



# Report & Implementation Plan

Grand Avenue Intersection Improvements Study

October 27, 2022

*Final Copy*



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## List of Abbreviations

- **AAMPO:** Ames Area Metropolitan Planning Organization
- **MTP:** Metropolitan Transportation Plan
- **CIP:** Capital Improvements Plan
- **TDM:** Travel Demand Model
- **HCM:** Highway Capacity Manual
- **MUTCD:** Manual on Uniform Traffic Control Devices
- **DOT:** Department of Transportation
- **ICAT:** Iowa Crash Analysis Tool
- **PCR:** Potential for Crash Reduction
- **LPI:** Leading Pedestrian Interval
- **LOS:** Level of Service
- **ROW:** Right-of-Way

# 1. Introduction

The purpose of this project was to identify needs and recommended improvements at key intersections along Grand Avenue from 9<sup>th</sup> Street to 24<sup>th</sup> Street in the Ames, Iowa. Specifically, the following intersections were the primary focus for this study.

- Grand Avenue & 9<sup>th</sup> Street
- Grand Avenue & 13<sup>th</sup> Street
- Grand Avenue & 16<sup>th</sup> Street
- Grand Avenue & 20<sup>th</sup> Street
- Grand Avenue & 24<sup>th</sup> Street

The study area for this project was selected based on previously planned improvements to the Grand Avenue intersections at 13<sup>th</sup> Street, 16<sup>th</sup> Street and 20<sup>th</sup> Street identified in the AAMPO Forward 2045 MTP and the City of Ames CIP. Intersections at 9<sup>th</sup> Street and 24<sup>th</sup> Street were also included in the study.

**Figure 1** shows the project study area.

This portion of Grand Avenue serves north Ames as a vital connection between commercial, residential, and educational uses. It is also part of the National Highway System and state highway system as US Highway 69. Average daily traffic volumes range between approximately 14,000 and 21,000 vehicles per day, with continued traffic growth anticipated in the future with continued residential and commercial growth to the north.

This study developed a plan for improvements that balance multimodal mobility and safety needs of this corridor with the character and quality of life for adjacent neighborhoods and property owners in accordance with the City's Complete Streets Plan and other applicable standards. Using traffic operations and safety assessments combined with local knowledge, this plan addresses existing deficiencies while also helping to position the corridor to be resilient to future demand and enhanced multimodal connections. The improvements recommended by the study were identified based on their ability to be implemented with limited impacts to surrounding properties and neighborhood character.



**Figure 1. Study Area**



## 2. Study Methodology

### Traffic Volumes

Traffic counts were collected at study intersections by the City of Ames in November and December of 2021 after the opening of the Grand Avenue extension south of S 5<sup>th</sup> Street to S 16<sup>th</sup> Street. The AAMPO also provided the latest TDM which provided the basis for forecasting corridor traffic growth through the horizon year for the project, year 2045. The TDM was updated prior to developing forecasts to account for planned land uses of a new aquatic center near Lincoln Way & Oak Avenue and Lincoln Way Mixed Use Development south of downtown.

### Traffic Operations

Traffic operations analysis was completed using Synchro 11 software, which replicates procedures from the HCM. Conditions were evaluated for the AM and PM peak hours under existing and year 2045 no-build and build conditions. Traffic Signal Warrants from the MUTCD were evaluated at the Grand Avenue & 16<sup>th</sup> Street intersection to identify if a signal is warranted and would be considered during concept development.

### Safety Analysis

A safety analysis was conducted for the study area to determine locations with high crash frequencies and crash patterns that could be used to identify safety improvements. Crashes were collected for years 2015 through 2019 using the ICAT. This study used a methodology (still in draft format) that the Iowa DOT has developed to evaluate the relative safety performance of intersections across Iowa. The methodology uses a potential for crash reduction to evaluate safety as a function of experienced crashes per year compared to an expected number of crashes per year based on the type of intersection. With this methodology, the following three tiers of rated safety performance for intersections were used to focus on locations with the greatest potential for crash reduction following improvements:

- **Tier 1:** PCR > 1 – Likely for safety improvement with improvements
- **Tier 2:**  $0 \leq \text{PCR} \leq 1$  – Potential for safety improvement with improvements
- **Tier 3:** PCR < 0 – Performing better than predicted

## 3. Intersection Evaluations & Improvements

Following review and evaluation of intersections to determine improvement needs, strategies were identified for each intersection to address these needs. Initial concepts at each study intersection were developed by combining strategies. The initial concepts were reviewed with the City of Ames staff and strategies were selected to create a recommended concept for each study intersection. The recommended concepts include a combination of the following strategies:

- Spot roadway widening at intersections to add left-turn lanes
- Restriping lanes to provide dedicated left-turn lanes
- Shared-use paths
- Leading pedestrian interval – providing the walk indication to pedestrians before a vehicular green signal, to allow pedestrians to move into the intersection first and provide greater awareness of pedestrians.

A public open house was held on April 28<sup>th</sup>, 2022 where the recommended concepts were reviewed, next steps were shared, and feedback was gathered from the public.

The following sections provide an overview for each study intersection (from south to north), including background on improvements at each location, completed evaluations and recommended improvements.

## Grand Avenue & 9<sup>th</sup> Street

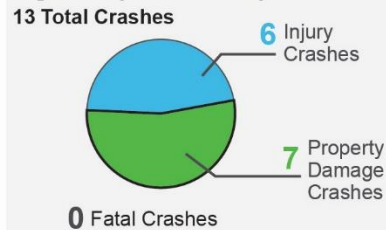
While the 9<sup>th</sup> Street corridor does not carry high levels of vehicular traffic, the signalized intersection with Grand Avenue does see pedestrian traffic as the 9<sup>th</sup> Street corridor connects several parks, trails, and recreational facilities nearby. No operational or safety deficiencies were previously noted for improvement at this intersection. Previously planned improvements identified in the Ames MTP include a shared-use path along Grand Avenue between 6<sup>th</sup> and 16<sup>th</sup> Street. The shared-use path project was identified as a fiscally constrained bicycle and pedestrian path planned for completion in 2025-2029. This shared-use path improvement would provide a continuous path facility from Lincoln Way to Ada Hayden along with the section of shared-use path from Lincoln Way to 6<sup>th</sup> Street that is programmed for fiscal year 2022/2023 of the CIP.

