

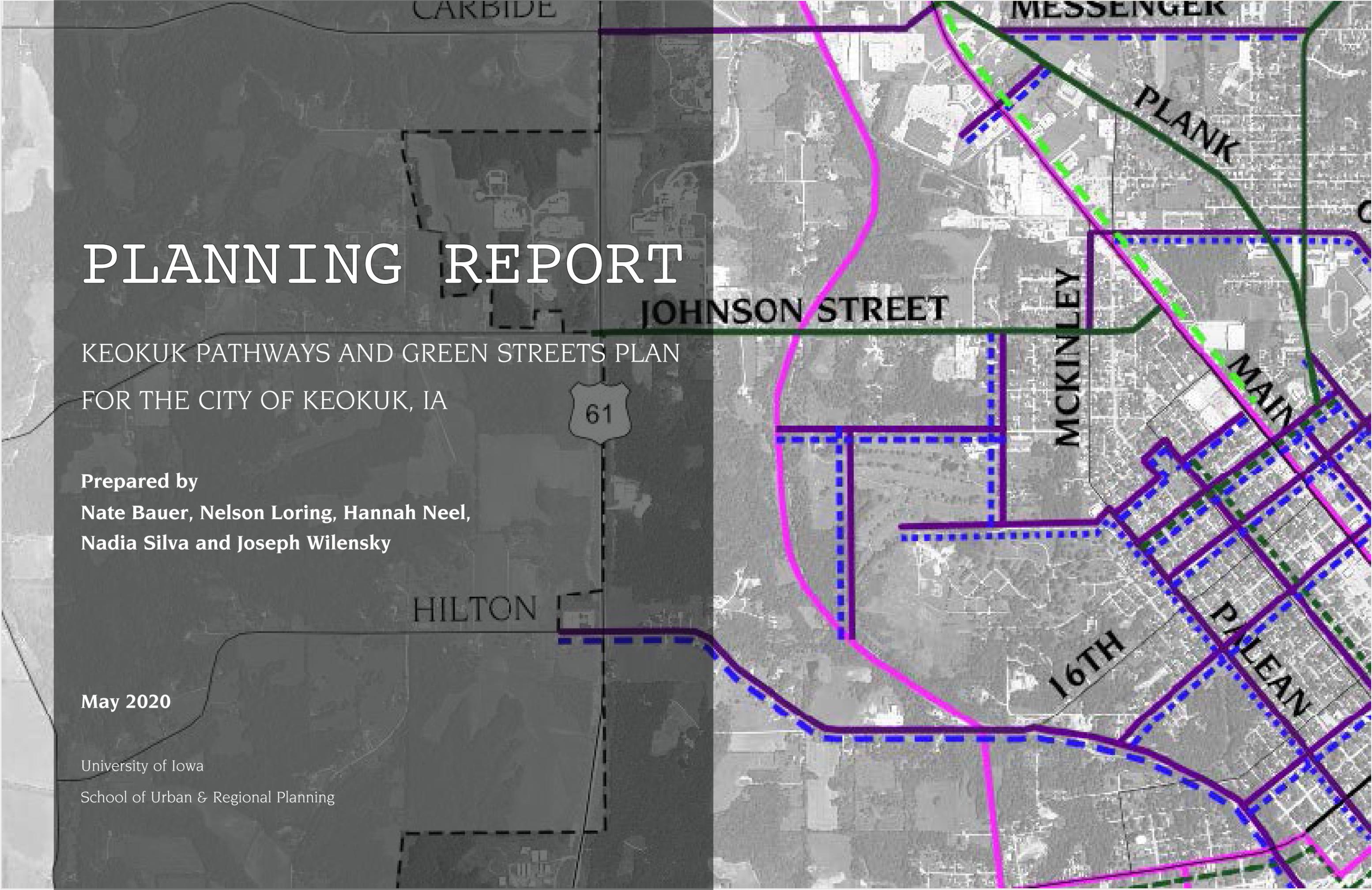
# PLANNING REPORT

KEOKUK PATHWAYS AND GREEN STREETS PLAN  
FOR THE CITY OF KEOKUK, IA

Prepared by  
Nate Bauer, Nelson Loring, Hannah Neel,  
Nadia Silva and Joseph Wilensky

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University of Iowa  
School of Urban & Regional Planning



**FACULTY ADVISORS:**

Dr. Lucie Laurian  
Dr. Steven Spears

**COURSE:**

Field Problems in Planning  
URP:6209:0001

**COMMUNITY PARTNERS:**

Keokuk Area Chamber of  
Commerce

City of Keokuk

Southeast Iowa Regional  
Planning Commission



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Iowa Initiative for Sustainable Communities

The University of Iowa, 111 Jessup Hall, Iowa City, IA, 52241

Phone: 319.335.0684 // Website: <https://iisc.uiowa.edu>

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## **LIST OF ACRONYMS**

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AADT - Annual Average Daily Traffic Count  
ADA - Americans with Disabilities Act  
ATP - Active Transportation Plan  
APA - American Planning Association  
BNSF - Burlington Northern Santa Fe Railroad  
CWSRF - Clean Water State Revolving Fund  
EPA - U.S Environmental Protection Agency  
ICAT - Iowa Crash Analysis Tool  
IDOT - Iowa Department of Transportation  
IISC - Iowa Initiative for Sustainable Communities  
KPGP - Keokuk Pathways and Green streets Plan  
MSD - Metropolitan Sewer District  
MUTCD - Manual on Uniform Traffic Control Devices  
Mph - Miles per Hour  
NACTO - National Association of City Transportation Officials  
NC - North Carolina  
ROW - Right of Way  
SEIRPC - Southeast Iowa Regional Planning Commission  
SRTS - Safe Routes to School  
VMT - Vehicle Mile Traveled  
TEAP - Traffic Engineering Assistance Program

## **ACKNOWLEDGMENTS**

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Finally, we would be remiss if we did not acknowledge and thank the residents of Keokuk for their assistance in the research drafting of this plan. The plan would be poorer without their generous contributions of time and local knowledge, and their dedication to improving Keokuk was an inspiration during the drafting of this document.

# EXECUTIVE SUMMARY

The University of Iowa’s School of Urban and Regional Planning and the Iowa Initiative for Sustainable Communities has partnered with the City of Keokuk, Iowa to provide the city with a pedestrian and bicycle pathway network and green streets decision matrix to link priority destinations and increase community safety while also increasing residential quality of life. By creating safe pathways between community destinations and by mitigating the impacts of stormwater runoff, urban green streets can increase the quality of life in Keokuk.

The goals of the Keokuk Pathways and Green streets Plan (KPGP) are to increase safety and connectivity for bicyclists and pedestrians in Keokuk, address aging street infrastructure, and address stormwater runoff in a cost-effective manner. Analyses and recommendations within this plan are based on guiding principles that including safety, equity, financial efficiency, flood mitigation, and improving residential quality of life.

To increase community connectivity, the location of community assets and their links to major employers, multi-family dwelling units, schools, parks, and grocery stores as points of interest and popular destinations guided the creation of the pathway network. Traffic volumes, collisions, road conditions, and a sidewalk inventory were considered when determining network treatment types and location.

When creating a pathway network that is sensitive to local ecological needs and community preferences, local experts and Keokuk residents were consulted for their knowledge; planning best practices and

community case studies were reviewed, and on-the-ground conditions were analyzed. Public input was gathered to determine areas perceived to be dangerous for bicyclists and pedestrians, where Keokuk would be best served by Pathway connections, and where precipitation- induced flooding occurs in the city.

The Pathway network includes a range of treatment options including shared use lanes through residential areas, conventional and buffered bike lanes on high volume streets, and off-street multi-use trails along the Main Street corridor, Highway 136, and areas well-suited for recreational use. To prioritize implementation, the network has been separated into three different phases. Phase One includes priority connections that are needed to address immediate safety concerns on high-volume streets where there is inadequate bicycle and pedestrian infrastructure. Phase Two involves filling out the network to increase connectivity through residential neighborhoods. The third and final phase includes aspirational trails primarily suited for recreational use.

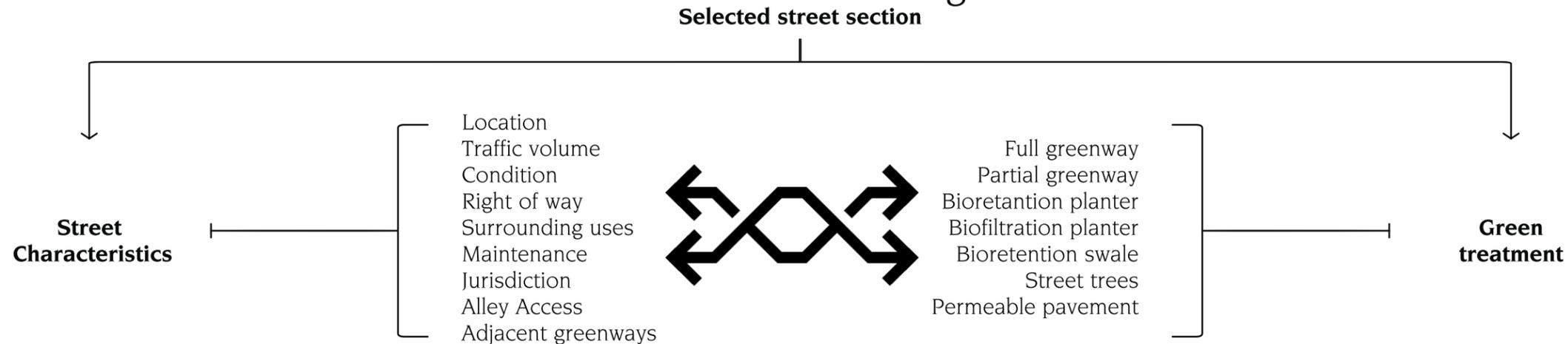
Urban Green streets are proposed to help control stormwater runoff, reduce infrastructure costs, beautify streets, and increase recreational opportunities in Keokuk. Leveraging ongoing infrastructure work undertaken to fulfill the EPA mandated sewer separation project, Green streets can be implemented at a lower cost than would be possible as a stand-alone project. To guide the selection and implementation of Green streets and other green infrastructure, a decision matrix has been developed. This tool is designed to analyze street segments, block by block, based on characteristics including traffic volume, proximity to important

destinations, flooding, street conditions, and other important street characteristics. Based on these characteristics, specific green treatments receive suitability scores that rank different treatment options for each location.

Cost-effective implementation options for both Pathways and Green streets treatments were prioritized, with priority consideration given to treatment options that are effective, require little in the way of physical interventions, and reduce ongoing maintenance costs compared to the status quo. Interventions are also suggested to coincide with ongoing infrastructure upgrades like routine street repair work or sewer reconstruction projects planned by the City. Even so, Keokuk is encouraged to seek external funding sources to reduce community costs. A guide to potential funding sources is included in this report along with recommended fundraising practices.

In conjunction with raising external funds, community support is vital to the implementation and subsequent use of the Pathways and Green streets networks. To help generate community enthusiasm, a community “pop-up event” how-to is also provided, outlining ways that community and civic leaders can preview the networks to community residents and build excitement for the proposal. Increased engagement and community enthusiasm will highlight the value of the network to local officials as well as provide additional documentation of community support for grant applications.

## Decision Matrix Diagram



## HOW TO USE THIS PLAN

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This document is broken into sections for the convenience of readers as outlined in the Table of Contents. If viewed electronically, the Table of Contents also acts as a hyperlink to each section, allowing users to “jump” to each section individually.

Readers may notice specific icons in the Guiding Principles section after each of the five KPGP principles. These icons are also featured throughout the case studies, local conditions, and recommendations sections of the document to highlight areas where the guiding principles influenced research direction and final KPGP recommendations.

Commonly used acronyms are highlighted on the List of Acronyms section of the KPGP. Additional technical details may be found in the Appendix including:

Information on estimated project costs;

Grant opportunities;

The Green streets Matrix;

Suggestions on coordination with private landowners;

How the KPGP furthers the goals of the 2018 Keokuk Comprehensive Plan; and,

The consolidated results of community surveys.



Equity



Financial efficiency



Quality of Life



Safety



Flooding

# 1. Introduction

This plan was prepared as part of the Iowa Initiative for Sustainable Communities (IISC). IISC is an engaged-learning program that partners students, faculty, and staff with Iowa communities to complete projects that enhance sustainability. The Keokuk Pathways and Green streets Plan (KPGP) was created by a group of students from The University of Iowa's School of Urban and Regional Planning.

Keokuk's location along the Mississippi River and historic significance provide opportunities for recreation and civic pride. Both the historic Lock and Dam No. 19 and the Keokuk National Cemetery are popular destinations for residents and visitors to Keokuk. Providing better access to these and other locations will provide more opportunities for physical activity and increase quality of life.

Like many other cities, Keokuk is experiencing population decline and some of the challenges of a diminishing tax-base. As city revenue declines due to population loss, available funds for city infrastructure maintenance are becoming scarce with a potential decline in the quality of infrastructure like public streets and right of ways (ROW). The degradation of street infrastructure quality can lead to many issues for residents including reduced mobility, increased wear on public and private vehicles, and an overall reduction in civic pride and curb appeal for residents and visitors to the community. Adding to maintenance challenges is a U.S. Environmental Protection Agency (EPA) mandated sanitary and storm sewer separation project that could consume a large portion of available community resources. The declining condition of residential streets and the mandated sewer separation project provide Keokuk with an opportunity to explore urban Green streets and other types of green infrastructure to manage stormwater, beautify streets, and provide enhanced recreational opportunities for residents.

Expanding sidewalks and mixed-use trails throughout Keokuk will help ensure that all residents have access to key destinations in town including parks, schools, grocery stores, employment centers and civic destinations. Integrating this bicycle and pedestrian Pathway network with urban Green streets will increase safety and connectivity for bicyclists and pedestrians in Keokuk and address both the aging street infrastructure and stormwater runoff in a cost-effective manner.

Figure 1.1. Keokuk and surroundings Cities and States 



# 2. Background

## 2.1. KEOKUK HISTORY

The city of Keokuk is located at the confluence of the Des Moines and Mississippi Rivers, immediately south of the Des Moines River Rapids. With a combination of bluffs overlooking the Mississippi and the narrowed course of the river, Keokuk was ideally situated for concentrated human habitation and trading. Originally settled by the Fox and Sac Native American tribes, the area was designated by the U.S. Government as a Native American reservation in 1825, specifically for those people with mixed European and Native American ancestry.

The prime trading location of the then named “Half-Breed Tract” attracted European settlers who soon established a trading post and settlement in violation of the negotiated treaty. Settlement in Keokuk rapidly increased, with formal platting and sale of land by 1837. Keokuk was officially recognized and incorporated as a city on December 13, 1847, shortly after Iowa was itself admitted to the United States as a state.

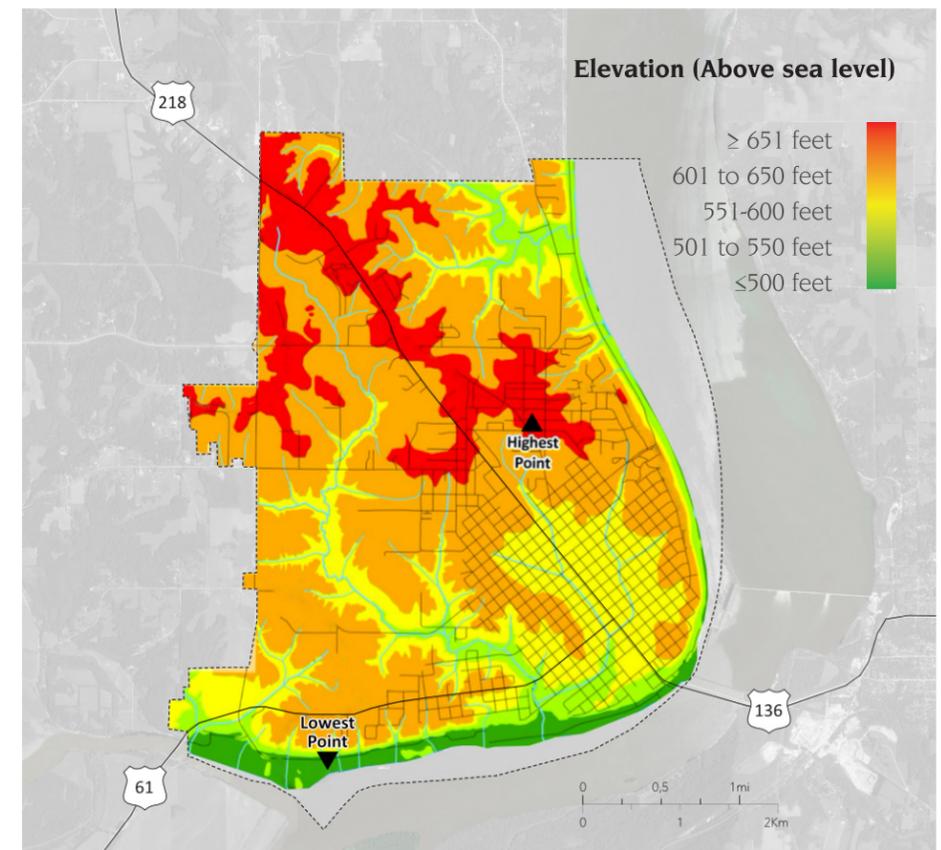
The city’s location below the Des Moines River rapids provided Keokuk with an economy firmly rooted in the transportation and shipping of goods down the Mississippi. Keokuk’s strategic location and experience with shipping became of vital importance during the Civil War as the community served as a major Union Army hub for soldiers departing for and returning from the Southern battlefields. This activity even created a need for the establishment of the first national cemetery west of the Mississippi in western Keokuk, a community resource that continues to operate and serve as a historical point of pride for the community.

Figure 2.1. Keokuk Topography Map →

Following the Civil War, Keokuk began building its industrial base with the establishment of a canal and lock system that provided additional shipping capacity and power generation resources that at one point gave Keokuk the largest per capita manufacturing workforce of any community in Iowa.

