be addressed with build improvements:

- Reduce delays and queuing
- Improve safety
- Prepare for future growth
- Improve multimodal facilities
- Better accommodate event traffic

Assessments were completed through review of projected traffic volume growth, operations analysis, safety analysis, and multimodal review. Summaries of the completed assessments are provided below and shown on **Figure 3**. Project goals at specific locations in the study area are shown on **Figure 4**.

Traffic Forecasts Review

Significant traffic growth is expected along S Duff Avenue by year 2045. Much of this is dependent on intensity and timeline for development activity in south Ames. Daily traffic on S Duff Avenue is expected to increase by 30-50% around the US 30 interchange.

Operations Analysis

The study area currently experiences long delays and queuing at select locations during peak times, particularly during the PM peak hour and at various times during events. By year 2045, there are expected to be multiple turning movements at study intersections that would operate at or over capacity (level of service (LOS) E or F) during the PM peak hour with queues extending through upstream driveways and intersections. The southbound approach of S Duff Avenue & S 16th Street would have a queue over a quarter mile in the outside (right) through lane during the 2045 PM peak hour due to much of the traffic destined to US 30 and Airport Road using this lane. The eastbound/westbound approaches to S Duff Avenue & S 16th Street would also have movements with high delays and long queues. The eastbound approach at S Duff Avenue & Airport Road would extend through the Sam's Club intersection.

The intersection of S Duff Avenue & S 16th Street would be expected to operate over capacity during the PM peak hour by year 2045 (with ongoing improvements to add eastbound/westbound left-turn lanes) and would create a bottleneck, limiting the traffic able to get to downstream intersections. This produces operations results for S Duff Avenue intersections south of S 16th Street appearing better than they would be with any additional improvements at S 16th Street since traffic is metered at S 16th Street due to poor operations.

Safety Analysis

The intersections on S Duff Avenue at Airport Road, eastbound US 30/Billy Sunday Road and S 16th Street have "Medium PCR" or "High PCR" ratings, indicating relatively poor safety performance.

- S Duff Avenue & Airport Road – PCR 0.36 (Medium PCR)
- S Duff Avenue & Eastbound US 30/Billy Sunday Road – PCR 1.10 (High PCR)
- S Duff Avenue & S 16th Street – PCR 1.79 (High PCR)

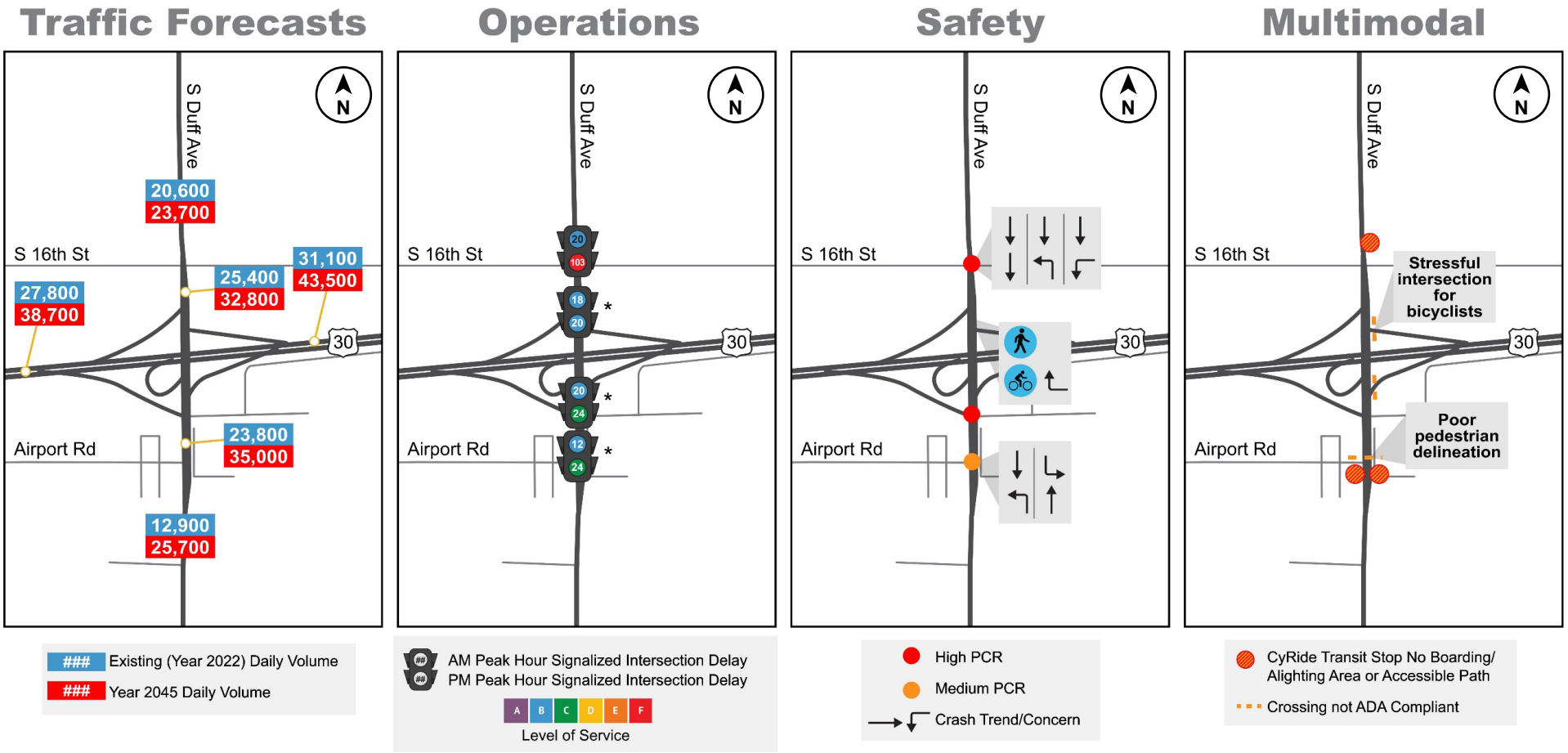
It is noted that the data at the Billy Sunday Road intersection is prior to the reconstruction of the intersection and traffic signal installation in 2021, so safety performance has likely changed at this location.