### Safety Analysis

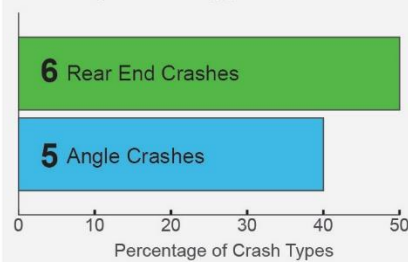
#### PCR Values/ Tier Classification

PCR Tier	Injury PCR 0.01 ↓ All crash PCR 0.61 ↓		
	TIER 3 Performing Better Than Predicted	TIER 2 Potential for Safety Improvement	TIER 1 Safety Consultation
All crashes	PCR < 0	0 < PCR < 1	PCR > 1
Injury crashes	PCR < 0	0 < PCR < 0.25	PCR > 0.25

#### Total Crashes During Recent 5 years (2015-2019)



#### Primary crash types



#### Number of pedestrian and bicycle crashes



#### Key safety findings

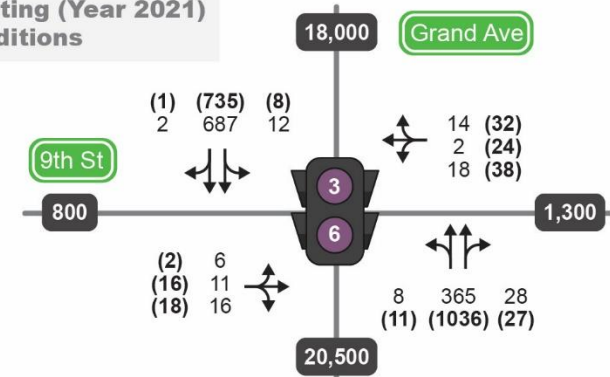
- Crashes at this intersection are primarily rear end or angle crashes.
- There was one bicycle injury crash at this intersection during recent 5 years.

Source: Iowa DOT Draft Safety Analysis Guide and ICAT Crash Data (2015-2019)

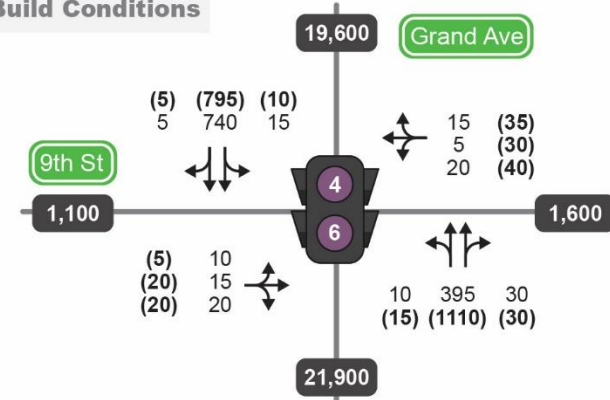
### Traffic Counts & Operations

Grand Avenue traffic volumes are projected to grow by 10% by year 2045 and 9th Street is projected to grow by 20%. Existing operations are LOS 'A' during AM and PM peak hours and expected to remain at LOS 'A' in year 2045 no-build conditions.

#### Existing (Year 2021) Conditions



#### Future (Year 2045) No-Build Conditions



#### LEGEND

- ## (##) AM and (PM) Peak Hour Volumes
- Intersection Lane Geometrics
- #,### Average Annual Daily Traffic (AADT)
- AM Peak Hour Signalized Intersection Delay
- PM Peak Hour Signalized Intersection Delay
- A B C D E F Level of Service

# Grand Avenue & 9th Street Intersection Improvements

*Project Approach: Enhance pedestrian and bicycle safety and mobility with limited impacts to adjacent properties*

## Key Improvements

- Leading pedestrian interval
- Shared-use path along west side of Grand Avenue
- Updated signal timings

## Expected Benefits:

- Increased awareness of pedestrians and bicyclists in the crosswalk

## Public Feedback

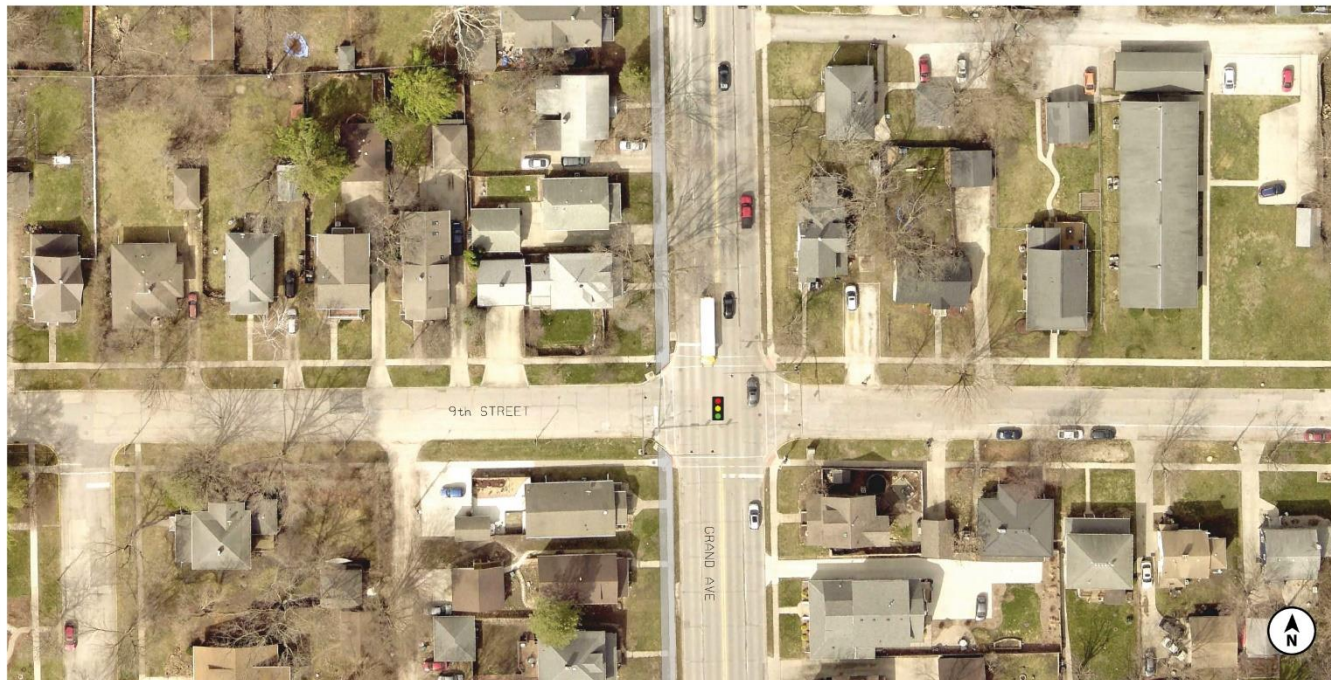
- Mostly positive public sentiment
- Concern related to CyRide on southbound Grand Avenue continuing to turn left from the shared lane