More modern declines in domestic manufacturing were also felt in Keokuk, with closures or significant downsizes of staff at many local companies. The population also suffered as new tax incentives for home building, coupled with the declining employment, prompted relocation across the Mississippi River to Hamilton, Illinois and outside of the city in Lee County. (Commission, 2018)

Featuring bluffs running along the Northeastern riverfront sections of the community, Keokuk’s topography slopes down to the riverfront, and creates opportunities for flash floods and substantial stormwater runoff through the community. As climate change increases the number and severity of precipitation in eastern Iowa, the increased amount of expected stormwater and flooding opportunities will continue to impact the community (Boulter, 2019).



## 2.2. DEMOGRAPHICS

As has been seen in numerous manufacturing communities across the United States, Keokuk's population has been in decline since the 1960's, with the highest population recorded during the 1960 census. Since that high of 16,119 residents, Keokuk has lost one-third of its population, with 10,780 residents recorded during the 2010 census. In addition to lowering population figures in the community, those that remain are economically challenged compared to the rest of the region and the state.

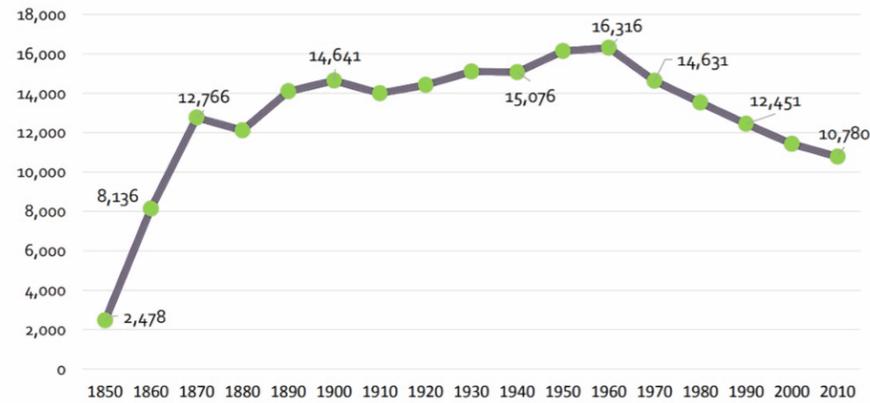


Figure 2.2. Graph of Keokuk Population change (Commission, 2018)

The median household income of Keokuk is \$33,608 (2015 dollars), much lower than the state median income of \$53,183 (2015 dollars). A similar gap exists for median family income: Keokuk's figure of \$43,227 is much lower than the Iowan average of \$67,466. Beyond low median household and family income, more than one-third of Keokuk households earn less than \$25,000 a year (Commission, 2018). This is an incidence of nearly 45 percent more than that of Lee County, in which Keokuk is located, and 69 percent higher than the state average of 21 percent.

Table 1: Keokuk Income and Unemployment.

	Keokuk	Lee County	Iowa	United States
Median household income	\$33,609	\$43,312	\$53,183	\$53,889
Median family income	\$43,277	\$55,694	\$67,466	\$66,011
% of households earning < \$25,000	36.8%	25.3%	21.8%	23.1%
% Unemployed (for workers in Labor Force)	10.8%	8.7%	4.9%	8.3%

Source: Commission, 2018 (Commission, 2018)

High unemployment rates contribute to the low median household. More than 10 percent of Keokuk's workforce is unemployed, two percentage points more than Lee County, and more than twice the state average.

Table 2: Keokuk Home Values

	Keokuk	Lee County	Iowa	United States
Median home value	\$66,000	\$85,400	\$129,200	\$178,600
% housing units valued at under \$50,000	33.4%	23.1%	11.2%	9.1%
Median gross rent	\$542	\$577	\$697	\$928
Median household income	\$33,608	\$43,312	\$53,183	\$53,889

Source: Commission, 2018 (Commission, 2018)

Alongside lower income levels, the median home value for owner-occupied homes in Keokuk is also lower than the State and County levels. Keokuk homes are, on average, worth less than homes in Lee County, the broader region, or across Iowa, and homes are much more likely to be valued under \$50,000 than homes in the county or across the state, 44.5 percent and 110 percent, respectively.

Residents of Keokuk primarily rely on personal automobiles for commuting purposes, with nearly 90 percent of all commuting trips using personal automobiles and 82 percent of all commuting trip accomplished by people driving alone. A further four percent of Keokuk residents walked or biked to work, often without adequate infrastructure to ensure their comfort, convenience, or safety when doing so.

Table 3: Keokuk Commuting Model Split

	Drive Alone	Carpool	Public Transport	Walked	Bicycle	Taxicab, Motorcycle, other	Worked at home
Percentage	82.2	7.2	0.9	3.5	0.4	2.6	3.1

Source: Bureau, 2019

Local government is primary funded through local property taxes and sales tax revenues, and the City of Keokuk is no exception. Lower property values and rental income have result in lower tax collection by the city. This has contributed to budget challenges and left the City of Keokuk unable to adequately address the needs of its aging physical infrastructure. However, with these challenges comes an opportunity for smart planning and resource conservation to bundle community priorities into projects and harness low-cost interventions to improve the safety and quality of life of all residents.

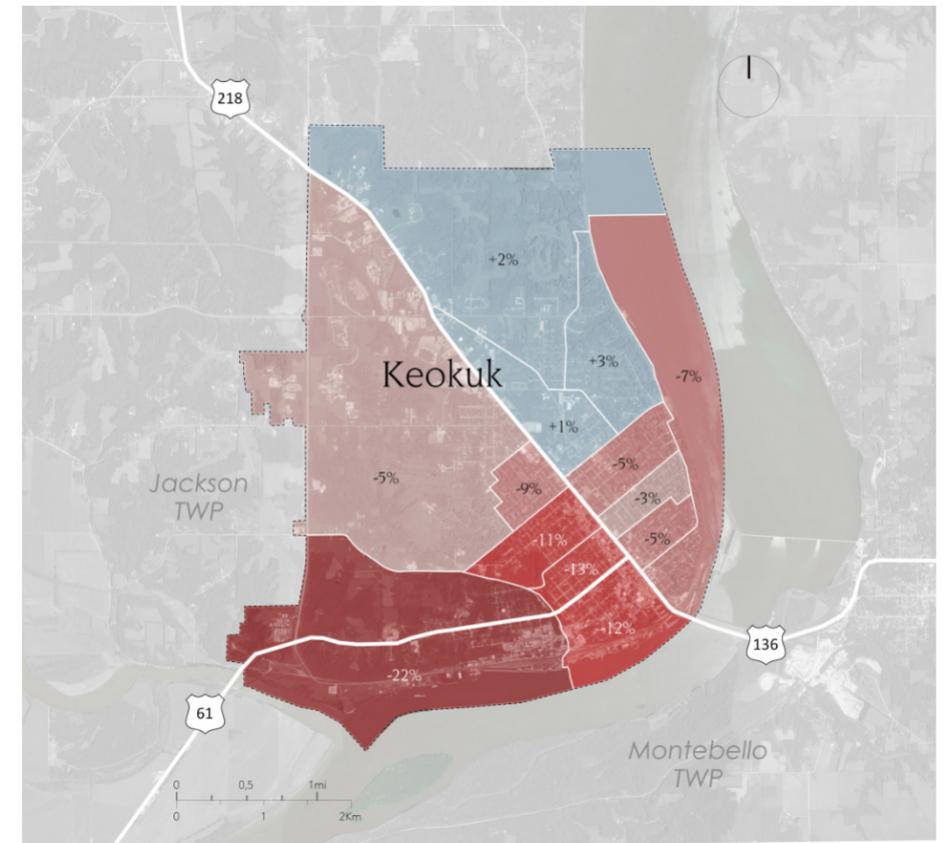
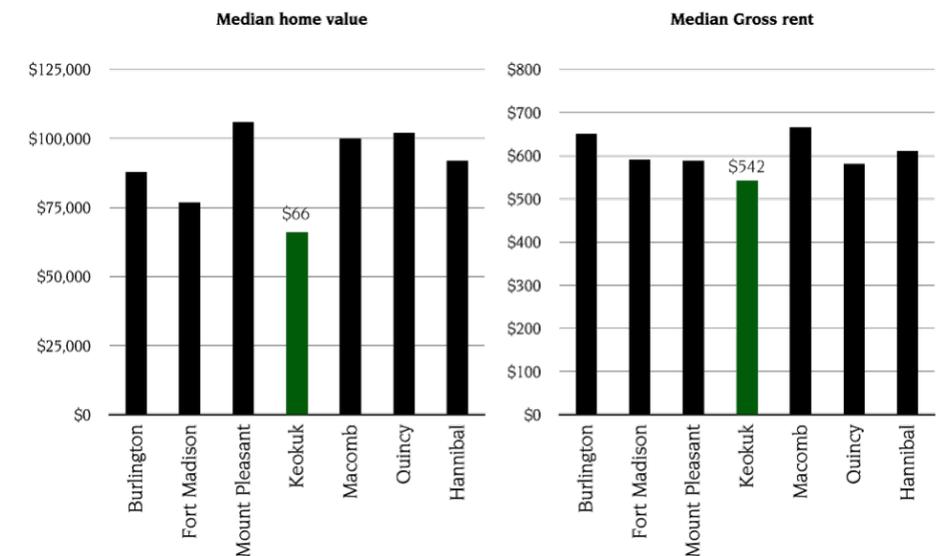


Figure 2.3. Keokuk Population (Commission, 2018)

Figure 2.4. Graphs of Keokuk Home Values and Median gross rent, (Commission, 2018)



## 2.3. PREVIOUSLY COMMISSIONED PLANS AND LINKS

Keokuk has commissioned several planning and engineering studies including several focused on physical infrastructures and adaption to current population and economic conditions. The resultant reports generated recommendations on 4-3 lane conversions, safe route to schools planning, and recreational trails linking Keokuk to the broader region.

### 2.3.1. Keokuk Main Street State Highway 218 Study

The Keokuk Main Street State Highway 218 Study created by the Sustainable Transportation class at the University of Iowa in 2019 recommends a redesign of Main Street (US 218) to increase safety and enhance its function as the commercial and social heart of the city. The study found that a lane conversion project could be achieved without significantly degrading its function as a major traffic thoroughfare. The report examined existing conditions along Highway 218 in Keokuk and provides alternative street treatments as well as cost estimates for the recommended redesign. This includes both general recommendations for redesign of the street ROW and identification of specific locations and treatments within downtown Keokuk. The study also provides background on the types of projects that are feasible within current Iowa DOT policy guidelines as well as resources for local officials to interface with Iowa DOT and other entities about design and funding. The report draws from case studies of successful conversions of similar downtown streets that are designated as US and State highways. Finally, next steps are provided to guide local officials in presenting a proposed redesign to IDOT and building local public support.

One of the recommendations of the report is a 4- to 3- lane conversion, which included protected bike lanes, paired with the creation of a designated truck route as the best option to address the safety and economic concerns of the community. While protected bike lanes are the better option when it comes to safety considerations, it is also the most expensive of the bike lane options. If enough funds cannot be allocated, the report recommended that more conventional bike lanes be included, but that a buffer space be included between traffic and the bike lane. This could be accomplished by paint and would be the most cost-efficient of the two options. In either situation, the creation of the truck route was recommended, as it would aid in reducing potential interactions between bicyclists and heavy-truck traffic. While specific route

decisions have not been made, the suggested route involves diverting freight traffic to US 136, or 7th street, allowing truck traffic to be diverted to US 61 which is already a designated business route.

The analysis and information provided in The Keokuk Main Street Highway 218 Study were intended to be used as the basis for a proposal to IDOT to begin a 4-3 lane conversion process. The recommendations of the Main Street study align with the goals and recommendations of the KPGP. Reducing the number of vehicle lanes on Main Street through downtown Keokuk allows the for implementation of bicycle lanes and safer environment for bicyclists and pedestrians.

### 2.3.2. Traffic Engineering Assistance Program (TEAP) Iowa Traffic and Safety Study

The Traffic Engineering Assistance Program (TEAP) study conducted by HR Green recommends the conversion of Main Street from 4- to 3-lanes between 2nd Street and 12th Street, which 'is expected to have minimal impact to intersection operations and travel times through the corridor ... [and] the added benefit of increased safety for drivers, pedestrians, and people parking downtown'. This study informed the previously mentioned Keokuk Main Street State Highway 218 study.

The TEAP study evaluates 'existing traffic patterns, traffic signal control, and lane use geometry along the corridor ... [and includes] traffic signal warrant and traffic operations analyses ... [and] possible improvements to the corridor.' These recommendations fall into three categories: Repairing existing traffic signal equipment at 2nd, 4th, 7th, 13th, and 14th Streets and updating the timing of the traffic signals; Reinvesting by removing traffic signals at 5th, 6th, 8th, 9th, and 10th Streets and putting in 'stop control[s] on minor streets'; and, Replacing and upgrading' the remaining existing equipment as well as interconnecting the traffic signals to 'ensure good traffic progression through the corridor'.

The report also suggests that the 'traffic signal mast arm lengths should account for a potential future 4-lane cross section to 3-lane cross section design.. Finally, the report recommends reinventing Main Street via a 4- to 3- lane conversion between 2nd and 12th Streets, removing certain traffic signals, replacing and interconnecting the other traffic signals, and making 'improvements to the pedestrian experience' through curb bump-outs and added pedestrian crossings. (HR Green, 2019) (URP:6265, 2019))

### 2.3.3. Safe Routes to Schools

The Safe Routes to School Program (SRTS) is a federally-funded program through the 2005 Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU) that aims to increase the number of children bicycling and walking to school and increase overall health and quality of life through 'reducing traffic, fuel consumption, and air pollution in the vicinity of schools' (US Department of Transportation , 2019). To increase connectivity to the local schools, the City of Keokuk created a Safe Routes to School Plan in 2012. Once implemented, the plan led to the construction of over 1 mile of new sidewalks to strategic sections of Middle Road, Boulevard Road, and Decatur Street, providing direct connection between Hawthorne Elementary School and the Middle/High School complex (Commission, 2018). The Safe Routes to School programs is no longer funded through SAFETEA-LU but is now funded through MAP-21's Transportation Alternatives Program (iowasaferoutes.org).

### 2.3.4. Mississippi River Trail

The Mississippi River Trail starts in Lake Itasca State Park in Minnesota. Established in the late 1990s as an economic development tool for the Delta Region, the trail will eventually traverse ten states, ending at the Gulf of Mexico. In 2000, the trail was designated a National Millennium Trail, one of only 16 in the country. Although the trail will span the entire length of the Mississippi River, each state is responsible for designating its own route. The Great River Road from Montrose, Iowa to Keokuk, IA has been designated as part of the route and a feasibility study has been conducted to evaluate the potential for the trail through Lee County and over the Des Moines River into Missouri. Incorporating this trail into the bicycle and pedestrian Pathway network will increase recreational opportunities for residents of Keokuk and other from outside of the community.

### 2.3.5. Links with the Comprehensive Plan

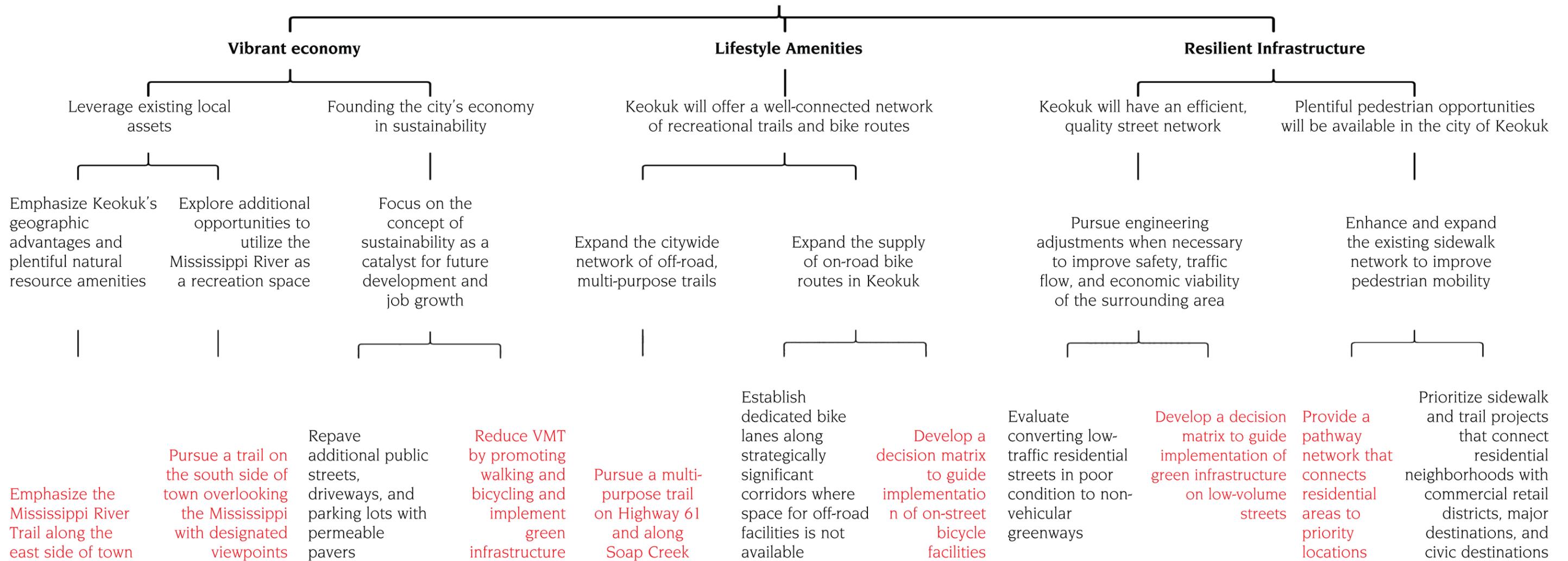
The Southeast Iowa Regional Planning Commission (SEIRPC) created a Comprehensive Plan for Keokuk in 2018. SEIRPC worked with numerous city officials, private sector representatives, local non-profits and public agencies, and community members when developing the Comprehensive Plan. Pulling together disparate threads, the plan outlines the inherent resources, challenges, and opportunities of Keokuk and presents the vision upon which the community will plan for the next twenty years (Commission, 2018). Specific goals and objectives that the KPGP helps to achieve include:



Figure 2.5. Comprehensive Plan 2018 and KPGP Alignment

# Comprehensive Plan of 2018 and KPGP Alignment

Principles - Goals - Objectives - Action Plans (KPGP proposals)



# 3. Keokuk Pathways & Green Street Plan (KPGP)

## 3.1. PROJECT GOALS

A community's ability to encourage growth and development and to enhance local quality of life depends on, among other factors, its ability to provide access to essential services and adapt to current and future challenges. Accessibility and mobility are two important considerations for choice of transportation for safely commuting to work and for leisure and the KPGP should directly address these concerns.