The following are notable crash trends and safety concerns within the study area from crashes during 2017-2021:

- S Duff Avenue & Airport Road – Over 60% of rear-end, angle and broadside crashes involved southbound vehicles
- S Duff Avenue & Westbound US 30 – Two crashes between westbound right-turning vehicles and vulnerable road users (pedestrians and bicyclists)
- S Duff Avenue & Airport Road – 15 out of 16 angle crashes involved a northbound or southbound left-turn vehicle with the opposing through

Multimodal Review

Multiple pedestrian crossings throughout the study area are not Americans with Disabilities Act (ADA) compliant and CyRide transit stops do not have dedicated boarding/alighting areas or accessible path. The intersection of S Duff Avenue & Westbound US 30 ramps was identified in the top five of most stressful intersections for bicyclists in the 2045 MTP due to the large turning radius and long crossing distance. The pedestrian area on the northeast corner of the S Duff Avenue & Airport Road intersection has poor delineation from vehicle traffic with striping only and no physical barrier.



* PM peak hour traffic is metered by poor operations at S Duff Avenue & S 16th Street, which yields results at downstream signals better than they would be with any additional improvements at the S 16th Street intersection.

Figure 3. Corridor Assessment Summary

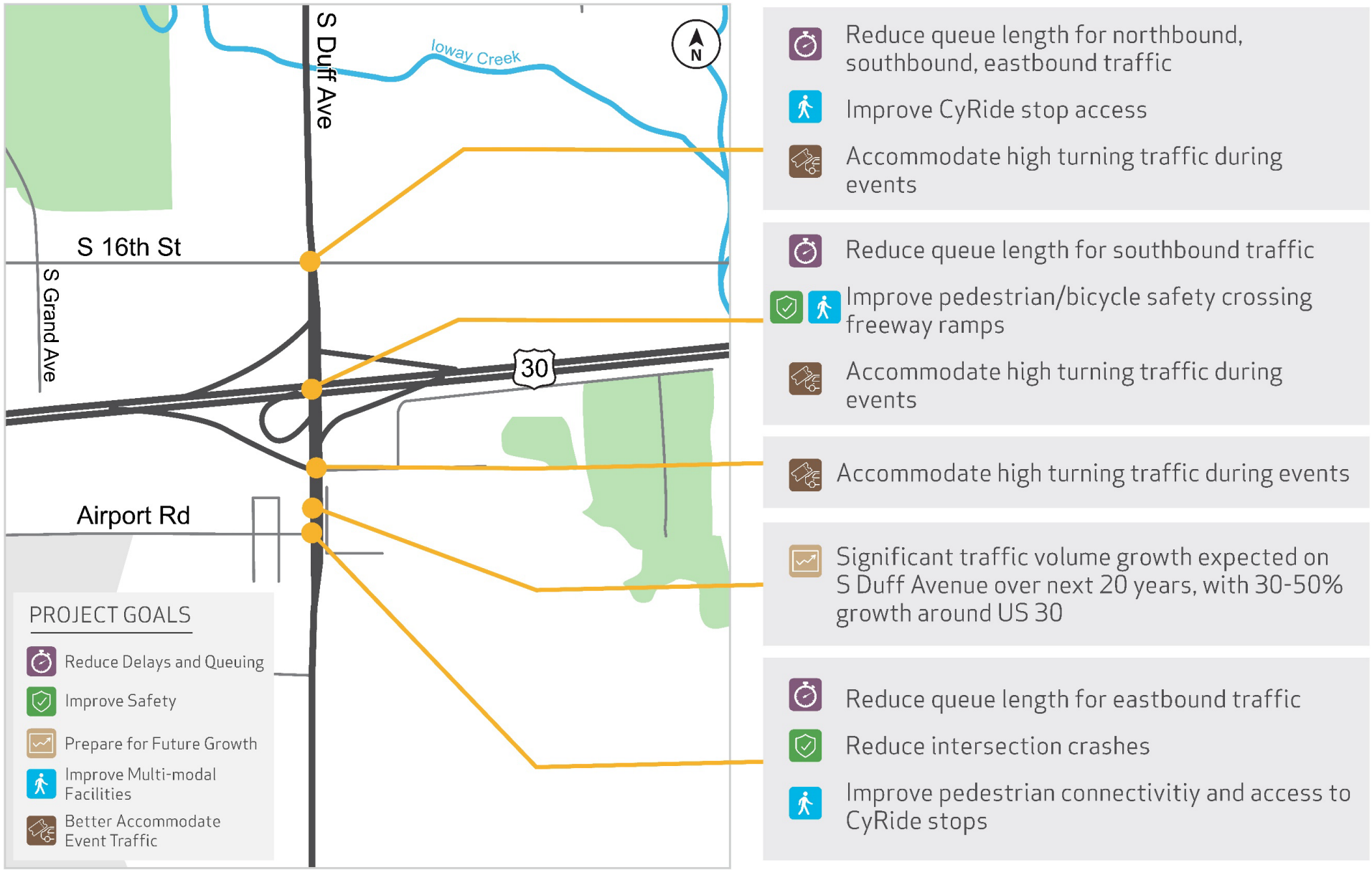


Figure 4. Project Goals

4. Build Alternatives

Initial concepts were developed to address project goals that included various combinations of solutions along the corridor and at the US 30 interchange. Interchange concepts included variations of diamond, single point, displaced left-turn and diverging diamond interchange configurations. Initial concepts were reviewed with City of Ames staff to develop a set of initial alternatives for preliminary evaluation and further review with the Iowa DOT. Through the preliminary evaluation and review with City of Ames and Iowa DOT staff, two build alternatives were advanced through refinement and evaluated.

The two refined build alternatives included a variation of a single point urban interchange (SPUI) and diverging diamond interchange (DDI). Both alternatives included identical improvements adjacent to the US 30 interchange at the S Duff Avenue & S 16th Street intersection and on Airport Road at the S Duff Avenue intersection and west to the Sam's Club entrance. Some of the improvements adjacent to US 30 are part of ongoing or planned improvements that align with the ultimate recommendation for improvements at those locations.

Build alternatives for the US 30 interchange improvements at adjacent locations are summarized on the following pages, including conceptual layouts (**Figure 5** through **Figure 8**), improvements, features and goals achieved. An evaluation matrix that summarizes the two build alternatives against the no-build condition is provided in **Table 1**. This evaluation matrix was used to make a recommendation for ultimate improvements. Evaluations completed with TransModeler simulation and Synchro software were used to complete operations analysis and determine fuel efficiency and emissions calculations. Bridge layouts were developed to determine bridge size, depth and planning-level costs.

Single Point Urban Interchange (SPUI) Alternative

Improvements:

- Combine left-turn movements to/from US 30 to single intersection
- Remove loop to eastbound US 30 and convert southbound S Duff Avenue to eastbound US 30 movement to a left turn
- Additional turn lanes on/off US 30
- Consolidate access onto eastbound US 30 (i.e., one ramp to eastbound US 30)
- Enhance trail crossings at US 30 ramps with protected crossings
- New US 30 bridges over S Duff Avenue to provide an additional foot of clearance (would require US 30 grade raise of about 9 feet)

Features:

- Maintains direct access from eastbound US 30 to Billy Sunday Road
- Maintains four traffic signals on S Duff Avenue in the study area
- Expandable to six lanes on S Duff Avenue between S 16th Street and Airport Road
- Leading pedestrian intervals (LPIs) at signalized crossings

Goals Achieved:

- Reduce delays and queuing
- Improve safety
- Prepare for future growth
- Improve multimodal facilities
- Better accommodate event traffic

Planning-Level Costs:

- Interchange improvements (excluding US 30 mainline): $11,100,000
- US 30 bridges: $15,700,000