## Next Steps for Improvements

- Program the shared-use path improvements on Grand Avenue through the Shared-Use Path System Expansion program in a future CIP (shared use path improvements may be completed after other Grand Avenue study intersection improvements are complete)

## Planning-Level Cost Estimate

- \$70,000 – Construction of shared-use path along west side of Grand Avenue from 8th Street to 10th Street
- Shared-use path easement required along properties on west side of Grand Ave
- No ROW acquisition required



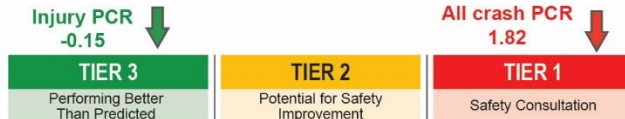


## Grand Avenue & 13<sup>th</sup> Street

The intersection of Grand Avenue & 13<sup>th</sup> Street has consistently been one of the most congested locations in the city for years. Traffic volumes are relatively high on all approaches, particularly Grand Avenue. The traffic signal operates with split signal phasing for north-south traffic because of shared through/left-turn lanes with heavy turning traffic volumes. The east-west approaches also have shared through/left-turn lanes, creating slowing/stopped traffic in the inside through lanes on 13<sup>th</sup> Street. Widening options are constrained by ROW and utilities adjacent to the street. The Traffic System Capacity Improvements section of the CIP includes the addition of turn-lanes, which are scheduled for design and ROW in years 2024/2025 and construction in years 2025/2026. Additionally, the MTP identified a shared-use path along Grand Avenue between 6<sup>th</sup> and 16<sup>th</sup> Street that was identified as a fiscally constrained bicycle and pedestrian path planned for completion in 2025-2029.

### Safety Analysis

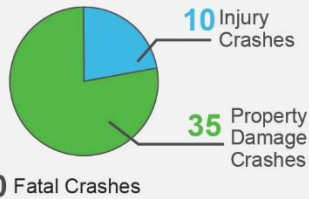
#### PCR Values/ Tier Classification



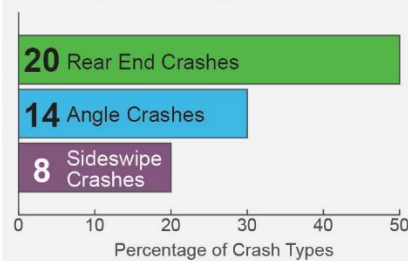
PCR Tier	All crashes	Injury crashes
Thresholds	PCR < 0	PCR < 0
	0 < PCR < 1	0 < PCR < 0.25
	PCR > 1	PCR > 0.25

#### Total Crashes During Recent 5 years (2015-2019)

45 Total Crashes



#### Primary crash types



#### Number of pedestrian and bicycle crashes



#### Key safety findings

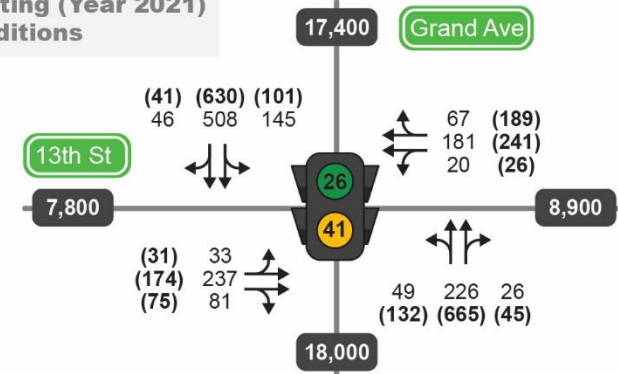
- ✓ PCR in Tier 1 – Reduction to crashes expected with intersection improvements.
- ✓ Half of the crashes at this intersection are rear end crashes.
- ✓ There were two pedestrian injury crashes at this intersection during recent 5 years.

Source: Iowa DOT Draft Safety Analysis Guide and ICAT Crash Data (2015-2019)

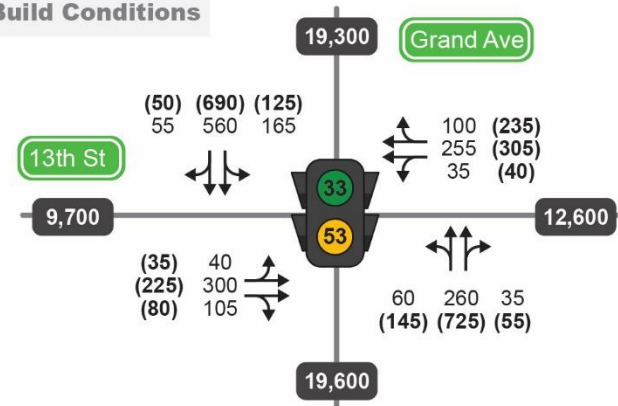
### Traffic Counts & Operations

Grand Avenue traffic volumes are projected to grow by 10% by year 2045 and 13<sup>th</sup> Street is projected to grow by 30%. Existing PM peak hour operations are LOS 'D' due to northbound/southbound split phasing. Operations are expected to degrade further by year 2045 and approach LOS 'E'. Existing queue lengths on Grand Avenue and 13<sup>th</sup> Street are expected to increase by 100' by year 2045 to ~550' on Grand Avenue and ~350' on 13<sup>th</sup> Street during the PM peak hour.