Keokuk is experiencing a population decline and subsequent losses of revenue that have impacted the City's ability to maintain aging street infrastructure throughout the community. In addition, an EPA mandated sewer separation project will strain the city's already limited resources. This required sewer upgrade provides opportunities for Keokuk to integrate needed infrastructure improvements in a cost-effective manner that is sensitive to community needs and preferences while being responsive to environmental concerns. The KPGP will support the city's efforts to reduce infrastructure maintenance costs, control stormwater runoff in cost-effective ways, and promote alternate modes of transportation.

The Pathway network primarily focusses on establishing routes within Keokuk's city limits. However, the potential benefit of providing linkages outside of the community are also identified, especially for recreational use and connections extending out of Keokuk into Lee County, to the east toward Hamilton, Illinois, and to the Mississippi River Trail. The Green streets guide will rank suitable treatments for proposed locations and provide a range of options for City consideration.

## 3.2. CHALLENGES

Following a review of local conditions and after meeting with community partners and stakeholders, the following challenges were identified:



**Community Resources and Funding:** Scarce resources is a barrier to implementing bicycle and pedestrian facilities for many cities experiencing declining populations. To remedy this concern, treatment options of varying costs are identified and the practice of linking interventions with currently planned infrastructure improvements like street construction and sewer separation projects are emphasized. Also included are potential funding mechanisms, including grants, for each treatment option. Long-term savings are also considered when proposing treatment options with relatively high implementation costs.



**Cross-Jurisdictional Control Over Pathways:** The lack of connectivity in some areas of the city forces residents to walk on private land to reach their destinations. Identifying property owners and taking appropriate steps to provide adequate pedestrian and bicycle facilities is crucial to a well-connected Pathway network. Roadways under IDOT jurisdiction are identified as potential barriers to pedestrian and bicyclist movements and establishing Pathways on these routes requires extra coordination with IDOT District 5 staff. To minimize these concerns, Pathway and Green streets connections on public ROWs are prioritized.

### 3.3. GUIDING PRINCIPLES

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The KPGP approach and recommendations are guided by several fundamental principles.

#### Safety



Current pedestrians and cyclists in Keokuk operate without the use of dedicated infrastructure and either walk/bike in the roads, on poorly maintained sidewalks, or on unimproved land in the right-of-way. These conditions place users in dangerous conflict with motorists or discourage residents from attempting to traverse their community by foot or bicycle. A well-planned and constructed Pathway network, along with public educational opportunities, can reassure residents that they will be safe on roadways and Pathways. Additionally, increased physical reminders to motorists can reduce accident rates on Keokuk roads. An increase in the number of street trees and other foliage along roadways realigns motorist perceptions of appropriate travel speeds and serves as a passive reminder to adhere to appropriate speed restrictions in Keokuk.

#### Equity



Equity is the use of community resources for the improvement of all community members. When applied to Keokuk, both the Pathway and Green street network proposals must serve all residents by linking community points of interest with businesses and neighborhoods while also improving mobility options for residents who are not able bodied.



#### Financial Efficiency

With a declining tax base, Keokuk's budgets are constrained, and any community project must be cost effective. The Pathway and Green streets interventions recommended are considered through a financial efficiency lens and the most cost-effective treatment options for infrastructure and implementation is proposed. External funding sources are also identified to reduce the financial requirements of any proposed intervention.

#### Flood Mitigation



As climate change continues to alter weather patterns in the Midwest, Keokuk must prepare for increased rainfall, both in storm frequency and intensity (Boulter, 2019). Green streets infrastructure provides a way to divert this increased rainfall, thereby reducing or eliminating flooding and purifying the captured rainwater through natural methods. A Green streets system with adapted and native vegetation also supports increased biodiversity in the region and enhances the pedestrian and cyclist experience in Keokuk.

#### Quality of Life



Increased opportunities for recreation, reduces reliance on automobiles, and community beautification with green street infrastructure promotes community pride and a sense of place. Through an increase in the "curb-appeal" of Keokuk, the community becomes an even more desirable place to live and work, helping to arrest population decline, assist with economic development initiatives, and increase resident satisfaction.



### 3.4.2. Community Preferences

The following map depicts input that gathered during the October football game and Oktoberfest. Residents identified dangerous areas, areas that frequently flood, and desired Pathway locations. It is also crucial to have the community's input in the planning process.

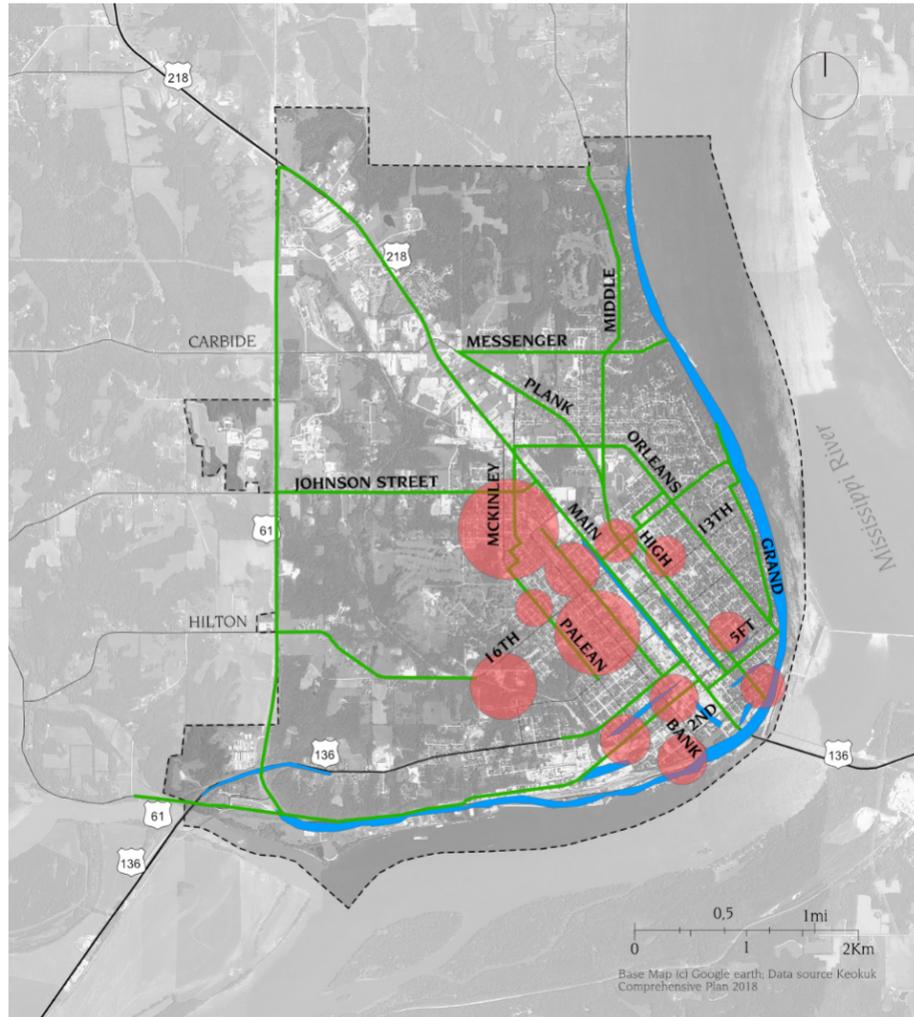


Figure 3.2. Community input map

Red circles indicate areas that are perceived to be unsafe by residents. Respondents deemed these areas unsafe due to the lack of bicycle and pedestrian facilities or a general sense of danger. Urban flooding is represented by blue marks along the Mississippi River spanning nearly the entire riverfront. Green lines represent where the community wishes to have Pathways connections and bike trails.

### 3.4.3. Dangerous Areas

The most input provided by community residents included road segments and routes that community members thought were dangerous to bicyclists and pedestrians. This contradicts previous comments that users felt safe walking or biking in Keokuk, but perhaps indicates concern for other community residents in unimproved areas. Participants note that a lack of adequate facilities contributed to dangerous conditions on both currently used routes, desired path locations, and in general areas of the city.

The noted dangerous areas included:

- Main Street near Walmart/Aldi due to lack of paths and easy road crossings
- Johnson St due to lots of walkers, high traffic counts, and main street crossing difficulties
- The downtown core northeast of Main Street due to broken sidewalks
- Highway 61 due to no shoulder and high-speed traffic

Figure 3.4. Photographs of Public engagement in Keokuk



The map on the right was created based on feedback from expert consultations in Keokuk. Participants were given maps of Keokuk and instructed to identify desired Pathways, current bicycle and pedestrian routes, dangerous areas, and areas that frequently flood.

### 3.4.4. Bicycle and Pedestrian Pathway Suggestions

Importantly, most survey respondents said they said they would use new paths both inside and outside of Keokuk and a large majority of respondents consider themselves to be active walkers and felt safe walking and bicycling in Keokuk. The survey suggests that not only are new paths desired, but that residents show interest in using paths both inside and outside of the community. Existing paths currently in use include:

- Grand Avenue south of Rand Park
- Orleans Avenue parallel to Highway 218
- Washington St East of Highway 218
- A combination of streets (Johnson, McKinley, Boulevard, Messenger, Middle, Grand, and North 4th) to create an active loop within Keokuk.

Several Pathways suggestions included:

- Paths on Boulevard Rd east of Highway 218 (Main Street)
- Paths along Highway 218 from downtown Keokuk towards McCredie Park
- Paths starting in Rand Park that travel south and along the Mississippi River waterfront
- Paths along Orleans Avenue, High Street, and Morgan Street, all running parallel to Highway 218
- Paths along Johnson Street running East to West
- Paths on Timea Street, originating in Kilbourne Park
- Paths linking the Community College, the Keokuk Middle School, and the Hawthorne School
- Paths forming an exercise loop from downtown, along Highway 61, and returning to Keokuk via Highway 218
- Paths along Soap Creek to form a recreation trail.

### 3.4.5. Flooding Locations

Flooding is a concern along Main Street in downtown and along the banks of the Mississippi River. While large sections of the riverbank are taken by industrial use and are of less concern to residents, persistent and heavy flooding along Main Street, as indicated in the maps above, needs to be addressed. Both the expert group and community survey respondents' comments confirm these determinations.

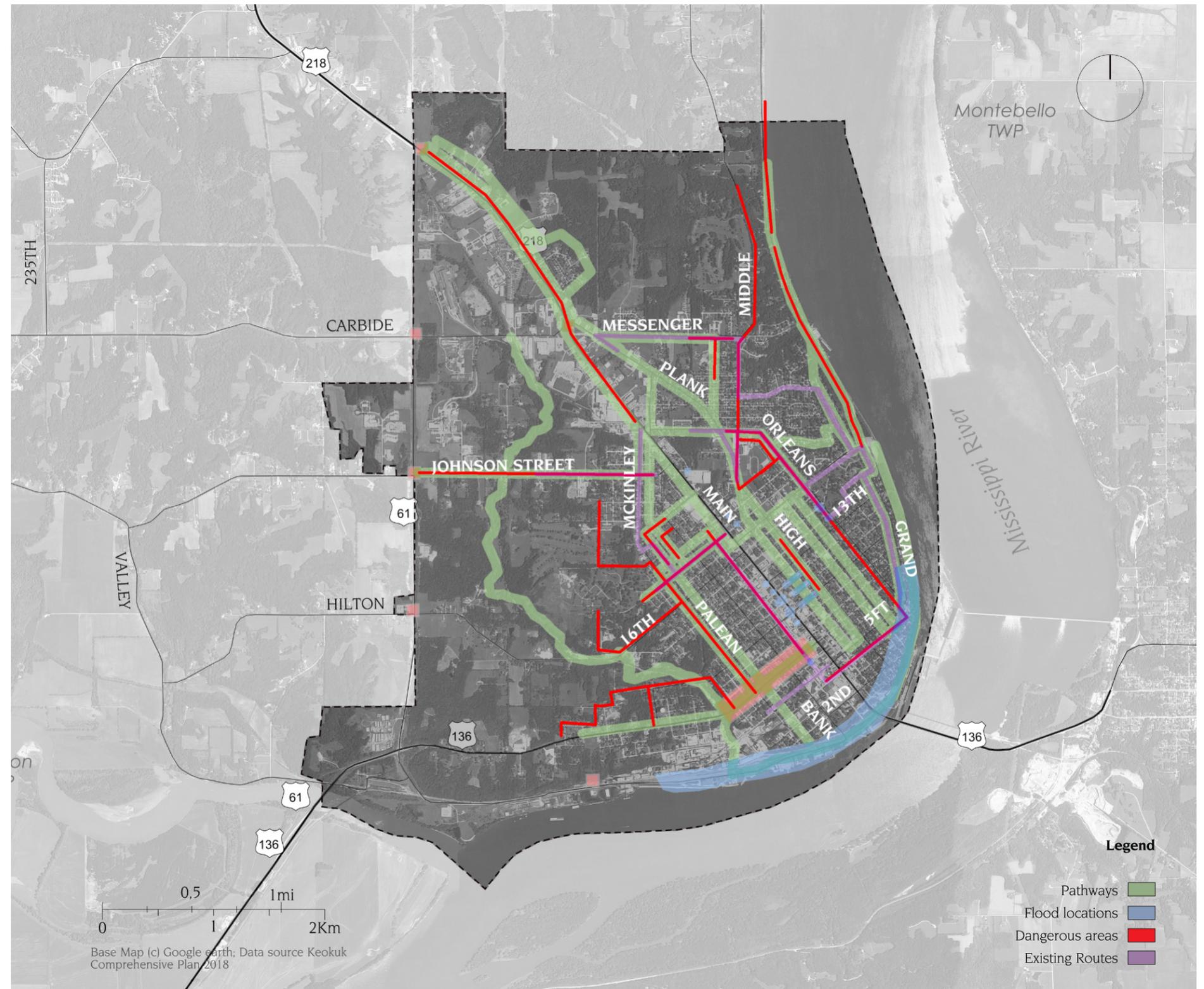


Figure 3.5. Expert consultation map

### 3.5. LOCAL CONDITIONS

Local conditions dictate the basic framework that any network plan should be built upon including:

- Important points of interest within Keokuk;
- Details on the ongoing maintenance plans of the City, including a planned sewer separation plan and existing road and sidewalk conditions in the City;
- Daily traffic volumes (AADT) on Keokuk streets; and,
- The history of traffic crashes on Keokuk streets.

#### 3.5.1. Points of Interest

The following map shows points of interest in Keokuk including major employers, grocery stores, public and private schools, and parks. As popular destinations, these locations help inform the placement of Pathways throughout the community and will increase both utilitarian and recreational use. In addition to city parks such as Rand Park, other park-like amenities such as the National Cemetery and golf courses were included as points of interest. All K-12, higher education schools, and community college were included as points of interest as they serve as both major employment centers and a frequent destination of school-aged children and adults. Grocery stores also include Hy-Vee and Aldi, as well as stores where groceries are sold like Walgreens, Walmart, and Dollar General.

Priority destinations were identified to inform the creation of the Pathway network. Priority destinations include grocery stores, parks, schools, and major employment centers. Access to food is a need that everyone has, making connections to grocery stores essential to increasing quality of life. As many grocery stores in Keokuk are located along Main Street, the Pathway network proposal includes direct paths to these locations that are accessible from all parts of town.

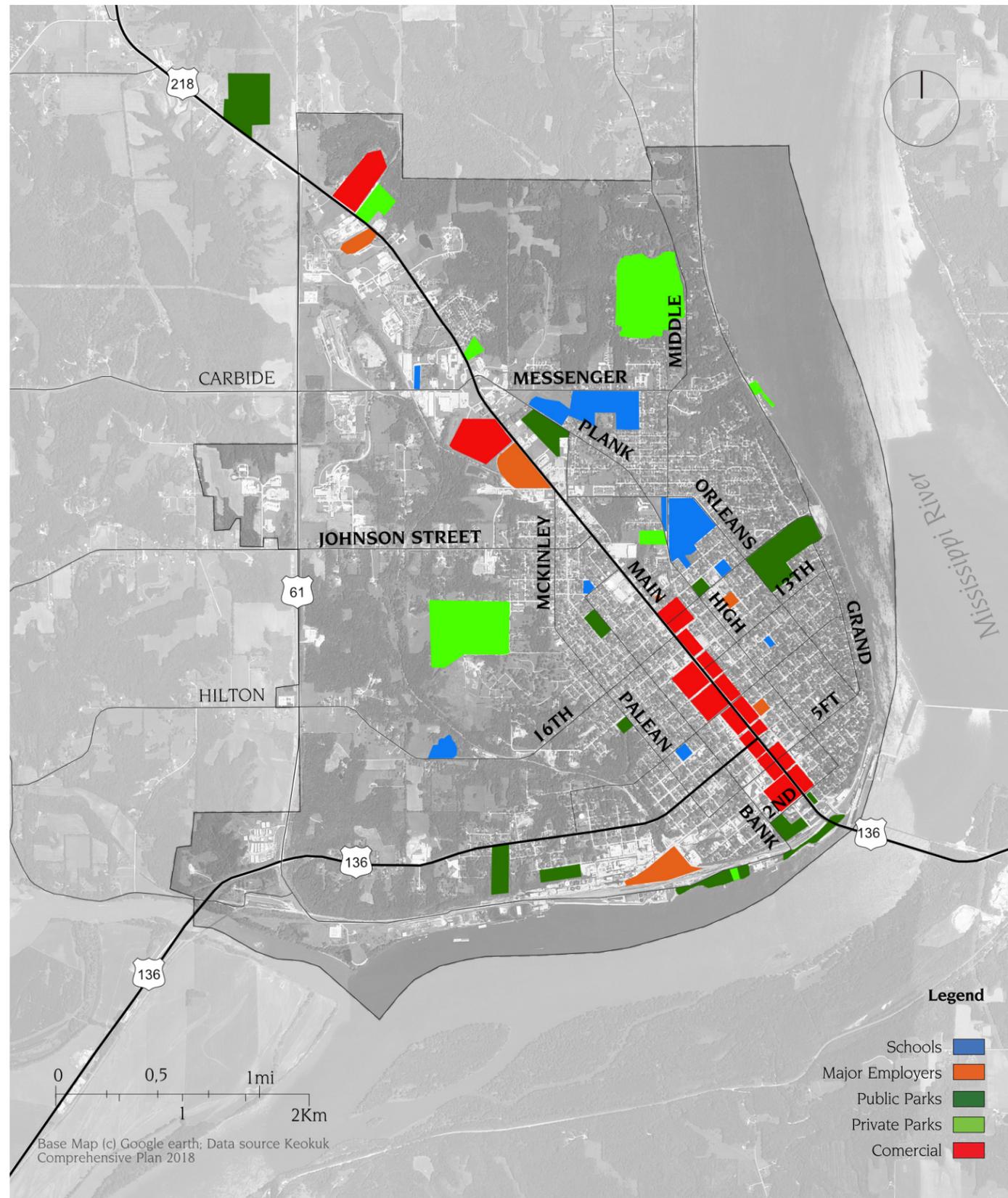


Figure 3.6. Keokuk points of interest →

Parks are deemed a point of interest as recreation and natural beauty in Keokuk are amenities that can be enjoyed by all. Results from community engagement revealed that many Keokuk residents desire Pathways for recreational use. The proposed Pathway network includes linkages directly to or near parks to ensure that all residents have access to public space and recreational opportunities.