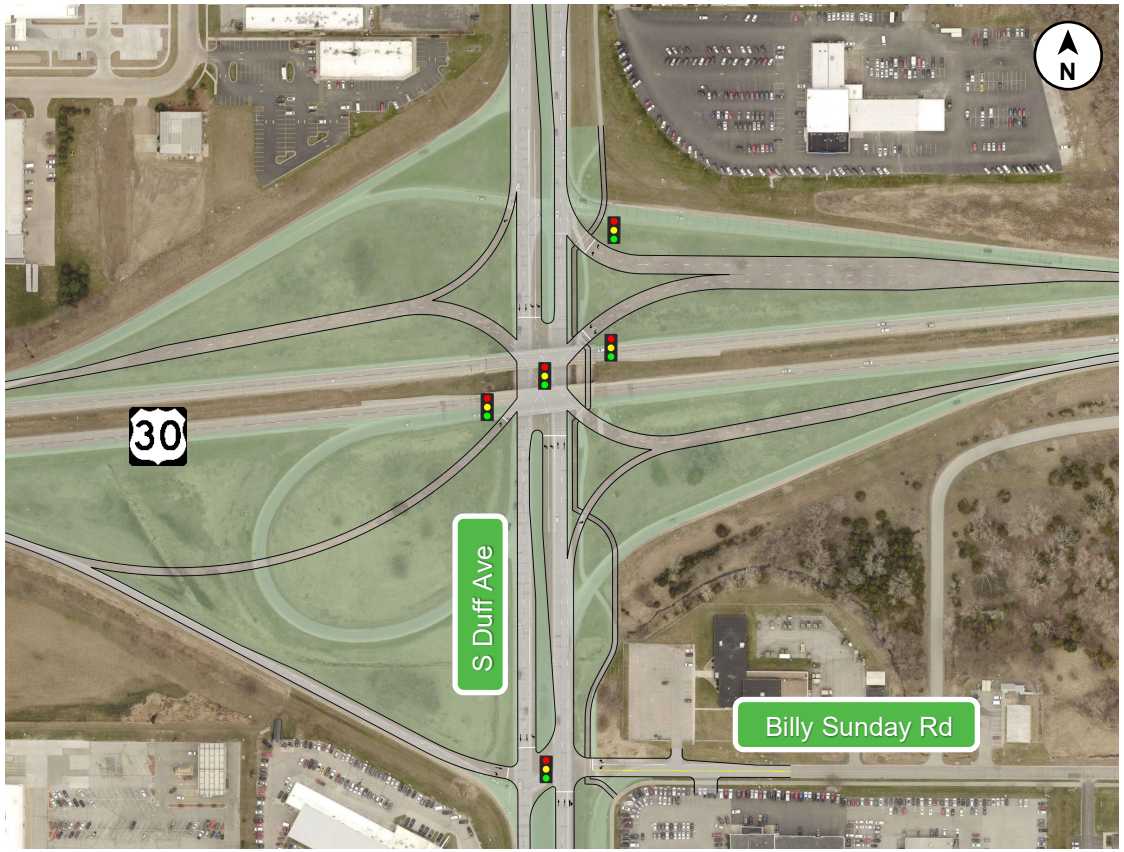


Figure 5. SPUI Alternative Layout

Diverging Diamond Interchange (DDI) Alternative

Improvements:

- Remove loop to eastbound US 30 and convert southbound S Duff Avenue to eastbound US 30 movement to a left turn
- Additional westbound right-turn lane off US 30
- Consolidate access onto eastbound US 30 (i.e., one ramp to eastbound US 30)
- Enhance trail crossings at US 30 ramps with protected crossings
- Improve traffic flow turning to/from US 30 and entering US 30 mainline
- New US 30 bridges over S Duff Avenue to provide an additional foot of clearance (would require US 30 grade raise of about 4 feet)

Features:

- Northbound/southbound traffic flips to opposite side of the road through the interchange
- Maintains direct access from eastbound US 30 to Billy Sunday Road
- Expandable to six lanes on S Duff Avenue between S 16th Street and Airport Road
- LPIs at signalized crossings

Goals Achieved:

- Reduce delays and queuing
- Improve safety
- Prepare for future growth
- Improve multimodal facilities
- Better accommodate event traffic

Planning-Level Costs:

- Interchange improvements (excluding US 30 mainline): $10,500,000
- US 30 bridges: $10,300,000