#### Existing (Year 2021) Conditions



#### Future (Year 2045) No-Build Conditions



#### LEGEND

- ## (##) AM and (PM) Peak Hour Volumes
- Intersection Lane Geometrics
- #,### Average Annual Daily Traffic (AADT)
- ⌚ AM Peak Hour Signalized Intersection Delay
- ⌚ PM Peak Hour Signalized Intersection Delay
- A B C D E F Level of Service

# Grand Avenue & 13th Street Intersection Improvements

**Project Approach:** Implement a multi-modal design per the complete streets plan while minimizing impacts to adjacent properties

## Key Improvements

- Adding left-turn lanes in all directions
- New traffic signal
- Dedicated left-turn signal phasing
- Coordinated signal system along Grand Avenue
- Shared-use path along west side of Grand Avenue
- Leading pedestrian interval

## Expected Benefits

- Reduced crashes
  - Expected to reduce crashes by 25%
  - Create more predictable movement at the intersection for users
- Overall delay expected to be LOS 'C' or better with queue lengths less than 300 feet.
- Improved driver expectancy
- Increased awareness of pedestrians and bicyclists in the crosswalk

## Public Feedback

- Mostly positive public sentiment
- Significant number of concerns regarding east/west traffic delays with current condition
- Left-turn lanes will alleviate queuing related to CyRide and left-turn traffic in through lanes
- Concerns from adjacent residents regarding impacts to properties

## Next Steps for Improvements

- Preliminary and final design of improvements and ROW acquisition
- Per the CIP, design and ROW is scheduled for years 2024/2025 and construction is scheduled for years 2025/2026

## Planning-Level Cost Estimate

- \$2,800,000 - ROW and property acquisition, construction of left-turn lanes on all approaches, new sidewalk adjacent to widened roadways, shared-use path from 12th Street to 500' north of 13th Street and new traffic signal
  - Shared-use path/sidewalk easement required along adjacent properties
  - Two property acquisitions in the northwest quadrant of the intersection and minor ROW acquisition on the remaining quadrants





## Grand Avenue & 16<sup>th</sup> Street

The 16<sup>th</sup> Street stop-controlled approaches to Grand Avenue experience high delays. 16<sup>th</sup> Street also serves as an east-west pedestrian and bicycle crossing of Grand Avenue due to vulnerable road user concerns of using the adjacent east-west corridors and signalized crossings on Grand Avenue at 13<sup>th</sup> Street and 20<sup>th</sup> Street. The Multimodal Roadway Improvements section of the CIP includes an enhanced intersection crossing planned for implementation in years 2023/2024. Additionally, the MTP identified a shared-use path along Grand Avenue between 6<sup>th</sup> and 16<sup>th</sup> Street that was identified as a fiscally constrained bicycle and pedestrian path planned for completion in 2025-2029.

### Safety Analysis

PCR Values/ Tier Classification	Injury PCR 0.29 ↓			All crash PCR 2.50 ↓		
	TIER 3 Performing Better Than Predicted	TIER 2 Potential for Safety Improvement	TIER 1 Safety Consultation	TIER 3 Performing Better Than Predicted	TIER 2 Potential for Safety Improvement	TIER 1 Safety Consultation
PCR Tier	All crashes PCR < 0	0 < PCR < 1	PCR > 1	All crashes PCR < 0	0 < PCR < 1	PCR > 1
Thresholds	Injury crashes PCR < 0	0 < PCR < 0.25	PCR > 0.25	Injury crashes PCR < 0	0 < PCR < 0.25	PCR > 0.25

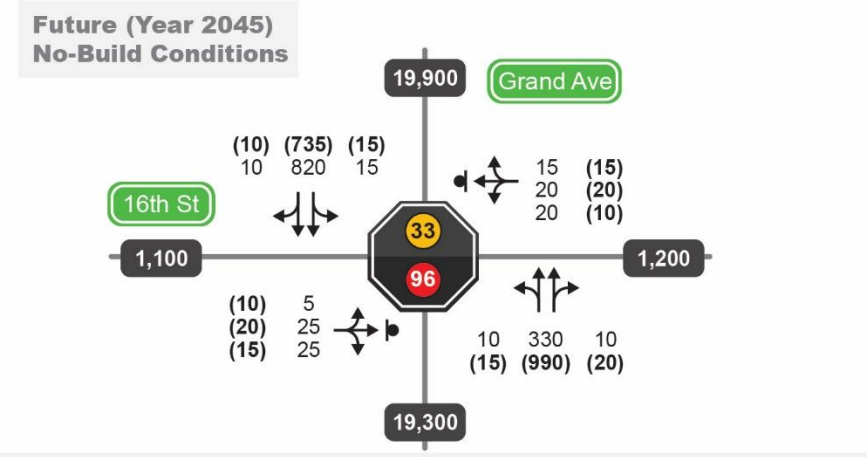
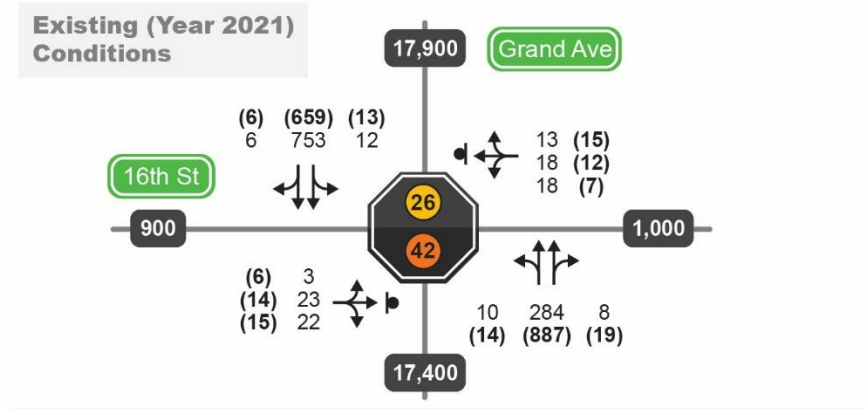


- Key safety findings**
- ✓ Nearly half of crashes involved injury.
  - ✓ PCR in Tier 1 – Reduction to crashes expected with intersection improvements.
  - ✓ A majority of the crashes at this intersection are angle crashes.
  - ✓ There was one bicycle injury crash at this intersection during recent last 5 years.

Source: Iowa DOT Draft Safety Analysis Guide and ICAT Crash Data (2015-2019)

### Traffic Counts & Operations

Grand Avenue traffic volumes are projected to grow by 10% by year 2045 and 16<sup>th</sup> Street is projected to grow by 20%. Existing operations are LOS 'E' for side street stopped traffic during the PM peak hour due to limited gaps in traffic on Grand Avenue to allow for 16<sup>th</sup> Street traffic to turn onto or cross Grand Avenue. Operations are expected to degrade further by year 2045 to LOS 'F' during the PM peak hour. Note that a traffic signal is not warranted at the intersection.