Schools are both major employment centers and a destination for children, many of whom do not have access to a personal automobile and must rely on some other mode of transportation or parents to drive to get them to and from school each day. As all the schools are located on the east side of Highway 218, special attention was given to accommodating crossing needs through several crossings for bicyclists and pedestrians coming from the west side of town.

Major employment centers in Keokuk are also incorporated in the Pathway network so that employees can safely commute without a personal automobile. There are approximately 2,062 residents that live and work in Keokuk according to the US Census, making pathway connections to major employers especially important for residents to have choices for their daily commute. According to 2018 American Community Survey Data, 7.4 percent of Keokuk does not drive, carpool, or commute for work. These residents either walk (3.5 percent), use other means (3 percent), or take public transportation (0.9 percent) (Bureau, 2019).

Incorporating priority destinations into our Pathway network will ensure that residents are able to travel safely and effectively. Without considering priority destinations, users will likely revert to using unsafe routes to reach their destinations. A key component to the Pathways network is the Highway 218 corridor. Although it experiences higher speeds and volumes than other streets, it is also lined with many popular destinations. Providing bicycle and pedestrian facilities on Highway 218 or directly parallel to it creates a key north-south link. Additionally, the number of Main Street crossings was limited to increase user safety and reduce implementation costs.

### 3.5.2. Existing Physical Infrastructure

#### Sewer Separation

Following a city-wide assessment of Keokuk's sewer system, the EPA mandated a complete sanitary and storm sewer separation project and an upgrade to Keokuk's Water Resource Recovery Facility to be completed by 2026. The required upgrades are intended to prevent major rainfall events from overwhelming the City's water treatment capacity, which would in turn result in the release of untreated sewage directly into the Mississippi River.

The Water Resource Recovery Facility upgrades

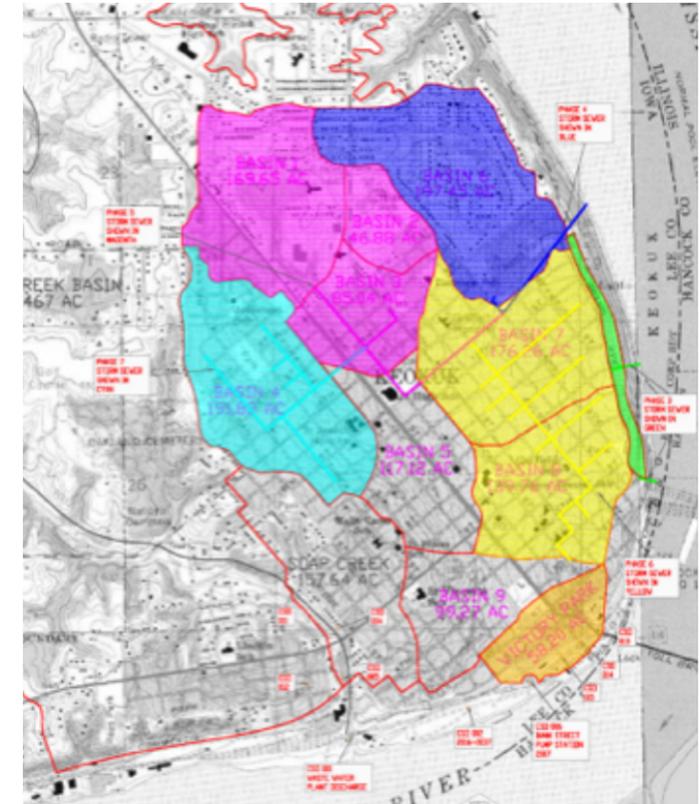
have been completed, and future work will focus on the below ground infrastructure within the City's ROW. To accomplish the needed upgrades, Keokuk will have to cut into and excavate existing streets for both pipeline placement and for the boring of a large drain tunnel running from near the south end of Rand Park and terminating at the Mississippi River, near the BNSF switch lines.

These improvements are still early in the planning phase and provide an opportunity for the City to integrate Pathway and Green streets design measures when the surface infrastructure is rebuilt. In doing so, Keokuk should realize cost savings

compared to the construction of network features on existing infrastructure while also reducing the paved square footage needed through the introduction of bioswales, rains gardens, or permeable pavement.

Phases 1 and 2 of the sewer separation project consisted of modifications to the existing water treatment facility and the boring of a drain tunnel from Rand Park to the Mississippi River. These two phases have already been completed. The remaining sections of the project will be completed in phases, with the relative order being Phase 3 in Green, Phase 4 in Blue, Phase 5 in Magenta, Phase 6 in Yellow, and Phase 7 in Cyan.

Figure 3.7. Sewer separation Phase Map. City of Keokuk Public Works



## Road Conditions

In 2018 Keokuk's Public Works division conducted a citywide assessment of pavement conditions for sections of pavement that the City is responsible for maintaining. Using a three-tiered rating system (Good, Fair, and Poor), the Public Works division reported that 36 miles of Keokuk streets (42 percent of total streets) are in "Poor" condition while only 18 miles (21 percent of total streets) are in "Good" condition. Many of those streets rated as "Good" are those that have been reconstructed within the past decade, and future reconstruction is expected to improve those remaining roads listed in "Poor" conditions.

This rebuilding project provides additional opportunities for KPGP integration during the design and reconstruction phase.

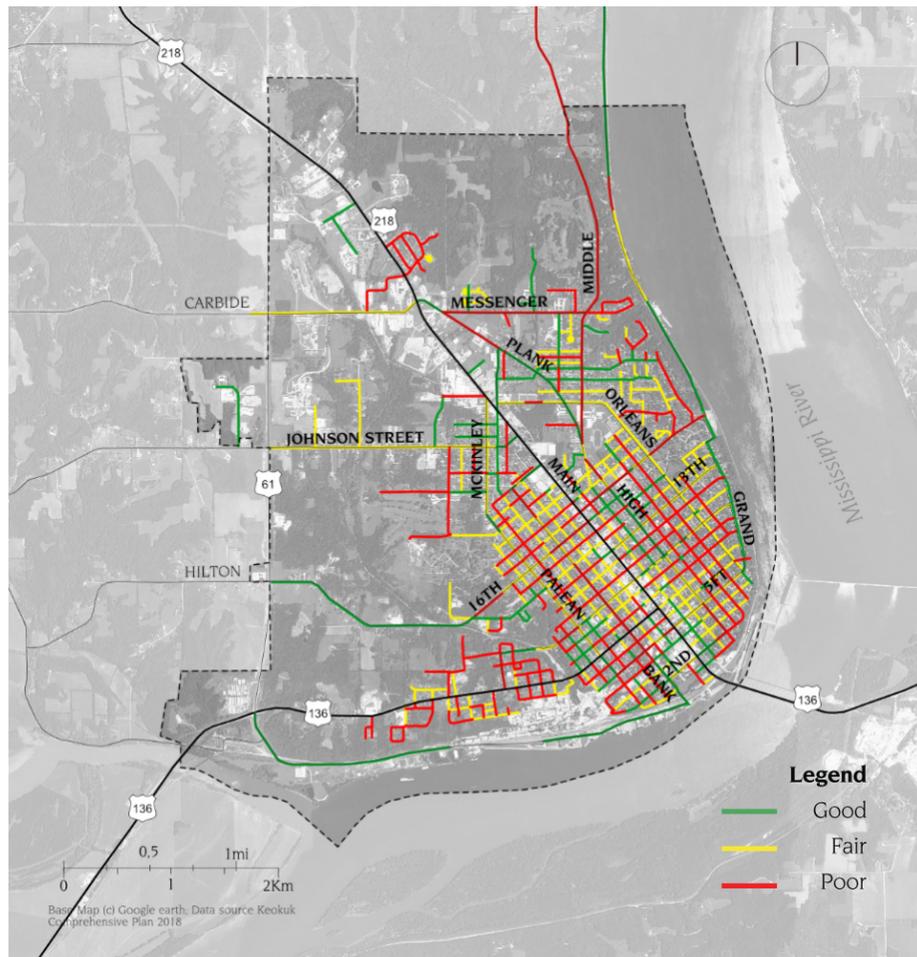


Figure 3.8. Keokuk Street condition survey (2016)

## Sidewalk Inventory

A fundamental component of pedestrian connectivity is the presence and condition of sidewalks. Without sidewalks, residents are forced to either walk in the street or create informal paths along roads. Neither is ideal for able-bodied persons and is far more problematic for those with a physical disability. The map below represents the minimum level of sidewalk connectivity in Keokuk. Green segments represent segments of road where a contiguous sidewalk exists on at least one side of the street. For this preliminary analysis, sidewalk condition was not analyzed.

The sidewalk analysis revealed that most of Keokuk does experience at least some sidewalk connectivity. The older, core of the town that is primarily residential is well-connected. As development moves outward, adequate sidewalk facilities begin to decrease. The analysis revealed that although most areas are well-connected, several streets warrant special attention to ensure bicyclist and pedestrian safety. Johnson Street Road and Highway 218, two high volume roads both lack adequate sidewalk facilities. Johnson Street Road has several multi-family housing complexes along it and Highway 218 serves as the primary to connects to many businesses, grocery stores, and other priority destinations. Pedestrians and bicyclists are forced to unsafely interact with traffic or walk along the road on unsuitable terrain since there are not sidewalks along these streets.

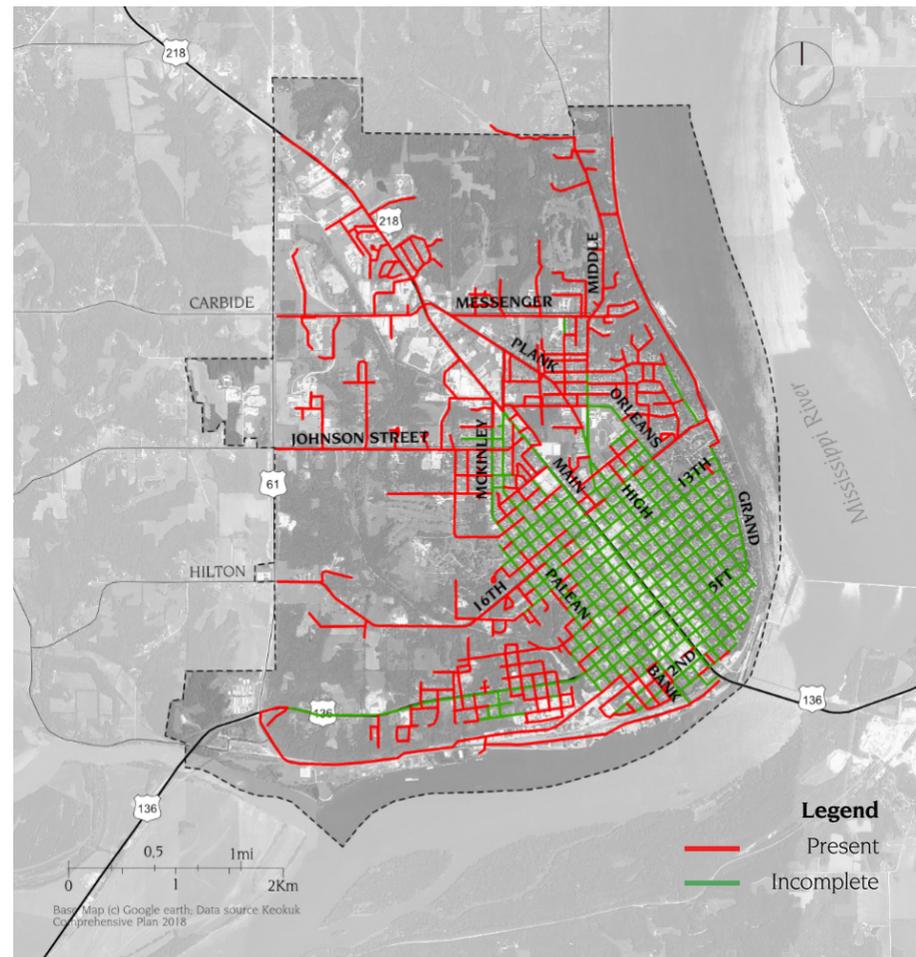


Figure 3.9. Keokuk Sidewalk inventory



Figure 3.10. Woman running on grass in Keokuk, IA

### 3.5.3. Road Traffic and Crashes

With an emphasis on cost effective interventions in an established community, most segments of a proposed network will, in part or in full, be on existing streets. To assess the danger that may exist for network users, an assessment of current motorist traffic and crash frequency was undertaken.

#### Keokuk Traffic Counts

The map presented here shows the AADT for every road in Keokuk, as recorded by the IDOT (Transportation, 2019) (DOT, 2018). As expected, most of the traffic is concentrated on Main Street, Highway 61 to the west, 7th St to the south, Johnson St and Carbide Lane running east to west, and on Plank Rd and Messenger Rd near Keokuk's middle and high schools. Outside of these high-traffic areas, most of Keokuk's roads have low average traffic counts and low residential speed limits.

With community identified points of interests and desired links in mind, how to safely navigate between these points becomes paramount. The KGPG plan focuses on using public road links with an emphasis on streets with low traffic counts in concert with proximity to points of interest when practical. Paths on streets like Hilton St, River Rd, Bank St, and Morgan St are preferred over paths on streets like Main Street, Johnson Street, Concert Street, Washington, St, 7th Avenue, Plank Rd, and Highway 61 due to traffic volumes as low traffic streets allow for lower intensity Pathway treatments like shared bike lane arrows, painted path indicators, and bicycle boulevard conversions.

When these avoidances are unavoidable given the desirability of a location on a heavily trafficked street, more intense infrastructure is called for to protect Pathway users from motorists. More intense treatments include treatments like buffered bike lanes and multi-use trails located completely off the roadway.