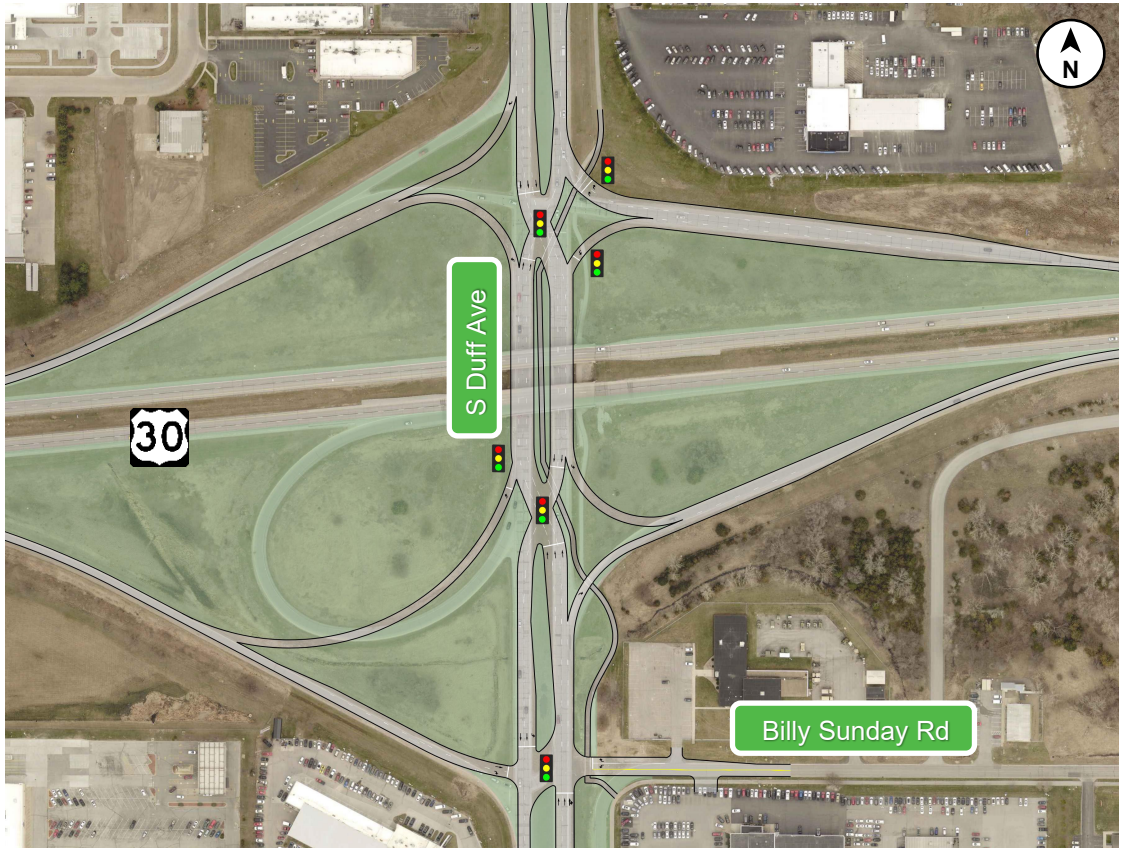


Figure 6. DDI Alternative Layout

Airport Road Improvements

Improvements:

- New traffic signal at Sam's Club / Lowe's access (anticipated 2024 construction)
- Continuous raised median between Sam's Club access and S Duff Avenue (anticipated 2024 construction)
- New sidewalk connections, including accessible connection to CyRide stops south of Airport Road (anticipated 2024 construction)
- Offset northbound/southbound left-turn lanes on S Duff Avenue (future construction)

Features:

- Right-in/right-out access between Sam's Club driveway and S Duff Avenue
- LPIs at signalized intersections

Goals Achieved:

- Reduce delays and queuing
- Improve safety
- Improve multimodal facilities

Planning-Level Cost:

- $3,200,000 (excludes 2024 construction)