**LEGEND**

- ## (##) AM and (PM) Peak Hour Volumes
- Intersection Lane Geometrics
- ##,### Average Annual Daily Traffic (AADT)
- Stop Sign
- ## (##) AM Peak Hour Minor Road Stop-Controlled Delay
- ## (##) PM Peak Hour Minor Road Stop-Controlled Delay
- Worst-Case Approach
- A B C D E F Level of Service

# Grand Avenue & 16th Street Intersection Improvements

*Project Approach: Identify a solution to improve intersection safety and side street delay within existing ROW*

## Key Improvements

- Raised median on Grand Avenue at 16th Street
- Shared-use path along west side of Grand Avenue

## Expected Benefits

- Reduced crashes - eliminate crossing conflicts that often lead to injury

## Public Feedback

- Public opposition to build alternative
- Need to maintain east/west crossing for pedestrians and bicyclists
- Prefer to maintain full access for vehicles

## Next Steps for Improvements

- Additional study of intersection following improvements at Grand Avenue & 13th Street and Grand Avenue & 20th Street to determine travel pattern changes for all modes resulting from adjacent intersection improvements
- Coordinate with Cyride and Iowa DOT for consistency of long-term plans at the intersection
- If pursued in the future, median needs to be wide enough to fit a pedestrian refuge (cost and ROW/easement would be impacted)
- Lowest priority project within the Grand Avenue corridor and should be considered for implementation after all other projects are complete
- Reevaluate Grand Avenue & 16th Street in the next MTP

## Planning-Level Cost Estimate

- \$54,000 – Construction of 4-foot median on Grand Avenue and shared-use path along west side of Grand Avenue south of 16th Street for 225 feet, as shown in the graphic
  - Shared-use path easement required along properties on west side of Grand Ave
  - No ROW acquisition required
- Improvements to create a median on Grand Avenue wide enough to fit a pedestrian refuge would require widening of Grand Avenue resulting in order-of-magnitude costs near \$180,000





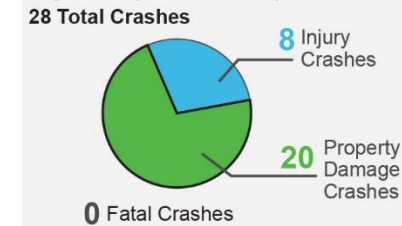
## Grand Avenue & 20<sup>th</sup> Street

The intersection of Grand Avenue & 20<sup>th</sup> Street experiences a moderate level of pedestrian and bicycle travel. There are three schools located along the 20<sup>th</sup> Street corridor within a half mile of Grand Avenue. 20<sup>th</sup> Street is also a designated bicycle-friendly street and has bike lanes planned for the corridor in the 2045 MTP from Ames High School to Duff Avenue. Other previously planned improvements include the addition of left-turn lanes and signal improvements projected in the MTP as short-term projects (2025-2029).

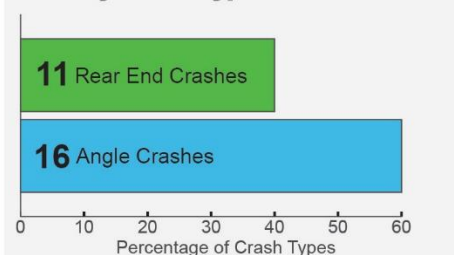
### Safety Analysis

PCR Values/ Tier Classification	Injury PCR 0.13 ↓			All crash PCR 2.36 ↓		
	TIER 3 Performing Better Than Predicted	TIER 2 Potential for Safety Improvement	TIER 1 Safety Consultation	TIER 3 Performing Better Than Predicted	TIER 2 Potential for Safety Improvement	TIER 1 Safety Consultation
PCR Tier	All crashes PCR < 0	0 < PCR < 1	PCR > 1	All crashes PCR < 0	0 < PCR < 1	PCR > 1
Thresholds	Injury crashes PCR < 0	0 < PCR < 0.25	PCR > 0.25	Injury crashes PCR < 0	0 < PCR < 0.25	PCR > 0.25

#### Total Crashes During Recent 5 years (2015-2019)



#### Primary crash types



#### Number of pedestrian and bicycle crashes



#### Key safety findings

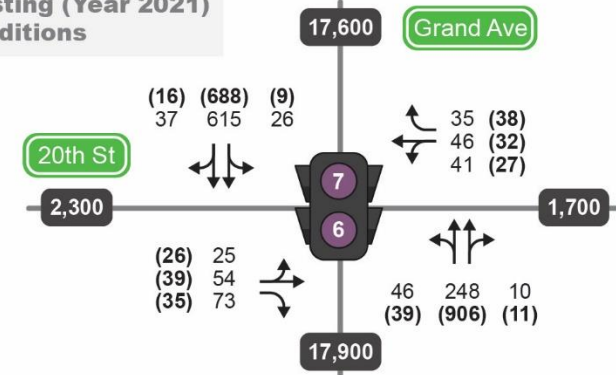
- ✓ PCR in Tier 1 – Reduction to crashes expected with intersection improvements.
- ✓ Nearly all crashes at this intersection are angle or rear end crashes.
- ✓ 90% of crashes involved only vehicles traveling north/south on Grand Avenue.
- ✓ There was one bicycle injury crash at this intersection during recent 5 years.
- ✓ Several safety deficiencies have been noted at the intersection, primarily for vehicles traveling north/south.

Source: Iowa DOT Draft Safety Analysis Guide and ICAT Crash Data (2015-2019)

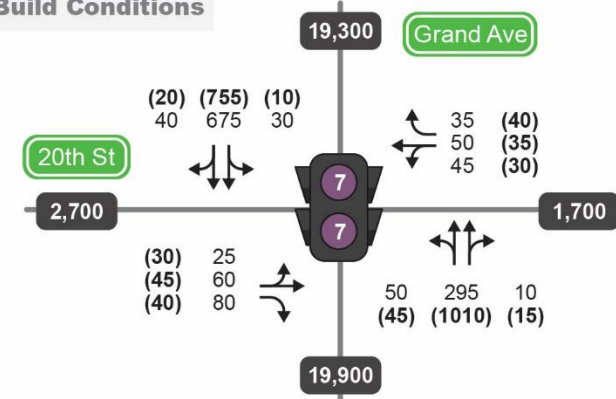
### Traffic Counts & Operations

Grand Avenue traffic volumes are projected to grow by 10% by year 2045 and 20<sup>th</sup> Street is projected to grow by 20%. Existing operations are LOS 'A' during AM and PM peak hours and expected to remain at LOS 'A' in year 2045 no-build conditions.