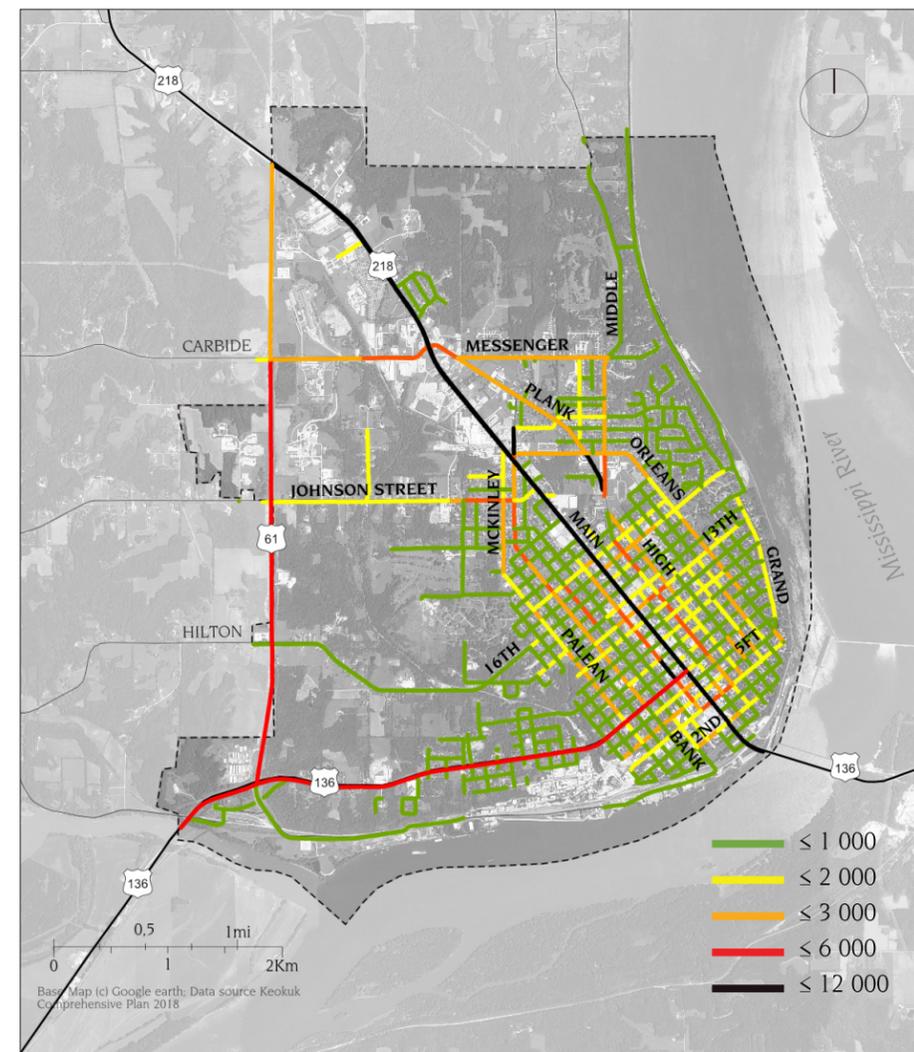
#### Crash Occurrences

Crash density is an important factor for bicyclists and pedestrians choosing which roads to use as it represents actual dangerous areas and users' safety concerns. The location and density of collisions inform what type of facilities are needed at certain locations. Corridors and intersections that experience more collisions warrant special treatments if Pathways are to be used. Reducing the number of collisions will also keep people safe and encourage recreational use. The following map shows crash density for all roads in Keokuk from 2008 - 2018 (IDOT,

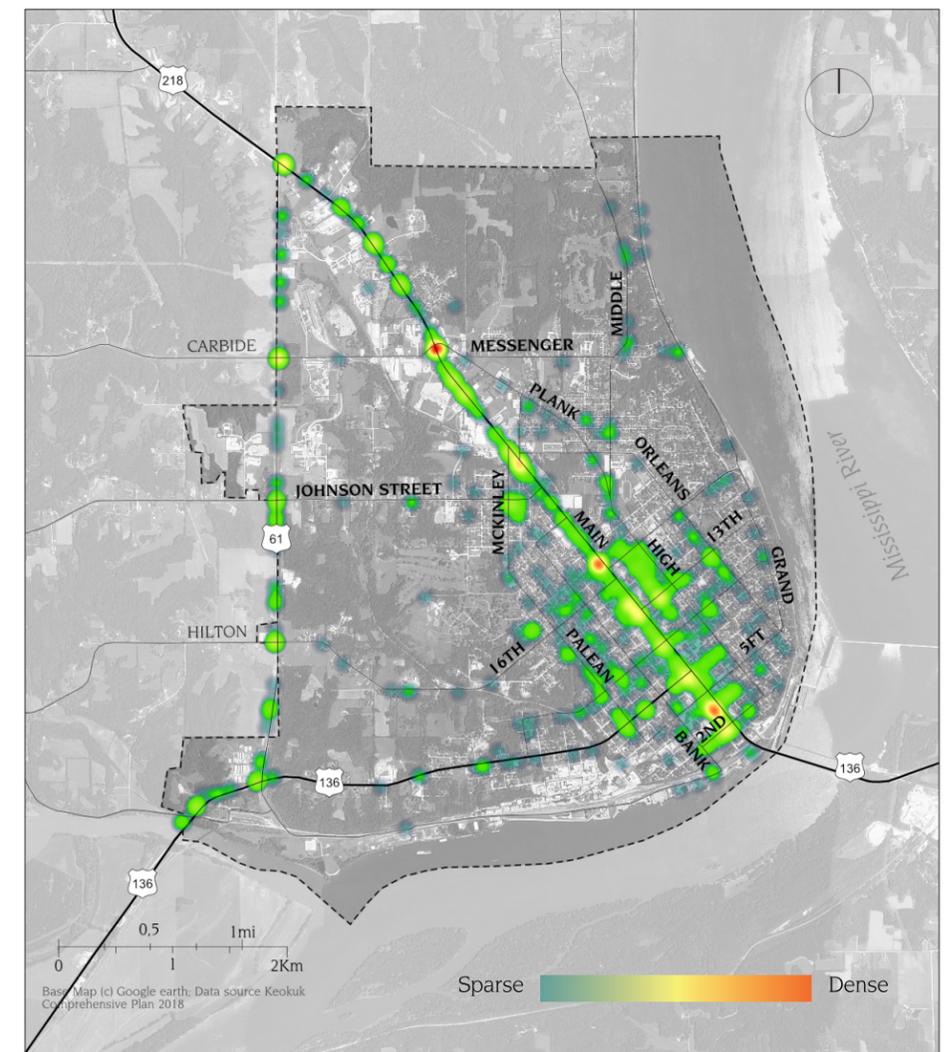
2019) (IDOT, 2019). Red symbolizes the most dense, yellow symbolizes medium density, and green symbolizes low density of crashes. The three highest densities of crashes are along Main Street. These could be the most dangerous due to the high speeds and a lack of adequate sidewalks and pedestrian crossing signals. As a component of the implementation matrix, crash data helps ensure that safe facilities are implemented.

The crash density analysis on Keokuk's roads from 2008 to 2018 shows the highest density of collisions occur along the two highways, with fewer collisions in the downtown and residential areas. A differentiation has not been made between types of crashes or severity of injuries and damages for this analysis, but it shows that many of the crashes occur at intersections. The areas with the highest crash occurrence density are especially important to consider for Pathway network placement. The Pathway network avoids high collision areas when possible. However, many medium-to-high crash density areas are near many priority destinations. Incorporating the appropriate types of infrastructure is key to reducing conflicts between users. As connectivity to priority destinations increases with the implementation of this plan, historic crash data has been evaluated, and future crashes mitigated through better Pathway placement for motorist, cyclist, and pedestrian safety. Special treatment is recommended for Main Street and the downtown area.

↓ Figure 3.11. Keokuk - Average Daily Traffic Counts



↓ Figure 3.12. Keokuk crash occurrence density



## 3.6 . CASE STUDIES RESEARCH & FINDINGS

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Best practices regarding the types of challenges Keokuk experiences were researched and similar communities were looked to for their own implementation of Pathway and Green streets networks. Through the review of other communities, essential lessons were distilled for application in Keokuk. Case studies were chosen due to subject expertise recognized by organizations like the American Planning Association (APA) or National Association of City Transportation Officials (NACTO) were prepared for communities that are geographically like Keokuk or were plans prepared by smaller consulting groups.

### 3.6.1. Case Studies: Pathways

Pathways refer to any on-street or off-street bicycle or pedestrian facilities that create linkages between users and destinations. Two case studies, the Evansville Bicycle & Pedestrian Connectivity Master Plan and the Sioux City Active Transportation Plan are examined in this plan. .

#### Evansville, Indiana – Evansville Bicycle & Pedestrian Connectivity Master Plan

Although the City of Evansville, Indiana is substantially larger than Keokuk with a population of 119,888 as of 2015, the Bicycle and Pedestrian Connectivity Master Plan addresses many similar challenges that Keokuk experiences. The Evansville, Indiana case study was chosen because it is geographically like Keokuk – both are situated in the Midwest and both are located on a river. Evansville has adopted best practices regarding project prioritization and implementation. Like Keokuk, Evansville has “safety concerns, physical barriers to bicycling and walking, and gaps in network connectivity” (City of Evansville, Indiana Bicycle and Pedestrian Connectivity Master Plan, 2015). In order to prioritize each bicycle infrastructure project, a scoring matrix tool was developed based on goals and objectives, input from the community, and feedback from the steering committee (City of Evansville, Indiana Bicycle and Pedestrian Connectivity Master Plan, 2015). The criteria for this tool include safety, connectivity to existing facilities, proximity to schools, proximity to parks, connectivity to proposed facilities, and ease of implementation. The Evansville BCMP also provides cost estimates per linear mile for each project by facility type and provides data sources to evaluate projects after they have been implemented. This case study is useful in providing a framework and guidance for the Plan as a model for the green streets matrix.

#### Sioux City, Iowa – Sioux City Active Transportation Plan

The Sioux City, Iowa case study was chosen because it was prepared by a small consulting group from the University of Iowa and focused on active transportation solutions in an Iowan community. The Sioux City Active Transportation Plan (Davila, 2015) was created to address many of the same issues that Keokuk experiences. Goals of the plan included overcoming existing barriers to walking and bicycling; providing safe and accessible connections between neighborhoods and destinations; and encouraging community participation in active transportation” (Davila, 2015). Sioux City has a population of 82,658 as of 2013 (Davila, 2015). Sioux City currently has 57.4 percent of its sidewalk network complete, an on-street bicycle network, and a working transit system. Although there is an on-street bicycle network, it is not utilized as much as it could be. An accessibility analysis was done for potential activity centers including schools, parks, employment centers, retail, and high-density zones to determine the level of accessibility for pedestrians and

bicyclists. The focus on destinations and activity centers are a good model for the pathways network proposal.

To further develop and optimize the bicycle and pedestrian network in Sioux City, the plan suggested a prioritization process for future projects comprised of three stages including: corridor selection, corridor scoring, and re-examination of selected corridors. Corridor selection was based on accessibility, connectivity, mobility, safety, and necessity. Each corridor suggestion includes bicycle recommendations, bicycle alternatives, and pedestrian recommendations.

### Lessons from Pathways Case Studies

Although both Evansville, Indiana and Sioux City, Iowa are substantially larger than Keokuk, Iowa, they experience many of the same issues. Safety concerns, physical barriers to use, and street networks that encourage the use of personal automobile are issues that Keokuk shares with Evansville and Sioux City. These studies were chosen for their similarities to Keokuk. Each of the following plans contain specific steps and tools for implementing bicycle and pedestrian facilities and helped to inform the development of a Pathway network for Keokuk.

### 3.6.2. Case Studies: Green streets

Green streets refer to a variety of treatments used to beautify a trail, street, or neighborhood while also mitigating the impacts of stormwater runoff. Storm water management is achieved by diverting water from storm sewers and allowing the captured or diverted water to naturally infiltrate the soil, improving overall water quality, decreasing the demands placed on existing storm water infrastructure, and providing recreational opportunities and streetscaping qualities for the community. The following case studies consist of a wide variety of treatment options that informed appropriate green infrastructure types for Keokuk.

Additionally, case studies vary greatly in size and implementation mechanisms and costs.

#### Clinton, Iowa

Located on the Mississippi River, Clinton, Iowa is a town of approximately 26,000 and is the eastern-most town in the state. Like Keokuk, Clinton has been mandated by the EPA to separate its combined sewer system. This upgrade will decrease flooding issues during and after major precipitation events and includes the reconstruction of nine blocks of paved roadway. Included in this upgrade will be the installation of permeable concrete pavers and a bioretention cell. The existing road surface will be replaced with full curb and gutter and a new bike path will be constructed. A Clean Water State Revolving Fund (CWSRF) Water Resource Restoration Sponsored Project has allowed Clinton to make improvements to a historic district including the use of tree planters that let trees soak up rainwater and the soil aeration of a city park to increase the amount of rainwater it can absorb. Due to its location along the Mississippi River, similar population, and similar experienced with an EPA mandated sewer separation, Clinton is a viable case study to determine best practices for Keokuk (Association, 2014).

#### Wake County, North Carolina (NC) – Wake County Green streets System Plan

The Wake County, North Carolina case study was chosen because of its similar goals to the Keokuk plan. Wake County, North Carolina has a population of over 1 million and is in the northeastern part of the state. The Green streets System Plan was published in 2017 with one of its stated goals being to increase connectivity for multi-modal transportation. While Wake County, North Carolina is significantly larger in population and area than Keokuk, Iowa, elements of the Wake County Green streets System Plan can be implemented in Keokuk. In the Plan, Wake County identifies various paved trails and two Green streets. Like Keokuk, public input indicated that safety is a

major concern. This plan provides several recommendations for projects including the Holly Springs Central Green streets which proposes a shared use path and on-street connection to connect the heart of Holly Springs to other cities and a park. Also included in the plan is a timeline and checklist for project planning and community engagement strategies (Wake Forest Greenway System Plan, 2017).

### Louisville, Kentucky

The City of Louisville Kentucky's Metropolitan Sewer District (MSD) created a user guide for public infrastructure projects and private property owners to increase the amount of diverted stormwater, improve water quality, and increase the aesthetics of their community. The MSD's plan outlined selection criteria, engineering considerations, effectiveness, initial and ongoing costs, and included graphic depictions of potential treatment options for property owners to help explain the aesthetic impacts. Importantly, this plan used a "low-medium-high" scale when detailing costs, effectiveness, and maintenance considerations for several treatment options (District, 2016). These estimates provide a cost benchmark when considering what interventions are most suitable for Keokuk, Iowa, from the perspective of another Midwest community facing similar weather conditions. Louisville's cost estimates may prove misleading when applied to Keokuk however, as Louisville is a much larger metropolitan area than Keokuk, with access to a much larger pool of resources than Keokuk. What is considered low-cost for Louisville may not be low cost for Keokuk.

### Philadelphia, Pennsylvania – Green Streets Initiative

The City of Philadelphia, Pennsylvania created a "Green City, Clean Waters" program in 2014 to introduce natural stormwater diversion measures onto city streets. Their efforts resulted in a complete streets policy that outlines numerous treatment options outlined by installation cost, ongoing maintenance considerations, and stormwater diversion effectiveness (Utilities, 2014). Like Louisville, Philadelphia has more resources than Keokuk, but it is useful to look at an APA award-winning plan for direction on an exemplary plan's course of action.

### Minneapolis, Minnesota- Proposed Green streets on the North and South Side

In 2015, the City of Minneapolis proposed multiple Green streets routes and temporarily implemented different Green streets treatments. This involved full and partial conversions of streets into parks with

bicycle and pedestrian trails. In some cases, automobile traffic was able to use the street, with priority given to bicyclists and pedestrians. The North Green streets plan used a one-year, temporary, five block long Green streets in June of 2016 to observe how residents would react to a permanent conversion. The city also implemented half-Green streets and bike boulevards. Their findings were generally positive, with 73 percent of survey respondents wanting some form of permanent Green streets installed, and 57 percent of those living on streets with a full conversion wanted to see it permanently installed (Minneapolis, 2018). Residents living along a street with a full Green streets conversion favored permanent installation more than those that lived-along a half-Green streets or bike boulevard conversion. The success of this case study makes it a useful example for the Keokuk plan.

### Green streets Case Studies Results

The Green streets case studies selected provided examples of Green streets project implementation suitable to midwestern climates with an eye toward low cost interventions and maintenance concerns. Minneapolis also provides examples on how to introduce Green streets to community members and get them used to the proposed interventions. The KPGP will integrate these cost saving measures, treatment decision criteria, and site suitability considerations for Keokuk.

### 3.6.3. Bicycle and Pedestrian Infrastructure Best Practices

Moving from specific built examples, literature on professional best practices were consulted to inform KPGP recommendations. The following bicycle and pedestrian treatments were adopted NACTO guidelines (NACTO, 2017). The guidelines consider street characteristics including speed limit, lane width, and traffic volume to determine the best bicycle and pedestrian infrastructure. Treatments range from shared use markings to buffered bike lanes and off-street trails. As NACTO guidelines are an accepted IDOT standard, the treatments described below can be implemented by Keokuk to increase the safety of bicyclists and pedestrians.

### Pathway Treatments

Pathways refer to coordinated and deliberate placement and markings of bicycle and pedestrian paths, trails, and travel lanes to increase the ability of users to travel without the use of a personal automobile safely and effectively. Pathways can consist of any kind of

treatment along a designated path network. Pathways should connect pedestrians and other non-motor vehicle users to their destinations in a safe and direct way. Pathways should accommodate users of all abilities, so that everyone has access to priority destinations and recreation. Many of the following treatment options were sourced from NACTO's bicycle and pedestrian design guides. The guides serve as a detailed template for transportation related infrastructure.

### Bicycle Specific Treatments

In Keokuk, bicycles can be ridden on sidewalks in residential neighborhoods, but not on sidewalks adjacent to schools or in the downtown area. Bicycles in the city are supposed to ride as close as possible to the right-side curb, single file in the business districts, and up to two bikes riding adjacent to each other elsewhere in the city. Adding additional bicycle infrastructure will help increase the mobility of cyclists of all abilities and provide safer accommodations throughout the city.

### Unprotected Bike Lanes

One Pathway treatment option is to add unprotected bicycle lanes on existing streets. NACTO defines a bike lane as "a portion of the roadway that has been designated by striping, signage, or marking for the preferential or exclusive use of bicyclists". The benefit of a bike lane is that they allow users to travel at a comfortable speed, free from pressure caused by automobiles queued behind or in front of the user. Unprotected bike lanes differ from buffered bike lanes in that they have no barrier preventing traffic from entering the lane. The only



↑ Figure 3.13. Example of an unprotected bike lane - NACTO

modification to the street is the paint for the lane markings, making bike lanes a relatively inexpensive option. Bike lanes can be implemented when a road is being resurfaced or when a road is reconstructed. Bicycle lanes come in different configurations and locations on the road surface depending on roadway characteristics. When implemented correctly, the visible narrowing of the street due to the addition of bicycle lanes can reduce traffic speeds. In some cases, restriping or construction of a wide shoulder may serve as an alternative to conventional shared lane markings.

Bike lanes are typically located on the right side of the street, between traffic and the sidewalk. Bike lanes may be placed on the left side of one-way streets depending on site-specific characteristics. Segregating uses also creates a degree of predictability on the roadway. Turning movements and behavior can be more easily predicted when bicyclists operate in a dedicated lane. Bike lanes are most appropriate on streets with at least 3,000 AADT and speed limits 25-mph or higher (NACTO, 2014). If these speed and volume parameters are far exceeded, buffered bicycle lanes should be considered. Bike lanes should receive the same level of maintenance and repair as the adjacent street surface to ensure safe use.

### Shared Lane Markings

Shared lane markings, or “sharrows”, are painted markings on the road that designate that bicycles can and will be encountered on the street. Shared lane markings act to guide bicyclists to ride in a safer position on the street away from parked cars. While they are not a suitable substitution for bicycle lanes, they are better applied on lower volume streets with a 25-mph speed or downhill section or road. They also provide direction and guidance as they show bicyclists that the path being ridden is a designated bicycle route, as well as the optimal positioning they should be riding in the street.

### Buffered Bike Lanes

Buffered bicycle lanes are a variation of conventional bicycle lanes that include a painted buffer or physical barrier that separate users from traffic or parking. A buffer can be comprised of two painted lines with diagonal markings in between them. A buffered bike lane creates several operational benefits. If the buffer is painted, it allows users to temporarily occupy the buffer to pass other bicyclists. If the buffer is between parking and the bike lane, it plays a crucial role in protecting the user. Often, cyclists riding adjacent to parked cars are subject to “dooring”. This occurs when the occupant of a vehicle quickly opens



↑ Figure 3.14. Example of shared lanes - NACTO



↑ Figure 3.15. Example of buffered bike lanes - NACTO



their door into the bike lane without checking for oncoming cyclists. Including a buffer can help reduce “dooring” incidents and increase safety for users. The buffer can also increase perceived safety, attracting more users.