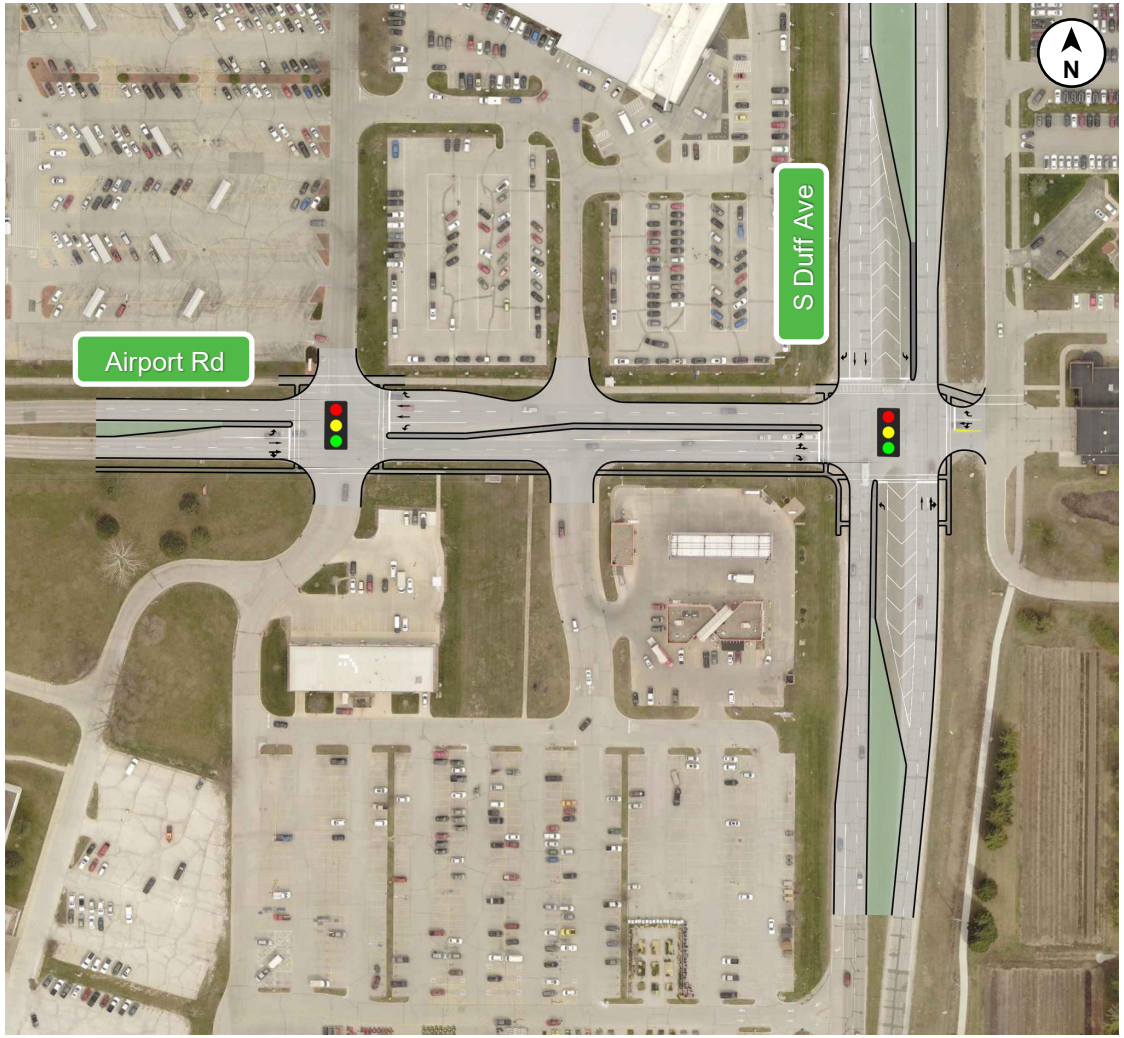


Figure 7. Airport Road Improvements Layout

S Duff Avenue & S 16th Street Improvements

Improvements:

- Add eastbound/westbound left-turn lanes (2023 construction)
- New sidewalk connections (2023 construction)
- Channelized eastbound right-turn lane (future construction)
- Dual northbound left-turn lanes (future construction)
- New accessible connection to CyRide stop north of S 16th Street (future construction)

Features:

- Signal control of channelized eastbound right-turn movement to prohibit movement during southbound through phase, provide protected pedestrian crossing and limit weaving on S Duff Avenue between S 16th Street and US 30
- LPIs at traffic signal

Goals Achieved:

- Reduce delays and queuing
- Improve safety
- Prepare for future growth
- Improve multimodal facilities
- Better accommodate event traffic

Planning-Level Cost:

- $2,000,000 (excludes 2023 construction)

Figure 8. S Duff Avenue & S 16th Street Improvements Layout

Table 1. Alternatives Evaluation Matrix

Alternative	Project Goals: Reduce Delays and Queuing	Project Goals: Improve Safety	Project Goals: Prepare for Future Growth	Project Goals: Improve Multimodal Facilities	Project Goals: Better Accommodate Event Traffic	Fuel Efficiency / Emission	Public Acceptance	Planning-Level Construction Cost	Overall Rank
No-Build	**RANKING 3** • 2045 PM peak hour network delay = 138 seconds • Long queues for multiple movements	**RANKING 3** • Safety deficiencies not addressed	**RANKING 3** • Does not improve multimodal facilities	**RANKING 3** • Does not improve event traffic accommodations	**RANKING 3** • Does not improve event traffic accommodations	**RANKING 3** • 2045 PM Peak Hour • Fuel Economy= 9.4 mpg • Emissions = 32.4 kg	**RANKING 3** • Does not address deficiencies	**RANKING 1** • No cost	**3**
Single Point Urban Interchange	**RANKING 1** • 2045 PM peak hour network delay = 89 seconds • Southbound queue at S 16th reduced from 1,500' to 300' • Eastbound queue on Airport Road at S Duff reduced from 700' to 300'	**RANKING 1** • S Duff & S 16th – Safety improved by modified interchange configuration and protected-only north/south left-turn signal phasing • S Duff & Westbound US 30 ramp terminal – Protected-only right-turn signal phasing to protect crossing pedestrians and bicyclists • S Duff & Airport Road – Offset left-turn lanes to reduce angle crashes	**RANKING 1** • LOS C or better operations at the interchange for year 2045 • LOS C or better at US 30 interchange signals during PM peak with 20% traffic growth beyond year 2045	**RANKING 