#### Existing (Year 2021) Conditions



#### Future (Year 2045) No-Build Conditions



#### LEGEND

- ## (##) AM and (PM) Peak Hour Volumes
- Intersection Lane Geometrics
- #,### Average Annual Daily Traffic (AADT)
- AM Peak Hour Signalized Intersection Delay
- PM Peak Hour Signalized Intersection Delay
- A B C D E F Level of Service



# Grand Avenue & 20th Street Intersection Improvements

**Project Approach:** Implement a multi-modal design per the complete streets plan with improved geometry for driver expectancy within existing ROW

## Key Improvements

- Add left-turn lanes on Grand Avenue
- Dedicated left-turn signal phasing
- Restripe 20th Street to include dedicated left-turn lanes
- Coordinated signal system along Grand Avenue
- Leading pedestrian interval
- Shared-use path along south side of 20th Street

## Expected Benefits

- Reduced crashes
  - Expected to reduce crashes by 25%
  - Create more predictable movement at the intersection for users
- Improved driver expectancy
- Reduce vehicle delays/queuing
- Increased awareness of pedestrians and bicyclists in the crosswalk

## Public Feedback

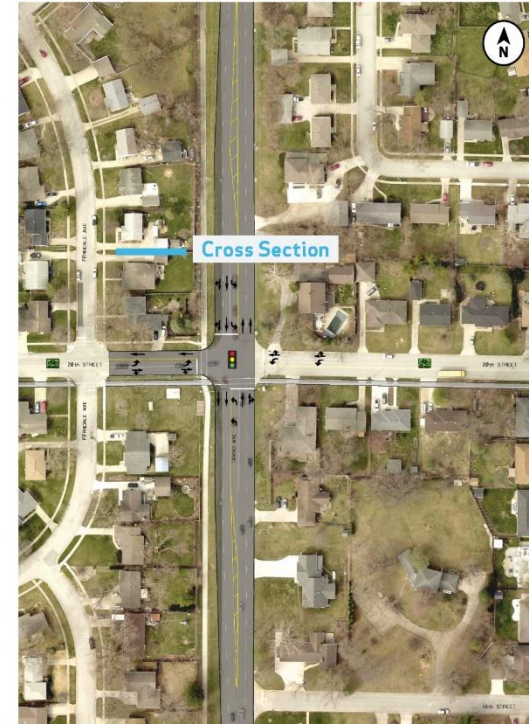
- Mostly positive public sentiment
- Concern over potential conflict of turning path for southbound right-turning truck/bus with stopped eastbound left-turn traffic

## Next Steps for Improvements

- Program the roadway widening, restriping and traffic signal modifications through the Traffic System Capacity Improvements program in a future CIP
- Program the shared-use path improvements on 20th Street through the Shared-Use Path System Expansion program in the CIP

## Planning-Level Cost Estimate

- \$450,000 – Construction of left-turn lanes on Grand Avenue (widen Grand Avenue 500 feet north and south of 20th Street), shared-use path along south side of 20th Street from Ferndale Avenue to Wilson Avenue and traffic signal modifications
  - Project anticipated to fit within existing ROW due to wide area between the west curb line and existing shared-use path



## Grand Avenue & 24<sup>th</sup> Street

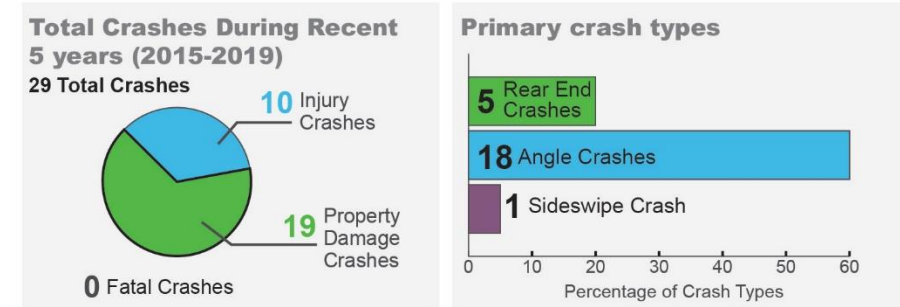
The intersection of Grand Avenue & 24<sup>th</sup> Street has shared through/left-turn lanes for the east-west approaches, creating slowing/stopped traffic in the inside through lanes on 24<sup>th</sup> Street. On the east side of Grand Avenue, 24<sup>th</sup> Street quickly transitions from a four-lane roadway to a two-lane roadway. The intersection experiences a moderate level of pedestrian and bicycle travel as a result of the existing side path along the south side of 24<sup>th</sup> Street west of Grand Avenue and adjacent North Grand Mall. Previously planned improvements identified in the MTP include a shared-use path on the south side of 24<sup>th</sup> Street from Grand Avenue to Duff Avenue planned for completion in 2025-2029.

### Safety Analysis

**PCR Values/ Tier Classification**

All crash PCR **-0.34** ↓  
Injury PCR **0.14** ↓

	TIER 3 Performing Better Than Predicted	TIER 2 Potential for Safety Improvement	TIER 1 Safety Consultation
PCR Tier	All crashes PCR < 0	0 < PCR < 1	PCR > 1
Thresholds	Injury crashes PCR < 0	0 < PCR < 0.25	PCR > 0.25