NACTO recommends buffered bike lanes on streets with a higher traffic volume and speed limit. Buffered bike lanes should be considered wherever bike lanes are being considered, and street width permits application. A buffered bike lane is subject to additional design requirements outlined in the Manual on Uniform Traffic Control Devices (MUTCD). These requirements include specific lane markings, lane widths, and buffer configuration. Maintenance of buffered bike lanes should be the same as the adjacent street surface to ensure safe use. Due to the additional paint, buffered bike lanes may be more costly and require more maintenance than conventional bike lanes.

### Bicycle boulevards

Bicycle boulevards are streets with low volume and low speeds that give special consideration and priority to bicycle traffic. Bicycle boulevards differ from normal low volume, low speed roads as they incorporate direct routes for bicyclists, few street crossings, and green street infrastructure to create a more friendly bicyclists environment. They also limit stop signs along the path, which creates fewer and safer points of conflict for bicyclists while still allowing for vehicle traffic. Bicycle Boulevards also incorporate speed and volume management for motor vehicles to make the area more bicycle friendly and provide more safety for both motorists and bicyclists. Bicycle boulevards often include specific signage and markings on the road to distinguish the bicycle boulevard from roads. The combinations of signage and speed reduction creates a pathway that is suitable for users of all abilities. This type of treatment has a variety of naming conventions in other cities such as quiet streets, neighborhood green streets, and bicycle priority streets.

### Pedestrian Treatments

Paths connecting pedestrians to priority destinations are essential for a strong transportation network as pedestrian facilities help increase safety while providing connections between home, work, school, shopping, and recreational destinations. Sidewalks and other pedestrian infrastructure are important for the community. Pedestrian treatments

← Figure 3.16. Example of street marking of bike boulevard - NACTO

should be aesthetically pleasing and accommodate all users.

## Sidewalks

Sidewalks serve as both a means for pedestrian movement and as public spaces. NACTO recommends sidewalks of 5'-7' in residential areas and 8'-12' sidewalks in commercial and downtown areas. Sidewalks should also be compliant with guidelines established by the Americans With Disabilities Act (ADA). Many sidewalks near downtown areas contain specific design elements. These sidewalks can be divided into three "zones".

The first subsection of the sidewalk is the frontage zone. This is the part of the sidewalk immediately adjacent to buildings. This area serves as an extension of the building and is can be comprised of entryways and outdoor restaurant seating. Moving toward the street, the next subsection is the pedestrian through-zone. The primary purpose of this section of sidewalk is to allow for easy pedestrian movements. This area is typically 5-12 feet wide, depending on the urban context, and should not be impeded by sidewalk furniture or other outdoor seating. The outermost subsection of the sidewalk is the curb zone. This section of the sidewalk is where additional street furniture and other amenities should be located. Amenities can



include things like lighting, kiosks, trees, and bicycle parking. This section acts as a protective buffer between sidewalk and street uses.

## Multi-Use Trails

Multi-use trails are separate from the street and allow for both pedestrian and bicycle use. These trails are often either asphalt, concrete, or crushed stone and are wide enough to allow for two-way traffic by various uses. Typical multi-use trails in Iowa are 10 or more feet wide. They are commonly found along defunct railroad tracks, along waterways, along highways, or through wooded areas. These trails are often used for recreation and are designed to be aesthetically pleasing. In more natural areas, there may be a desire for pathways that can retain the natural feel of the area while providing connection and recreational opportunities. These treatments differ from traditional bike lanes and sidewalks as they are their own separate infrastructure, typically separate from a road.

## Pathways Research Results

Appropriate bicycle and pedestrian treatments vary based on user needs and street characteristics. To inform the Pathway network in this plan, NACTO guidelines were used along with state guidelines to determine treatment types that are appropriate based street width, traffic volume, speed limit, cost, and other site-specific street criteria. Treatments range from shared use streets to dedicated bicycle lanes with varying degrees of separation from other road users. Also included are mixed-use trails that remove uses from high-volume roadways and provide residents with recreational opportunities.

### 3.6.4. Green streets Best Practices

Green streets treatments can help address stormwater mitigation and enhance street aesthetics. In areas that frequently flood during heaving rain events, Green streets treatments may be appropriate to divert and absorb runoff, alleviating flooding in low lying areas. Keokuk has several locations that frequently flood, including intersections along Highway 218, and implementing different Green streets treatments "upstream" can help address this. Different treatment options are site-specific, but examples appropriate for Keokuk are as follows:

## Street Trees

Planting trees along streets can have a quantifiable economic and ecological impact on cities. Trees can help mitigate storm runoff and create a buffer between sidewalk users and motorists which also increases pedestrian perception of street safety while depressing automobile speed. Trees can either be planted in a single box or a linear trench. Boxes or trenches can be linked by subsurface pipes or channels that move water among different trees. Adequate street trees can combat the urban heat island effect by providing shade and evapotranspiration. Pits and trenches must be sized to accommodate root growth and the long-term health of the trees should be incorporated in initial designs. If tree roots are not given adequate space surrounding sidewalks and pavement can eventually buckle and the tree's health will suffer. Tree species that are salt-resistant and can accommodate snow storage around the base should be considered in colder climates. If trees are planted along mixed-use paths or in the furnishing zone of the sidewalk, it is important that branches are trimmed to not impede pedestrian and cyclist

← Figure 3.17. Graphic example of sidewalk space - NACTO

Figure 3.18. Example of pedestrians treatments - Street Trees - NACTO →

movements. The volume of water than trees can absorb is largely site specific but the City of Minneapolis estimates that on average, each municipal tree is responsible for intercepting approximately 1,600 gallons of water annually. This results in a benefit to the city of about \$45 per tree (McPherson, et al., 2005). These values do not consider trees are private property, which make up most of the tree coverage in most cities. Stormwater trees may require more maintenance than other treatments explored below.

## Permeable Pavement

The large amount of impervious surface in cities contributes to the stormwater runoff problem. Various treatment options exist and are largely dependent on surface and subsurface conditions (NACTO, 2017). Treatments are typically best suited for low traffic surfaces including parking spots, bike lanes and paths, and low traffic streets. Permeable pavement can help address flooding areas where available space prohibits other types of green infrastructure Extra design consideration should be given to areas that accommodate heavy vehicles like garbage trucks, semis, or emergency service vehicles. Curb lines and alleys are usually the best candidates for permeable pavement treatments. Vacuuming, blowing, or washing is necessary to clear sediment that accumulates between surfaces. In colder climates, snow should not be stored or piled on interlocking permeable pavers as sediment will build up



quickly. When possible, permeable asphalt or pavement should be used on bike paths as pavers can create an unpleasant riding surface for bicyclists. If interlocking pavers are used, heaving and buckling can lead to an uneven surface and maintenance may be required to ensure safe conditions for users.

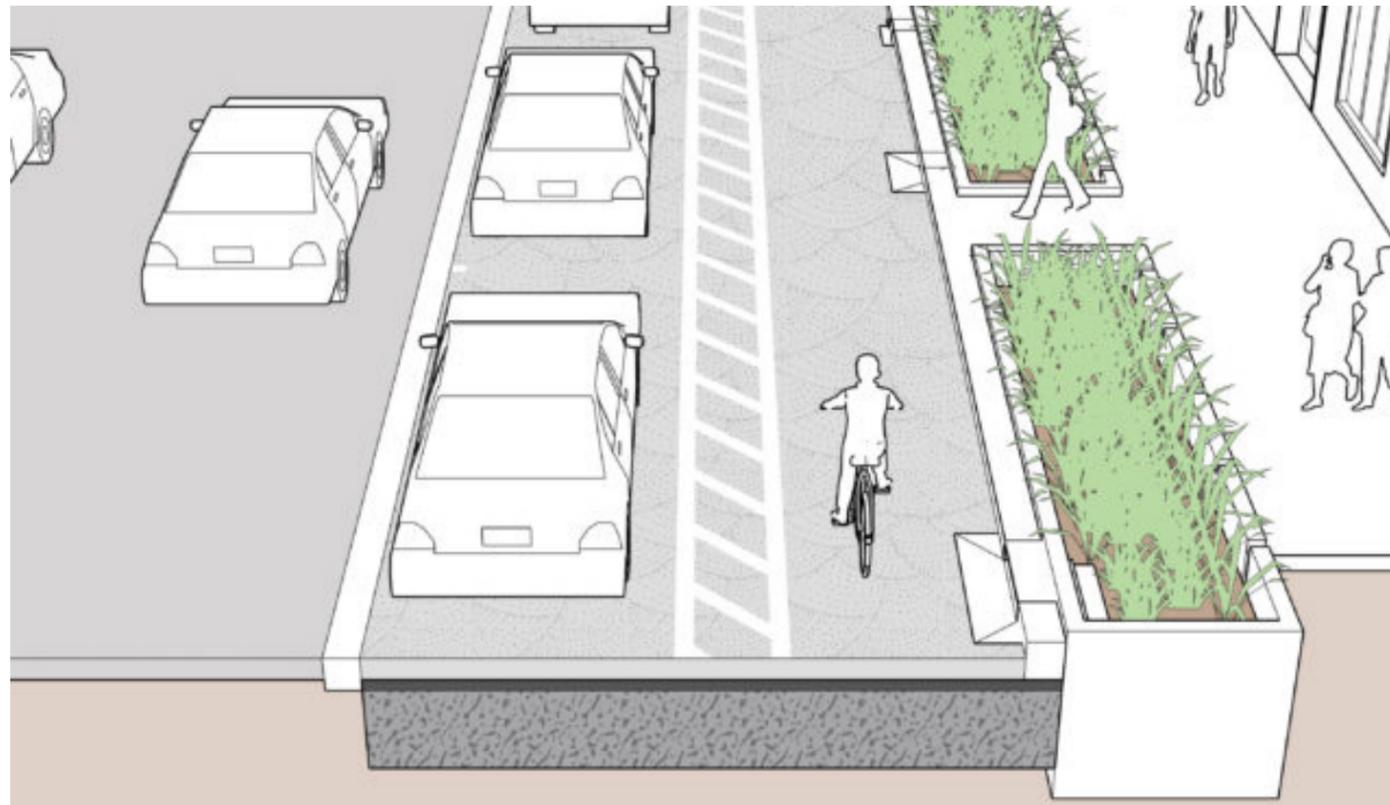
### Bioretention Cell

Bioretention cells are constructed in the ground with vertical sides and a flat bottom, like a box (NACTO, 2017). The cells are designed with large surface areas to capture and treat stormwater runoff from the street. The surface area of the cell serves as place for plants to treat the stormwater, and as temporary storage for stormwater. One advantage of this type of bioretention cell is that they can be placed nearly anywhere within the right-of-way. Typically, bioretention cells are placed along sidewalks in the curb zone. These cells can be varying widths and depths, depending on site-characteristics. Cells may require irrigation for several years after implementation to establish healthy vegetation. Benefits of bioretention cells include increased aesthetics, cooling via evapotranspiration, and providing habitat for pollinators. The bioretention cell should not inhibit pedestrian movement and should be easily detectible by those with vision impairments; this can be achieved by a prominent curb or low fencing around the cell.

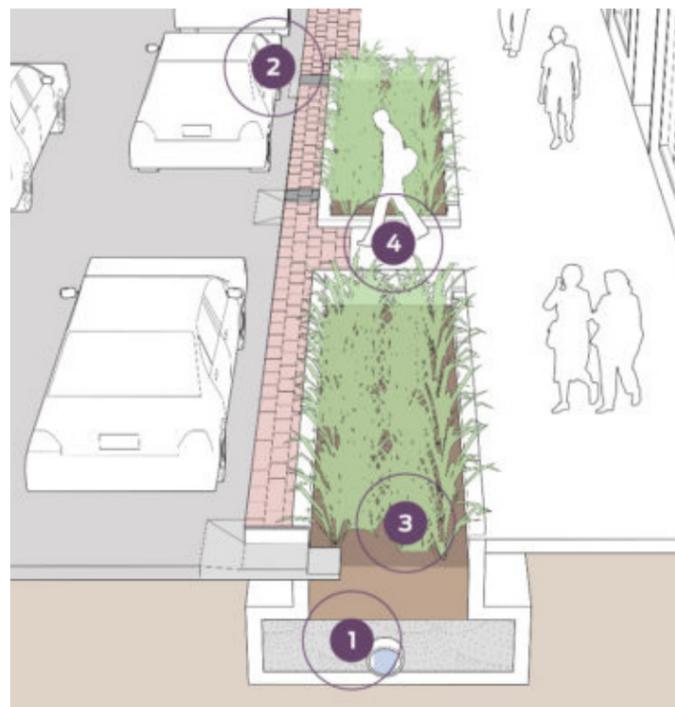
### Biofiltration Cell

Unlike a bioretention cell, biofiltration planters often have an impermeable base (NACTO, 2017). Water that enters a biofiltration planter is collected, treated by soil and vegetation, and the surplus is diverted if needed. This type of treatment can help reduce peak flow during rain events and is more flexible than other treatment options. The pipe that diverts the treated water may connect directly into the stormwater sewer system or can contain flow controls to help regulate peak flow volumes. Many of the same surface guidelines and considerations of

Figure 3.20. Example of biofiltration cell - NACTO →



↑ Figure 3.19. Example of Bioretention Cell with buffered bike lane - NACTO



↓ Figure 3.21. Example of bioretention swale - NACTO



bioretention planters apply to biofiltration planters with the main difference being subsurface construction. As filtration cells are often deeper than retention cells, addition design should be ensuring structural integrity of the cell and the adjacent street and sidewalk.

### Bioretention Swale

Bioretention swales are like bioretention planters in function, but their form varies slightly (NACTO, 2017). Instead of a planter box, a bioretention swale is shallow with gently sloping sides. The swales are vegetated and treat stormwater runoff as it moves downstream. A swale is typically less expensive than a planter but requires more space for effective implementation. Swales are most appropriate in lower volume areas or where adequate space is available. Potential locations for bioretention swales include medians, roundabouts, adjacent mixed-use paths, or other unused right of way areas. Due to their size, swales can accommodate a wide variety of vegetation. Swales allow for easier access to underground utilities than planters as there are

not cement walls. Most swales are less than two feet deep and are not especially dangerous to pedestrians or motorists. Adequate buffers along the edges of the swale may be needed as swales have little or no vertical separation from the street or sidewalk.

### Full Green streets Conversion

Full Green streets conversions are a treatment option that promote bicycle and pedestrian travel while limiting or eliminating motor vehicle access. The street surface is converted to include a trail for pedestrians and bicyclists. This reduces the maintenance requirements of the roadway as there is less pavement to maintain. The road is either removed and replaced with a new multi-use path that can accommodate emergency vehicles when necessary, or the existing roadway can be physically reduced to transform the area into a Green streets park. Streets considered for a full conversion should have alley access, so residents and emergency service vehicles have access to homes.

Full conversions to Green streets with limited car access have been piloted in Minneapolis (Minneapolis, 2018). They work best on low volume and low speed residential roads that would benefit from lower road maintenance cost and more park space. Full Green street conversion designs can be temporarily installed through the use of chalk or paint, planters, and picnic tables.

### Partial Green streets Conversion

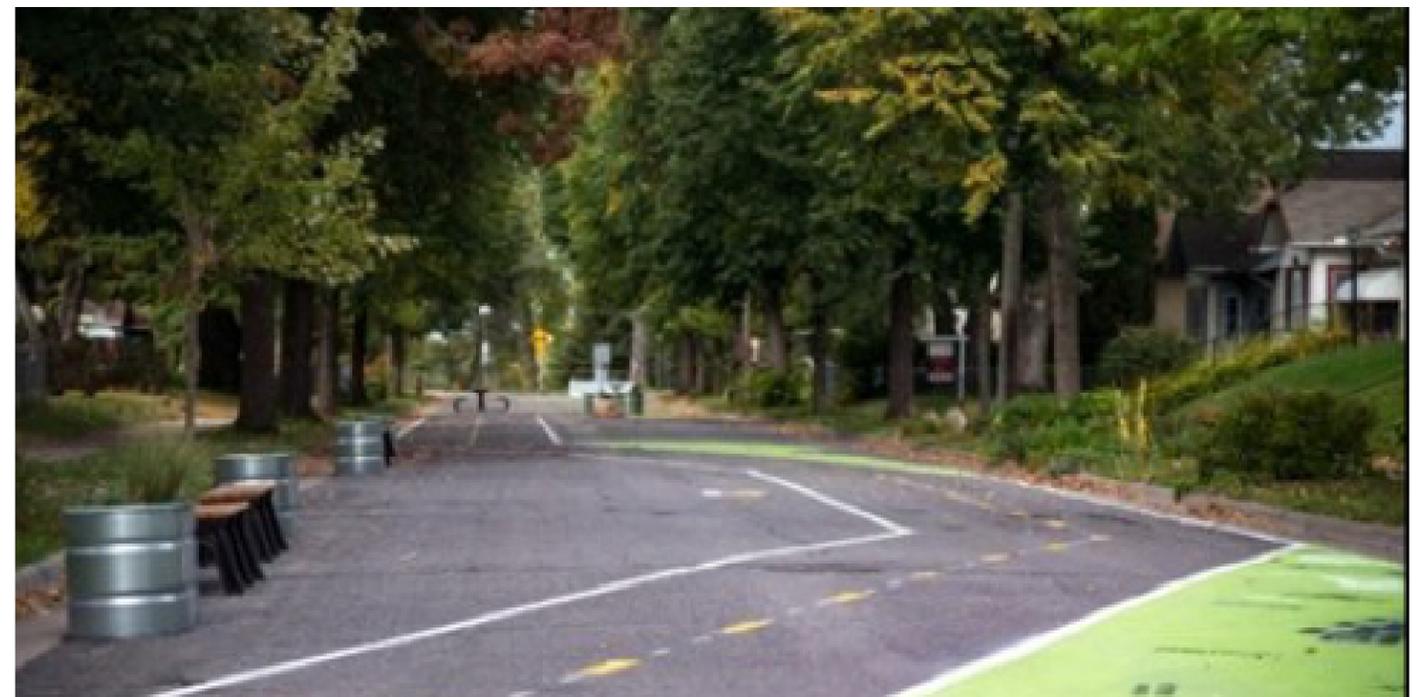
There are other designs of Green streets where part of the street allows for one-way or two-way traffic with the other half of the street being dedicated to bicyclists and pedestrians. In this type of Green streets, bicycling is encouraged with widened bicycle trails through a residential neighborhood. Functionally, partial Green streets operate the same as a full Green streets or bicycle boulevards, where there is a designated pathway that promotes bicycle and pedestrian travel that minimizes intersection crossings and uses other traffic calming measures to promote user safety.