1** • ADA-compliant crossings and incorporates LPI • Adds two protected trail crossings • Flexibility for pedestrian-activated crossing of EB US 30 entrance ramp • Pedestrian crossings on all legs at S Duff & Airport Road • Boarding area and accessibility for CyRide stops	**RANKING 1** • Dual left-turn and right-turn lanes from WB US 30 for Iowa State and Hunziker Sports Complex event traffic • Dual NB left-turn lanes at S 16th Street for Iowa State event traffic • Increased signal spacing for southbound left turn storage at Billy Sunday for Hunziker Sports Complex	**RANKING 1** • 2045 PM Peak Hour • Fuel Economy = 10.0 mpg • Emissions = 28.3 kg	**RANKING 1** • Stakeholder and public generally support • Added spacing between US 30 interchange ramps and adjacent signals is favorable • Two added trail crossings at the SPUI is not favorable	**RANKING 3** • $32.0M (does not include mainline widening of US 30) • Grade of US 30 would increase 9 feet	**2**
Diverging Diamond Interchange	**RANKING 1** • 2045 PM peak hour network delay = 86 seconds • Southbound queue at S 16th reduced from 1,500' to 300' • Eastbound queue on Airport Road at S Duff reduced from 700' to 300' • Improved traffic flow turning to/from US 30 and entering US 30	**RANKING 1** • S Duff & S 16th – Safety improved by modified interchange configuration and protected-only north/south left-turn signal phasing • S Duff & Westbound US 30 ramp terminal – Protected-only right-turn signal phasing to protect crossing pedestrians and bicyclists • S Duff & Airport Road – Offset left-turn lanes to reduce angle crashes	**RANKING 1** • LOS C or better operations at the interchange for year 2045 • LOS C or better at US 30 interchange signals during PM peak with 20% traffic growth beyond year 2045	**RANKING 1** • ADA-compliant crossings and incorporates LPI • Adds two protected trail crossings • Flexibility for pedestrian-activated crossing of EB US 30 entrance ramp • Pedestrian crossings on all legs at S Duff & Airport Road • Boarding area and accessibility for CyRide stops	**RANKING 2** • Dual right-turn lanes from WB US 30 interchange and high percentage of signal time for Iowa State and Hunziker Sports Complex event traffic • Dual NB left-turn lanes at S 16th Street for Iowa State event traffic	**RANKING 2** • 2045 PM Peak Hour • Fuel Economy = 9.9 mpg • Emissions = 30.4 kg	**RANKING 2** • Stakeholder and public generally support • Two added trail crossings and trail down the center of the DDI is not favorable	**RANKING 2** • $26.0M (does not include mainline widening of US 30) • Grade of US 30 would increase 4 feet	**1**