**Number of pedestrian and bicycle crashes**

- 4 Bicycle Crashes
- 0 Pedestrian Crashes

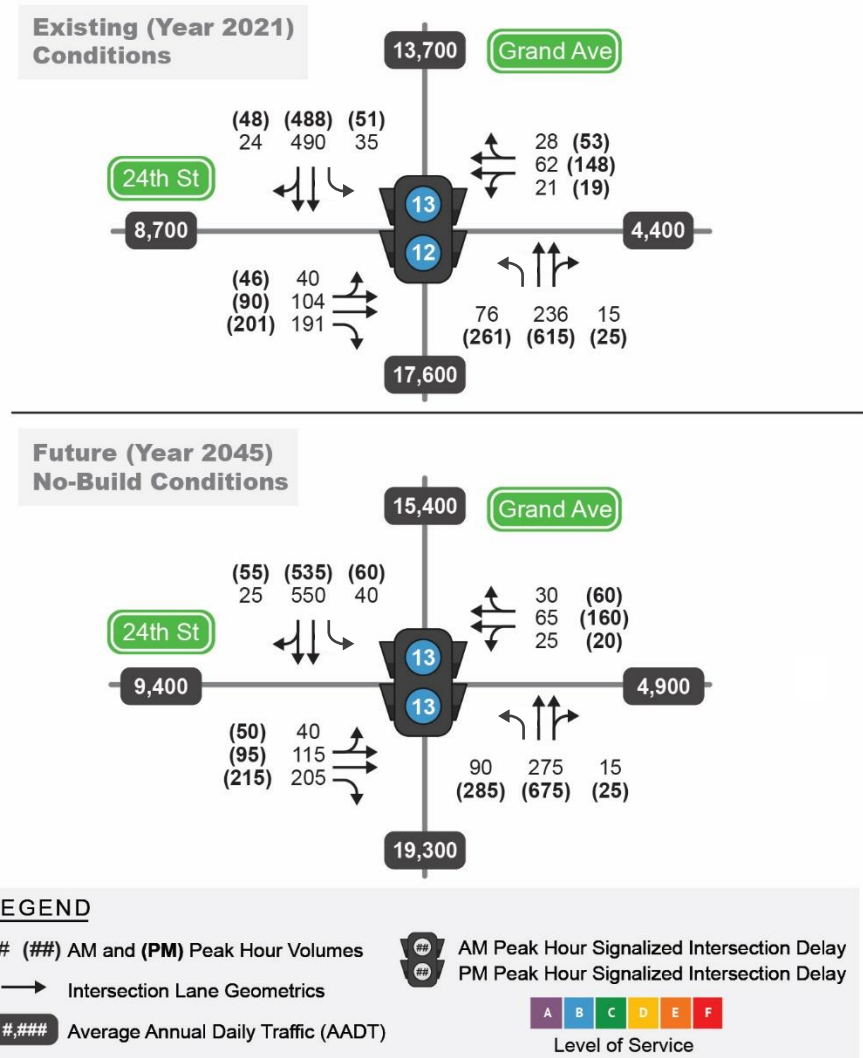
**Key safety findings**

- ✓ A majority of the crashes at this intersection are angle crashes.
- ✓ There were four bicycle injury crashes at this intersection during recent 5 years.

Source: Iowa DOT Draft Safety Analysis Guide and ICAT Crash Data (2015-2019)

### Traffic Counts & Operations

Grand Avenue and 24<sup>th</sup> Street traffic volumes are projected to grow by 10% by year 2045. Existing operations are LOS 'B' during AM and PM peak hours and expected to remain at LOS 'B' in year 2045 no-build conditions.





# Grand Avenue & 24th Street Intersection Improvements

**Project Approach: Implement a multi-modal design per the complete streets plan with improved geometry for driver expectancy within existing ROW**

## Key Improvements

- Restriping lanes on 24th Street to provide dedicated east/west left-turn lanes
- New traffic signal
- Coordinated signal system along Grand Avenue
- Three-lane road on 24th Street between Grand Avenue and Jensen Avenue utilizing existing pavement
- Shared-use path along south side of 24th Street east of Grand Avenue
- Leading pedestrian interval
- Decrease SW corner radius to standard dimension

## Expected Benefits

- Improved driver expectancy
- Reduced vehicle delays/queuing
- Increased awareness of pedestrians and bicyclists in the crosswalk

## Public Feedback

- Mostly positive public sentiment

## Next Steps for Improvements

- Program the intersection restriping and traffic signal replacement through the Traffic System Capacity Improvements program in a future CIP
- Program the shared-use path improvements on 24th Street through the Shared-Use Path System Expansion program in a future CIP

## Planning-Level Cost Estimate

- \$600,000 – Remove median on east leg, modify intersection returns, construct shared-use path along south side of 24th Street from Grand Avenue to Jensen Avenue and new traffic signal
  - Project anticipated to fit within existing ROW
  - Signal pole replacement may require traffic signal easements





## 4. Improvements Summary & Implementation Plan

The following Grand Avenue intersection improvements are summarized by intersection and type of improvement in **Table 1**.

**Table 1. Summary of Key Improvements**

Key Improvements	Intersection				
	Grand Avenue & 9 <sup>th</sup> Street	Grand Avenue & 13 <sup>th</sup> Street	Grand Avenue & 16 <sup>th</sup> Street	Grand Avenue & 20 <sup>th</sup> Street	Grand Avenue & 24 <sup>th</sup> Street
<b>Add Left-Turn Lanes</b>		All Directions		Northbound & Southbound Lefts	
<b>Restripe to Include Left-Turn Lanes</b>				Eastbound & Westbound Lefts	Eastbound & Westbound Lefts
<b>Raised Median</b>			On Grand Avenue Through Intersection		
<b>Three-Lane Road</b>					Grand Avenue to Jensen Avenue
<b>Shared-Use Path</b>	Along Grand Avenue (West Side)	Along Grand Avenue (West Side)	Along Grand Avenue (West Side)	Along 20 <sup>th</sup> Street (South Side)	Along 24 <sup>th</sup> Street (South Side)
<b>New Traffic Signal</b>		New Mast Arms for All Approaches			New Mast Arms for All Approaches
<b>Coordinate Signal System</b>	Northbound & Southbound Progression	Northbound & Southbound Progression		Northbound & Southbound Progression	Northbound & Southbound Progression
<b>Leading Pedestrian Interval</b>	All Pedestrian Movements	All Pedestrian Movements		All Pedestrian Movements	All Pedestrian Movements
<b>Update Yellow and Red Time</b>		All Directions		Eastbound & Westbound	
<b>Dedicated Left-Turn Signal Phasing</b>		All Lefts		Northbound & Southbound Lefts	

## Cost Summary & Implementation Plan

Next steps for improvements at each study intersection are summarized below. Note that each individual project is expected to go through its own public input process as part of the preliminary and final design.