### Green streets Treatments Results

Urban Green streets and other green treatments vary both in their design and purpose. More intensive treatments like a full Green streets conversion limit automobile access to streets and prioritize bicyclists and pedestrians. Less intensive treatments like bio swales and street trees are more versatile and can be implemented more easily where street characteristics or resident preference prohibits a Green streets conversion.



↑ Figure 3.22. Graphic representation of full green street conversion - NACTO



↑ Figure 3.23. Graphic representation of Partial Green street conversion - NACTO

### 3.7. RECOMMENDATIONS

Prior to the creation of the Pathway network, priority gaps were identified in the existing transportation network and major urban flooding areas to inform our recommendations. Affordability and cost-benefit analysis will determine which treatment option the city should choose to best meet the needs of the community. Based on these findings, two recommendations were developed.

#### 3.7.1. Pathway Network

The Pathway network builds on the information collected and analyzed and incorporates the five principles of this plan: safety, equity, financial efficiency, ecological storm water management, and quality of life.

These principles guided the identification of the primary purposes of the network plan:

- Safely connect major destinations, such as schools, parks, employment locations, and commercial areas;
- Fill in the existing network gaps and provide paths in underserved areas;
- Provide recreational trails along key landscape features such as the Mississippi River banks and along Soap Creek.

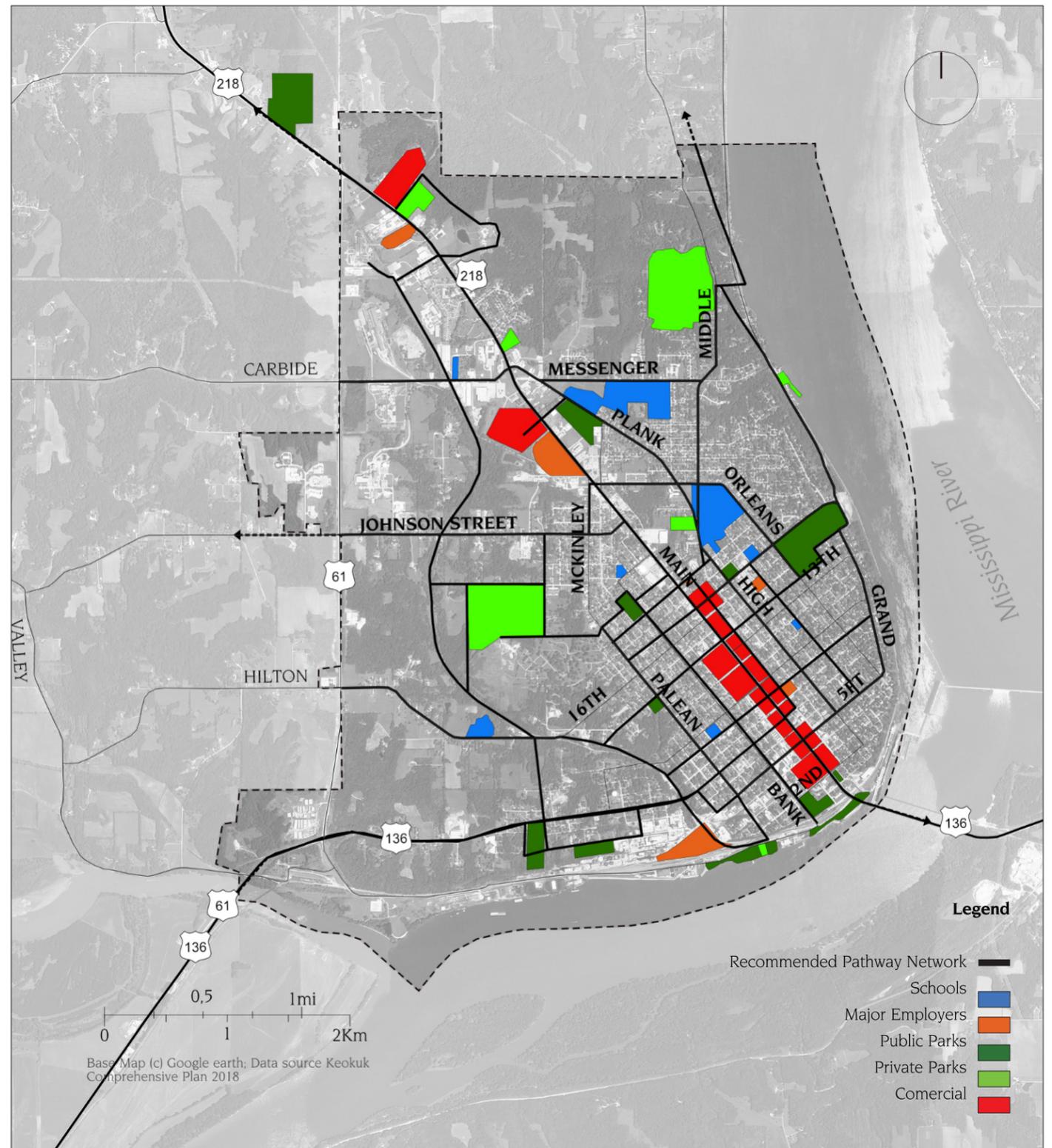


Figure 3.24. Pathway Network Plan



### 3.7.2. Network Treatments

The network plan has been carefully designed to safely connect residents to places of interest. The network treatments have been adapted from the State of Iowa’s guidelines for bicycle and pedestrian infrastructure. The treatment guidelines were applied to Keokuk by factoring in speed limits, traffic volumes, and roadway widths, which assures that the treatments chosen will be appropriate. Exceptions to the state guidelines had to be made in several instances to accommodate site specific conditions such as on River Road’s narrow width. Selected treatments include shared lane markings, conventional bicycle lanes, multi-use trails, and buffered bicycle lanes. For proposed recreational trails, limestone nature trails may be used instead of multi-use trails for cost saving benefits.

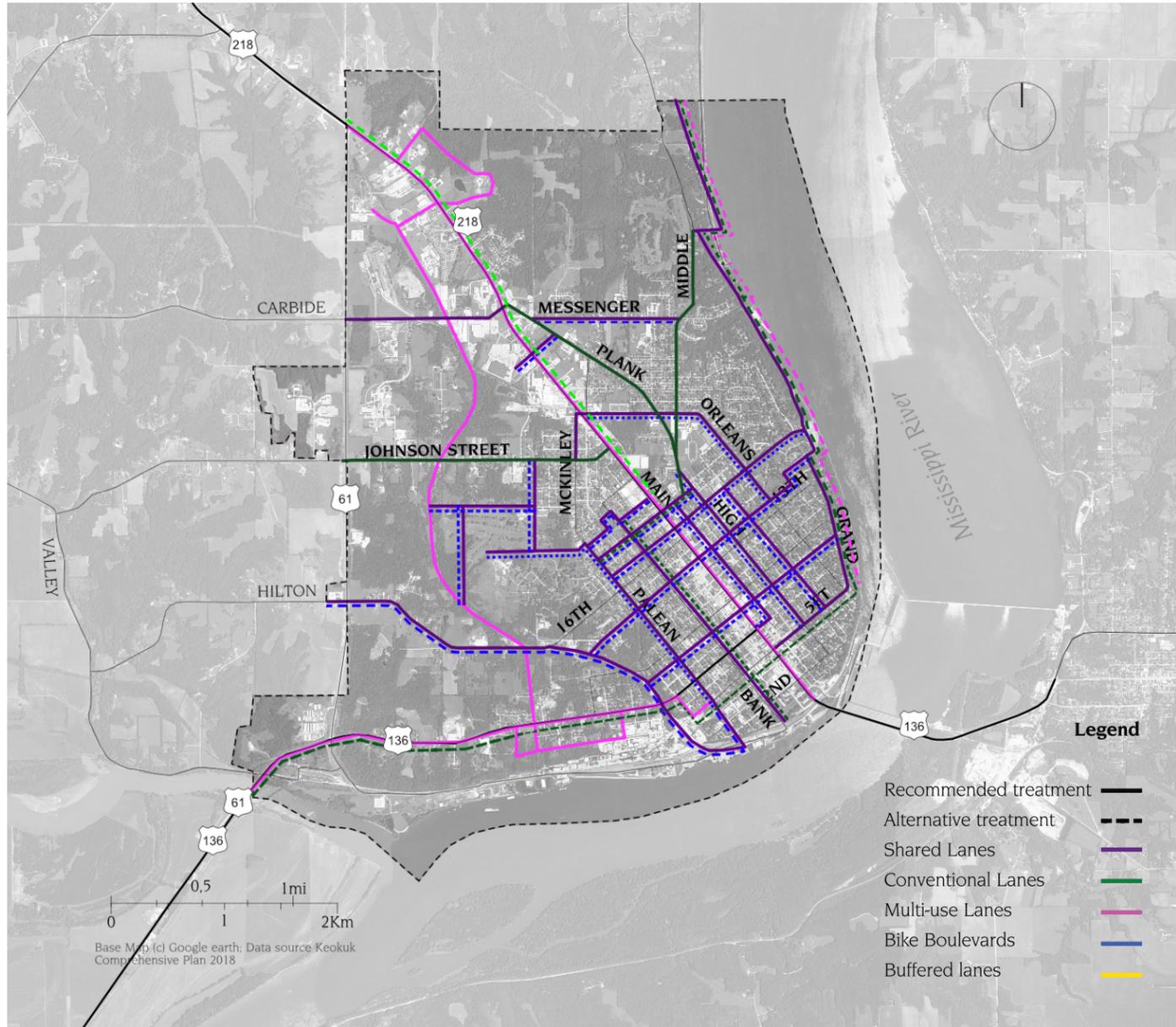


Figure 3.25. Pathway Network, Pedestrian and Bicycle treatment Map.

Figure 3.26. Before and after renderings for Blondeau Street

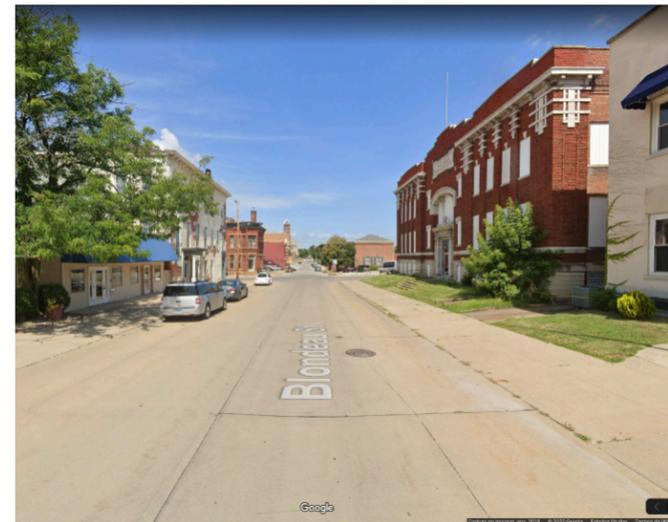


Figure 3.27. Before and after renderings for Main Street (Walmart)





Figure 3.28. Before and after renderings for Main Street.



Figure 3.29. Before and after renderings for South Side



To help prioritize projects, funding allocations, and address immediate concerns regarding bicyclists and pedestrians in Keokuk, the Pathway Network implementation is divided into three separate phases. Phase One addresses immediate safety concerns along high volume streets and creates a base level of connectivity throughout Keokuk. Phase Two fills out the network and increases access to bicycle and pedestrian specific infrastructure throughout the residential areas of town. Phase Three adds recreational trails to the network and provides residents with access to natural areas west of Keokuk. While community surveys indicated a desire for recreation paths along the Mississippi River, unstable ground in the bluffs to the north of the Main St Bridge to Illinois and industrial development to the south precludes this option.

### 3.7.3. Network Plan - Phases

#### Phase One – Priority paths

Phase One of the bicycle and pedestrian Pathway network includes priority connections in Keokuk. This includes treatments along Main Street, Highway 136, and Johnson Street Road that address immediate safety concerns due to the high motor vehicle volumes. It also includes treatments that link destinations that will likely generate bicycle and pedestrian activity including the high school and Rand Park. Also included in this phase are several east-west routes that allow users to cross Main Street. As this is the highest volume street in Keokuk, it is important that bicyclists and pedestrians have access to intersections and streets with dedicated infrastructure to promote safety.

Completing this phase addresses immediate safety concerns along high volume roads and increases connectivity to key locations throughout Keokuk. Phase one can stand alone as a basic network to connect priority destinations and residents of Keokuk, but greatly benefits from Pathways Phases Two and Three.

Road segments included in Phase One include:

- Highway 218
- Highway 136
- Johnson Street Rd
- River Rd
- Plank Rd

#### Phase Two – Secondary paths

Phase Two involves fill out connections in the network. Street segments in this phase experience lower traffic volumes and require less-intensive treatments. This phase builds on the connectivity in Phase One by including additional routes for crossing Highway 218 and creating more direct routes for traversing Keokuk. As this phase includes treatments along relatively low-volumes streets, many of the treatments only require paint to designate bicycle lanes or shared use routes. By including more routes throughout the residential areas of town, residents will have better access to the network and will be able to reach their destinations quicker. Treatments in this phase include conventional bicycle lanes as well as shared lane markings, which makes up the bulk of the network mileage.

Road segments included in Phase Two include:

- 270th Ave
- Messenger Rd
- Blondeau St

#### Phase Three – Aspirational Paths

Phase Three includes a recreation trail along Soap Creek and additional connectivity for the west side of Keokuk. Locations identified in this phase are not meant to address immediate safety concerns or create links to priority locations. When prioritizing funds, treatments in this phase should be considered after Phases One and Two have been adequately addressed as those phases are essential for safety. Treatment options for the Soap Creek trail and other recreational paths include multi-use trails and nature

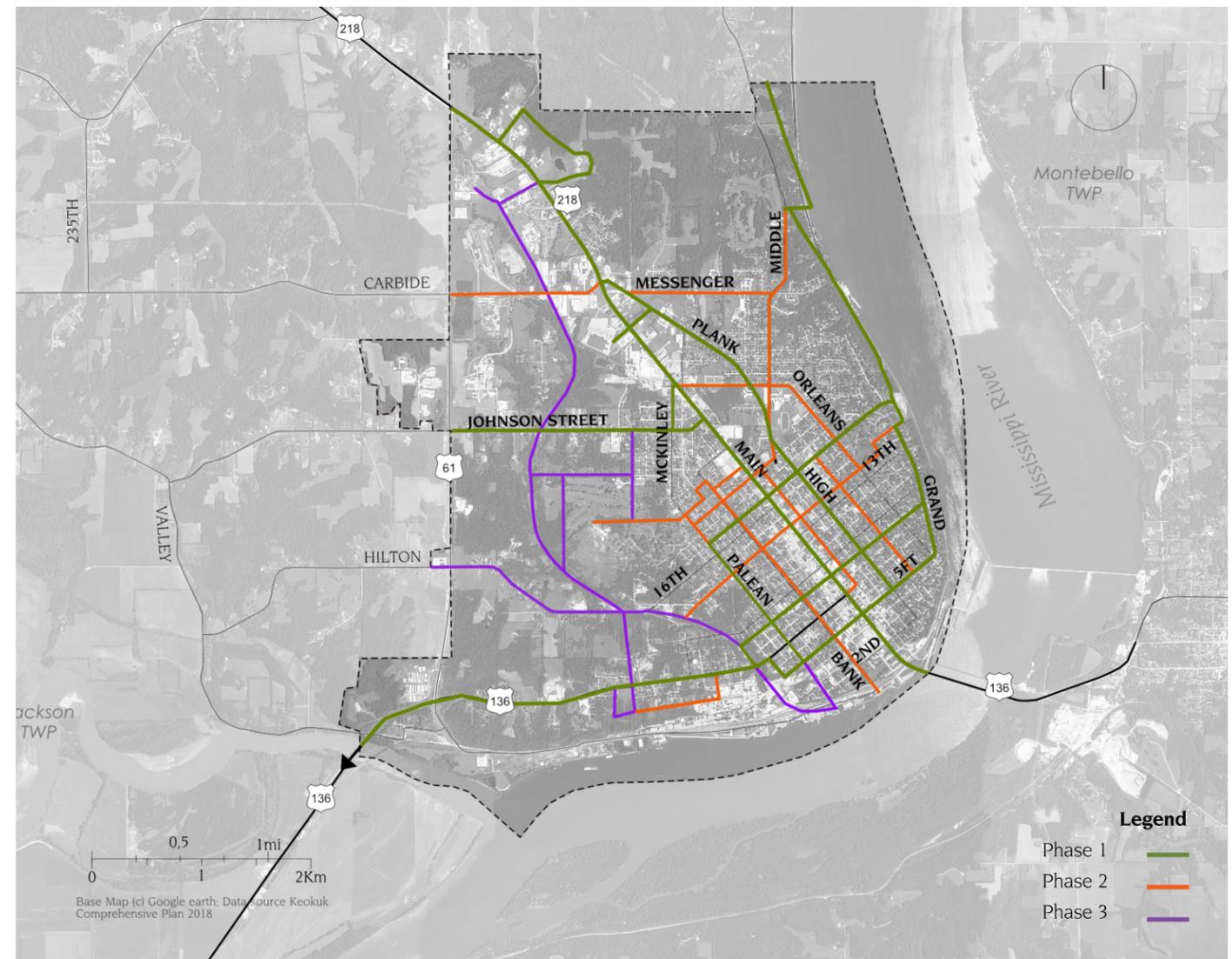


Figure 3.30. Map showing the implementation phases of the Network plan

trails. As mentioned previously, ground conditions and economic development along the Mississippi River have made direct recreational access to the River outside of existing parks challenging.