Ranking 1 (best) through **3** (worst) subjective based on how well the alternative addresses deficiencies, meets public acceptance and anticipated construction costs.

5. Recommendations & Implementation Plan

Improvements Recommendation

It is recommended to advance the DDI alternative and incorporate into a future CIP for programming of design and construction. Both DDI and SPUI alternatives meet project goals, but the SPUI would require longer and taller bridge structures on US 30 over S Duff Avenue compared to the DDI, resulting in significantly more costs for the bridge and to raise the profile of US 30 adjacent to the bridges.

The DDI alternative includes the following improvements that are not currently programmed:

- Modify S Duff Avenue & US 30 interchange to DDI configuration
  - Six lanes on S Duff Avenue through interchange
  - Dual westbound right-turn lanes from US 30 to northbound S Duff Avenue
- Maintain direct access from eastbound US 30 to Billy Sunday Road
- Add channelized eastbound right-turn lane at S Duff Avenue & S 16th Street
- Add dual northbound left-turn lanes at S Duff Avenue & S 16th Street
- Offset northbound/southbound left-turn lanes at S Duff Avenue & Airport Road
- New accessible connection to CyRide stop north of S 16th Street

A graphic of the entire DDI alternative is shown in the Appendix.

Funding Review

S Duff Avenue corridor and interchange improvements are expected to cost $26,000,000 and are anticipated to be funded through a cost share between the City of Ames and the Iowa DOT. This due to the ownership and maintenance responsibility of the highway infrastructure assets being assigned to both agencies within the project area. The cost share between the City of Ames and Iowa DOT for the project will be determined through coordination and will depend upon overall project cost, asset ownership, funds (local, State, Federal) dedicated to the project, and any supplemental grant funding secured. For the purposes of this study a 50 percent cost share between the City of Ames and Iowa DOT was assumed as the conservative approach. City of Ames cost share could be less than 20 percent of project costs if the Iowa DOT is able to allocate a higher percentage of State and Federally apportioned funds or the project is awarded a project-specific grant.

City of Ames Funding

The City of Ames 2022-2027 CIP includes $23,000,000 per year for expenditure on transportation projects through fiscal year (FY) 2026/2027. Approximately $17,000,000 (74 percent annually) is programmed for street improvements, the shared use path system, and traffic improvements. Programmed projects like the ongoing widening of S 16th Street between S Grand Avenue and Lark Avenue and general system preservation projects are examples of street improvement projects in the 2022-2027 CIP.

Iowa DOT Funding

The Iowa DOT regularly evaluates project needs across the state to determine how to allocate State and Federal funds. The Iowa DOT has apportioned Federal funding that may be used to fund the S Duff Avenue corridor and interchange improvements. State-apportioned Federal funding that would likely be considered to fund the project improvements include the National Highway Performance Program (NHPP) and Surface Transportation Block Grant (STBG). These funds are defined below:

- **NHPP** – The NHPP provides support for the condition and performance of the National Highway System (NHS), for the construction of new facilities on the NHS, and to ensure that investments of Federal-aid funds in highway construction are directed to support progress toward the achievement of performance targets established in a State's asset management plan for the NHS.
- **STBG** – The STBG program provides flexible funding that may be used by States and localities for projects to preserve and improve the conditions and performance on any Federal-aid highway, bridge and tunnel projects on any public road, pedestrian and bicycle infrastructure, and transit capital projects. The AAMPO manages STBG allocated by the Iowa DOT to fund projects within the planning boundary.

The Iowa DOT also administers grant programs to assist local agencies with projects across Iowa. State grant programs that align with the S Duff Avenue improvements and could be pursued for project funding include:

- **Iowa Clean Air Attainment Program (ICAAP)** – The purpose of ICAAP is to help finance transportation projects and programs in Iowa that reduce

transportation-related congestion and air pollution. Since 2014, the Iowa DOT has earmarked and administered $4 million of Congestion Mitigation and Air Quality (CMAQ) funds annually for ICAAP. The minimum total project cost to be eligible for ICAAP is $20,000 (there is not a maximum project cost stipulation for ICAAP). S Duff Avenue capacity improvements and sidewalk/trail improvements would fit the ICAAP criteria for improving traffic flow and constructing bicycle and pedestrian facilities.