### 9<sup>th</sup> Street and Grand Avenue

- Planning-Level Cost Estimate: \$70,000 with no ROW acquisition required
- Next Steps: Program the shared-use path improvements on Grand Avenue through the Shared-Use Path System Expansion Program in a future CIP

### 13<sup>th</sup> Street and Grand Avenue

- Planning-Level Cost Estimate: \$2.8 million, including two property acquisition in the northwest quadrant and minor ROW acquisition on the remaining quadrants
- Next Steps:
  - Preliminary and final design of improvements and ROW acquisition
  - Per the CIP, design and ROW is scheduled for years 2024/2025 and construction is scheduled for years 2025/2026

### 16<sup>th</sup> Street and Grand Avenue

- Planning-Level Cost Estimate: \$54,000 with no ROW acquisition required for improvements illustrated in this report (with 4-foot median); Improvements to create a median on Grand Avenue wide enough to fit a pedestrian refuge would require widening of Grand Avenue resulting in order-of-magnitude costs near \$180,000
- Next Steps:
  - Additional study of intersection following improvements at Grand Avenue & 13<sup>th</sup> Street and Grand Avenue & 20<sup>th</sup> Street to determine travel pattern changes for all modes resulting from adjacent intersection improvements
  - Coordinate with CyRide and Iowa DOT for consistency of long-term plans at the intersection.
  - Reevaluate Grand Ave & 16<sup>th</sup> Street in the next MTP

### 20<sup>th</sup> Street and Grand Avenue

- Planning-Level Cost Estimate: \$450,000 with no ROW acquisition required
- Next Steps:
  - Program the roadway widening, restriping and traffic signal replacement through the Traffic System Capacity Improvements program in a future CIP
  - Program the shared-use path improvements on Grand Avenue through the Shared-Use Path System Expansion Program in a future CIP

### 24<sup>th</sup> Street and Grand Avenue

- Planning-Level Cost Estimate: \$600,000 with no ROW acquisition required
- Next Steps:
  - Program the intersection restriping and traffic signal replacement through the Traffic System Capacity Improvements program in a future CIP
  - Program the shared-use path improvements on Grand Avenue through the Shared-Use Path System Expansion Program in a future CIP

## Appendix

- Grand Avenue & 9<sup>th</sup> Street Intersection Improvements
- Grand Avenue & 13<sup>th</sup> Street Intersection Improvements
- Grand Avenue & 16<sup>th</sup> Street Intersection Improvements
- Grand Avenue & 20<sup>th</sup> Street Intersection Improvements
- Grand Avenue & 24<sup>th</sup> Street Intersection Improvements



Grand Avenue & 9th Street Intersection Improvements



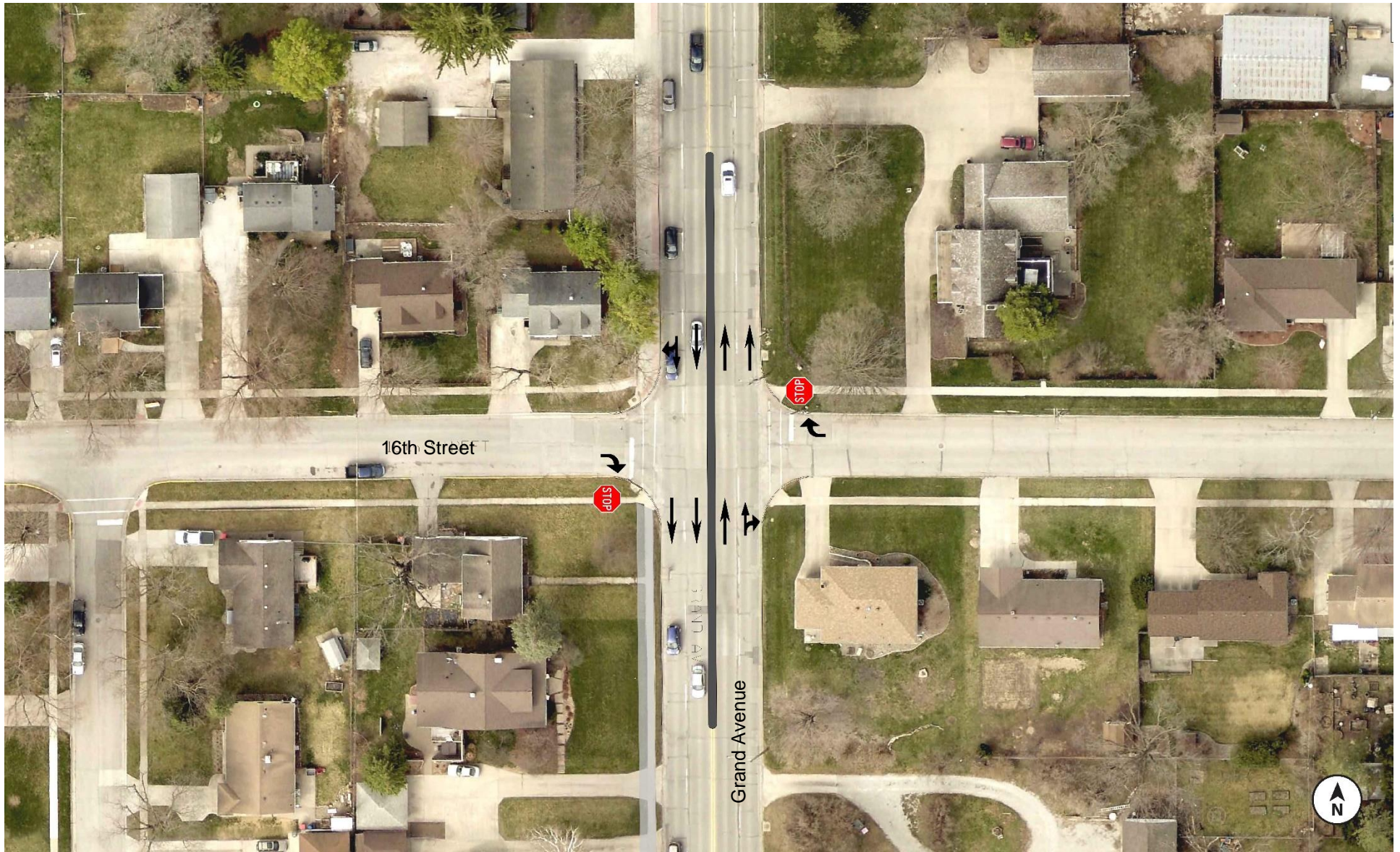


Grand Avenue & 13<sup>th</sup> Street Intersection Improvements





Grand Avenue & 16<sup>th</sup> Street Intersection Improvements





Grand Avenue & 20<sup>th</sup> Street Intersection Improvements





Grand Avenue & 24<sup>th</sup> Street Intersection Improvements