- **Traffic Safety Improvement Project (TSIP)** – The intent of TSIP is to fund roadway safety improvements, traffic control devices, studies, and outreach. TSIP is funded at 0.5 percent of Iowa's Road Use Tax Fund, which varies by year but typically amounts to $6-7 million annually. The maximum amount that can be requested for TSIP is $500,000. S Duff Avenue corridor improvements would fit the TSIP qualifications, particularly the improvements at Airport Road to offset northbound/southbound left-turn lanes and replace necessary traffic signal equipment, and improvements at S Duff Avenue & S 16th Street to add dual northbound left-turn lanes and channelized eastbound right-turn lane.
- **Urban-State Traffic Engineering Program (U-STEP)** – U-STEP funds are intended for cities to use for construction of projects on primary roads to solve traffic operation and safety problems. Spot improvements and linear improvements are eligible and funded at different levels. The maximum amount available through U-STEP on a project is $200,000 for spot improvements and $400,000 for linear improvements. City match is 45 percent of project cost. S Duff Avenue corridor improvements would fit the U-STEP qualifications, particularly the improvements at Airport Road to offset northbound/southbound left-turn lanes and replace necessary traffic signal equipment, and improvements at S Duff Avenue & S 16th Street to add dual northbound left-turn lanes and channelized eastbound right-turn lane.
- **Transportation Alternatives Program (TAP)** – Eligible project activities for Iowa's TAP funding include a variety of smaller-scale transportation projects such as pedestrian and bicycle facilities, recreational trails, Safe Routes to School projects, and community improvements such as historic preservation, vegetation management, and some environmental mitigation related to storm water and habitat connectivity. TAP is administered both at the State and local (MPO) levels. The AAMPO is allocated STBG-TAP funds from the Iowa DOT to allocate to projects within their planning boundary. The Iowa DOT reserves additional TAP funds to allocate across the state. S Duff Avenue sidewalk/trail improvements would fit the TAP criteria for transportation alternative facilities.

Federal Discretionary Grant Opportunities

The City of Ames and the Iowa DOT could partner to apply for Federal funding through the Rebuilding American Infrastructure with Sustainability and Equity (RAISE) discretionary grant program. RAISE provides funding for road, rail, transit and port projects that promise to achieve national objectives. The eligibility requirements of RAISE allow project sponsors at the state and local levels to obtain funding for multi-modal, multi-jurisdictional projects that are more difficult to support through traditional DOT programs. RAISE projects are rigorously reviewed and evaluated on statutory criteria of safety, environmental sustainability, quality of life, mobility and community connectivity, economic competitiveness and opportunity including tourism, state of good repair, partnership and collaboration, and innovation.

The Safe Streets and Road for All (SS4A) grant program could be another financial source the City could pursue to fund project improvements. The SS4A program funds regional, local, and Tribal initiatives through grants to prevent roadway deaths and serious injuries. The program supports the development of a comprehensive safety action plan (Action Plan) that identifies the most significant roadway safety concerns in a community and the implementation of projects and strategies to address roadway safety issues. SS4A requires an eligible Action Plan be in place before applying to implement projects and strategies. The AAMPO is in the process of applying for SS4A funds to support development of an Action Plan. The AAMPO could then apply for SS4A implementation funds for safety improvements like the project offset the northbound/southbound left-turn lanes at S Duff Avenue & Airport Road.

Next Steps

Ongoing improvements along S 16th Street to add eastbound/westbound left-turn lanes at S Duff Avenue and sidewalks are anticipated to be complete in fall 2023. Improvements along Airport Road to add a traffic signal at the Sam's Club access, create a continuous median between Sam's Club access and S Duff Avenue and add sidewalks are planned for design in 2023 and construction in 2024.

The additional recommended improvements in the study area are anticipated to be needed by year 2035 to provide acceptable (LOS D or better) operations. These include:

- Modify S Duff Avenue & US 30 interchange to DDI configuration
- Offset northbound/southbound left-turn lanes at S Duff Avenue & Airport Road
- Add channelized eastbound right-turn lane at S Duff Avenue & S 16th Street
- Add dual northbound left-turn lanes at S Duff Avenue & S 16th Street
- New accessible connection to CyRide stop north of S 16th Street

These improvements should be coordinated together for design and construction efficiencies, especially since the improvements at S 16th Street will connect to the US 30 interchange via an added lane on southbound S Duff Avenue.

Recommended improvements beyond the current and near-term programmed projects on S 16th Street and on Airport Road will need to be programmed by the City of Ames and the Iowa DOT to establish funding and timeline for design and construction. Ongoing communication between the City of Ames and the Iowa DOT will be needed to discuss State and Federal grant applications and funding amounts each agency will need to program.

Appendix