Road segments and areas included in Phase Three include:

- Soap Creek recreational trail
- Minor west side connections

#### 3.7.4. Green streets

Local topography can result in pooling water along streets, creating hazards to bicyclists, pedestrians, and property owners. In Keokuk, several intersections near downtown often flood after intense rain events. Flooding can be addressed in part with natural mechanisms like trees, grass swales, or other treatments that retain and treat water rather than letting it travel down the street. Beyond water retention and treatment, green street infrastructure

also provides many other services including beautification, shade, traffic calming, and ecosystem services. These benefits are especially important near downtown, schools, parks, and other areas of interest where there are opportunities to enhance the pedestrian and bicyclist experience.

One option considered is a green street. A green street is a full or partial conversion of the road surface to green infrastructure in strategic locations compatible with land ownership that can enhance user experience and mitigate the impacts of stormwater. A full green street conversion involves eliminating automobile use on the street and providing a green space for pedestrians and cyclists. A partial green street conversion does not eliminate all traffic but limits the amount of automobile use and gives preference to bicyclists and pedestrians. This could include closing the street to through traffic or narrowing the street to one travel lane.

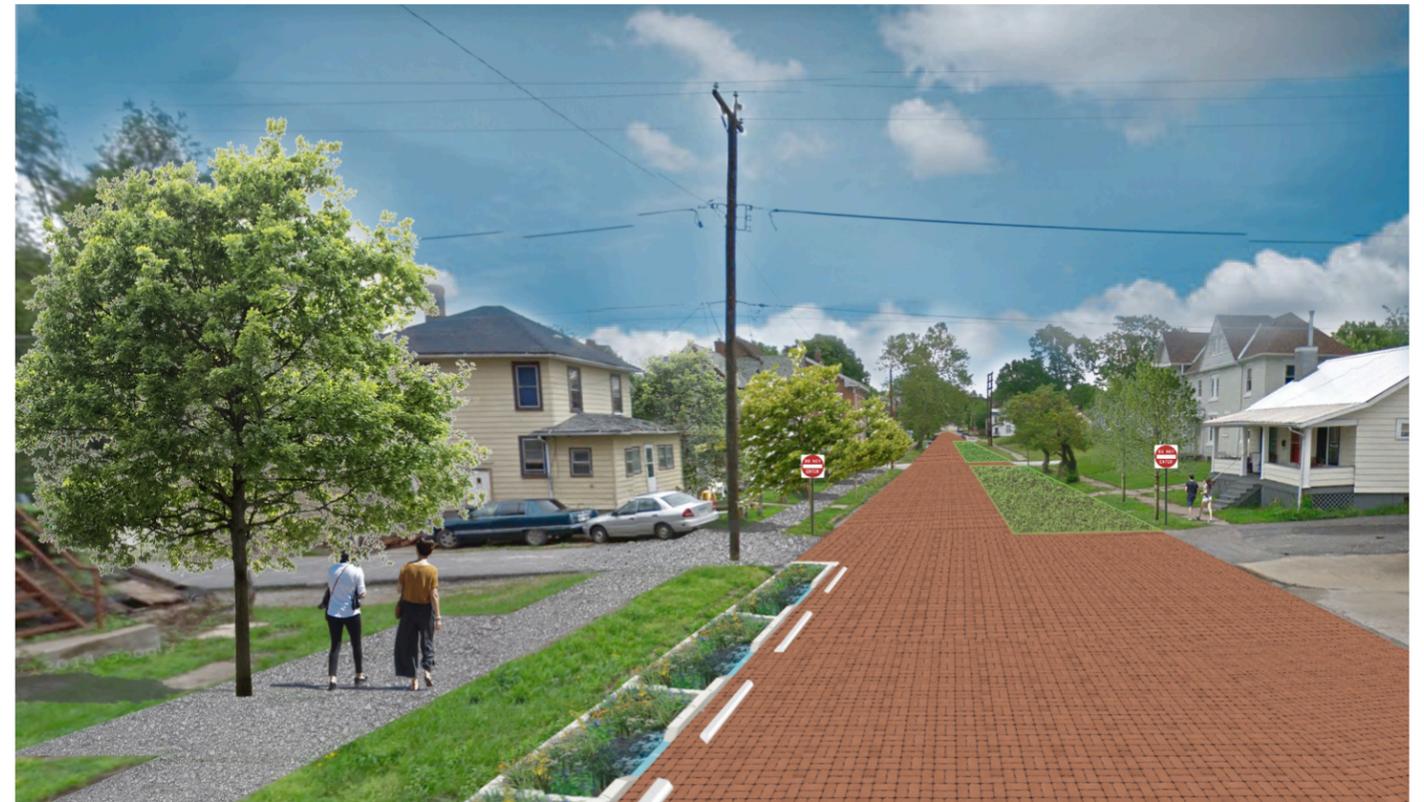
While individual green treatments like trees or grass swales can be implemented flexibly, a full or partial green streets conversion requires more consideration. Because the conversion will limit automobile use, the street must be relatively low volume. It also important to maintain access to homes for residents and essential services.



➤ Figure 3.32. Before and after renderings for N 6th Street



Figure 3.31. Before and after renderings for N 6th Street. (different angle) ↙



### 3.7.5. Implementation Matrix

To help guide the implementation of Green streets infrastructure in Keokuk, a decision matrix has been developed to identify which treatments are best suited to specific street segments. By analyzing one-block segments and choosing treatments that are appropriate, the end results will be safer, more financially efficient, and more effective at mitigating the effects of urban flooding. As green treatments can be costly, the matrix is designed to help determine which treatment options will have the largest benefit. The matrix includes eight street characteristics that affect how appropriate specific green treatments are.

Detailed descriptions of treatment options included in the implementation matrix are discussed in the Green streets best practices section of the KPGP. The following street characteristics were chosen because they impact how appropriate each type of green street treatment is for specific locations.

#### Flooding

Different green street treatments serve different purposes regarding stormwater treatment. Some are designed with low capacities and would not do well on block segments that experience pooling water for days after heavy rain events. The treatment capacity depends on the surface area and depth of treatments. Considering the local topography will help determine which treatments are appropriate.

#### Average Daily Traffic

The AADT of a street plays a large role in determining what type of green infrastructure is appropriate. For example, a street segment that carries 6,000 vehicles per day is not a suitable candidate for intensive green streets treatments. For a full or partial conversion to be appropriate, the street must have very low average daily traffic. Additionally, as streets with green street treatments are visually appealing, it can be expected that pedestrians and bicyclists may be attracted to use them. Lower volume streets will be safer and more appealing to these vulnerable road users.

#### Proximity

The proximity of a street segment to important destinations like

schools or the downtown area also plays a role in determining what type of green treatment is appropriate. If the segment being analyzed is near a school, implementing more intensive treatments like partial Green streets or large planters along the road's edge that will slow traffic can help create a safer environment for children walking to and from school. Additionally, if the segment being analyzed is near downtown, where there are bars, restaurants, and other attractions that generate pedestrian activity, using green streets infrastructure to calm traffic may be an effective way to increase safety and create a more friendly pedestrian environment.

This plan also proposes a Pathway Network to provide cyclists and pedestrians with safe routes throughout Keokuk. Once other criteria are satisfied, green streets treatments should overlap with bicycle and pedestrian Pathways. However, there are some exceptions. For example, permeable pavers have many benefits, but they can be dangerous for cyclists. If the segment being analyzed sees frequent bicycle use, permeable pavers may not be the best treatment option.

For Green streets and other treatments designed to mitigate the impacts of stormwater runoff, contiguous segments are most beneficial. If a one-block segment is converted into a Green streets, but the blocks on either side of it do not receive any treatment, the full potential of the green infrastructure is not realized. Therefore, if the segment being analyzed is directly adjacent to a full or partial Green streets conversion, it is likely a strong candidate to receive the same treatment.

#### Street Condition and Sidewalk Condition

Although the existing street and sidewalk condition does not have an impact on how effective the green infrastructure will be, it does have an impact on the financial efficiency of projects. If a street segment is in good condition, funds for green street infrastructure may be better spent somewhere else. However, if the street is in poor condition and needs repaired, the street segment would gain from the addition of green street infrastructure when repairs are made.

#### Sewer Separation Project

As Keokuk's EPA mandated sewer separation project progresses, all street segments scheduled to be reconstructed should be analyzed to determine what types of green treatments are most appropriate. As streets and sidewalks are torn up and reconstructed, there are

opportunities for cost savings when implementing green treatments.

#### Right of Way

The width of the ROW along the street segment also has an impact on treatment effectiveness. Treatments like street trees or bioswales require more space to be effective and should only be considered where there is adequate space to allow for pedestrian use and comfort, ADA requirements, and treatment installation.

#### City Ownership

The number of city-owned parcels along the street segment has an impact on how easy it will be to implement green infrastructure projects, especially for green streets conversions. City ownership allows for more flexibility and can ease the process of implementing green street infrastructure that residents may not be accustomed to.

#### Alley with Garage Access

For a full or partial green street conversion, considering vehicular access to homes is essential. Thus, having an alley with garage access for the houses along the street is the most important characteristic when determining the feasibility of a full Green streets conversion. Without an alley, homeowners will lose access to their property and the project should not proceed. Partial Green streets conversions and other treatment options should still be considered at these locations.

### 3.7.6. Recommended Policy Changes

Beyond the specific Pathway and Green streets proposal previously outlined, there are several policy changes Keokuk could undertake that would encourage the repair and rehabilitation of their existing sidewalks. Examples of best practices for Complete Street Policies were reviewed across Iowa for suggested alterations to Keokuk's code.

#### Existing Sidewalks and Maintenance

The City of Keokuk's Code of Ordinances contains several provisions placing the responsibility of maintaining adequate sidewalk conditions on the abutting property owner. Regarding snow removal, the abutting property owner is responsible for removing snow and ice accumulation in a timely manner. If the owner fails to do this, the city may do so and

assess the costs against the property owner for collection in the same manner as a property tax.

Additionally, property owners shall maintain all public right-of-way property between the curb line and property lines, including sidewalks. The sidewalk should be free from cracks, holes, or other defects that may create a safety hazard for users. A state of sidewalk disrepair is considered a public nuisance and the property owner assumes full liability for any injuries sustained by sidewalk users. However, the ordinance requiring maintenance of sidewalks differs as it does not specify that the city will make repairs to sidewalks at the property owner's expense.

The ordinance should be amended to state that the City will make repairs if the sidewalk is not adequately maintained.

### New Sidewalks and Development

According to City Code, no building permits shall be issued for any use where there are existing sidewalks in front of, or along the adjoining properties until the applicant agrees in writing to construct such sidewalks as may be required to connect the existing segments. This ordinance does not specify sidewalk requirements for properties where the adjoining properties do not have sidewalks. Additionally, for plats and subdivisions, the City Planning Commission may require sidewalks if they are considered necessary for the general welfare and public safety of the development. Amendments should be made to require sidewalk construction regardless of the presence of a sidewalk on adjoining properties.

### Complete Streets Sample Language

Many municipalities are implementing Complete Streets Policies to ensure that streets are designed for all users. Although Complete Streets can be more costly during construction, providing facilities for all users can help mitigate the need for future reconstruction projects. An adequate Complete Streets policy will be different for each municipality, but several key elements should be included. The following model policies appropriate for Keokuk are included in the Complete Streets Local Policy Workbook (Smart Growth America, 2013). Specific language should be included to ensure that bicycle and pedestrian facilities are included in the design of new streets or for major street reconstruction projects.

Example: Develop as many street projects as possible in an

affordable, balanced, responsible, and equitable way that accommodates and encourages travel by motorists, bicyclists, public transit vehicles and their passengers, and pedestrians of all ages and abilities. (Source: Dubuque, Iowa, Complete Streets Handbook)

The Complete Streets policy should also include language that ensures that the bicycle and pedestrian facilities will be well-maintained. Infrastructure condition is especially important for bicyclists and pedestrians as they cannot tolerate the same pavement conditions that automobiles can.

Example:

- The City of Keokuk will design, operate, and maintain a transportation network that provides a connected network of facilities accommodating all modes of travel.
- The City will actively look for opportunities to repurpose rights-of-way to enhance connectivity for pedestrians, bicyclists, and transit.
- The City will focus non-motorized connectivity improvements to services, schools, parks, civic uses, regional connection, and commercial uses.

While it is important that all users are considered when designing or reconstructing streets, the Complete Streets policy must also include exceptions. This will help create support from both residents and city staff.

Example: Facilities for all users will be considered in the construction, reconstruction, retrofit, repaving, and rehabilitation of City streets, except under one or more of the following conditions:

An affected roadway prohibits, by law, use by specified users, in which case a greater effort shall be made to accommodate those specified users elsewhere, including on roadways that cross or otherwise intersect with the affected roadway; or

- The costs of providing accommodation are excessively disproportionate to the need or probable use; or
- The existing and planned population, employment densities, traffic volumes, or level of transit service around a particular roadway as documented by [appropriate City plan or department] is so low that future expected users of the roadway will not include pedestrians, public transportation, freight vehicles, or bicyclists.

Documentation shall be publicly available and exceptions for City

projects shall be granted by [accountable person or committee, e.g. City Manager, Director of Public Works, Complete Streets Advisory Committee]. For private projects, the owner shall document the exception and approval shall be granted by [accountable person or committee, e.g. City Council, Director of Planning].

Altering the City's code in the suggested manner should result in long-term changes to the physical infrastructure of Keokuk through the rebuilding the sidewalk network in the older segments of the community while ensuring that new developments continue to encourage active mobility by Keokuk's residents.

If residents bearing the cost of these repairs is a concern, cost sharing options should be explored by the City. While the City currently offers to pay for concrete for sidewalk repairs, perhaps a "group-buy" of labor for repair work would galvanize community action while reducing the costs for each participating resident or location through volume.

### 3.7.7. Building Public Support

Meaningful public engagement involves informing the public, consulting the public, getting feedback from the public, building commitment within the community, community ownership, and getting the public excited about a project. These steps are important to bolster support for a project and to involve the public in the planning process. It can be a fun experience to work together to accomplish a project and enjoy the results of a combined effort! Public support can be key when the City Council is deciding on when and where to implement this project. It is also useful for raising money to implement the project.

The COVID-19 pandemic led to the discouragement and effective banning of the congregation of people an increase of people going to parks, walking, biking, and generally being outdoors. People are connecting more with their community and perhaps noticing areas where they would like to see a bike path or street trees. Further public engagement events are recommended to gather the community's input for optimizing the plan and garnering public support and excitement for implementing the KPGP. Public engagement events are an opportunity for the community to come together and contribute to planning changes in their town and have fun while doing so. It is recommended that future public engagement events be done in person, including presentations, open houses, and pop-up events once it is safe to do so. Until then, online public engagement is recommended and encouraged.

Helpful tools that can be used to engage the public when people

cannot congregate include:

#### 1. Social media (Facebook/Twitter/Instagram)

- Create social media pages for each platform (Facebook/Twitter/Instagram/etc.) as a dedicated space for information, communication, and engagement. The City can use its established social media pages to promote the project also.
- Facebook Live can be used to give a presentation and have people interact in real time. Visual aids such as renderings can be posted in the comments.
- Facebook, Twitter, and Instagram all have a 'poll' feature, allowing individuals to choose their favorite option. This is good for pre-set options, but not ideal if looking for open-ended feedback. Polling in one or any combination of social media platforms can increase the reach to a broader audience.

#### 2. Video Conference

Host meetings using Zoom, GoTo Meeting, Skype for Business or other video conferencing tools. The number of participants may or may not be limited, but this offers the opportunity to 'talk face-to-face' with others. Participants can choose to join meetings with or without video, and internet is not necessarily required. For non-internet options, participants can call a telephone number and use a meeting ID number to be connected to the meeting. These video conferencing options provide access for a larger audience than perhaps would be available for in-person meetings.

#### 3. MentiMeter

Creates interactive presentations that use quizzes and word clouds to gather data from the audience in real time. There is a question and answer (Q&A) option that allows the opportunity for further discussion during the presentation. Slides can be created in MentiMeter or PowerPoint slides can be uploaded into a presentation. Audience members use a cellphone/tablet/laptop/other device to connect online to the specific presentation using a code generated by MentiMeter. This is completely anonymous, unless identifying questions are specifically asked. MentiMeter is free, but options to purchase plans that include the option for presenters to ask more questions and the ability to export data gathered are available.

#### 4. Project Website

Create a website for the project - this can be for the pathway network, the implementation matrix, or a popup event. There are websites such as wix.com or squarespace.com where users create their own free website. From there, it is possible to gather input, post visual aids, communicate with the public and shareholders alike, and offer a space where all information about the project is in one place and easily accessible.

#### Incentives

Incentives for people to engage could include:

- Holding a raffle where each participant is automatically registered once they enter the event and prizes would be announced at the end of the event. A random number generator could be used to determine the winners.
- Host games throughout the event and have prizes for winners.

#### Pop-Up Event

The City of Keokuk may wish to put on display the merits of bicycle facilities and green streets for the public through a pop-up event. Such events can include painting/chalking/otherwise marking temporary bicycle lanes on a street for the public's use. Artists groups, children, or community members could take part in painting bicycle lanes or the art between them. Children and adults alike would be encouraged to bike on the street(s) for the day of the event, as well as after the event so the community can get a sense of what bicycle riding and safe bike infrastructure could be. The event could be conducted on its own or in conjunction with another community event to save on organization and promotion efforts.

Another pop-up event that could be implemented by the city could be trails with thematic routes to promote the connectivity of the network plan to the community. For example, a route from Rand Park/ Kilbourne Park to Victory Park, and a route along Main Street going Downtown, could be phased in over the summer to provide summer activity to the community. The park routes are targeted at families and other community members, with the downtown route targeting adults to shop and eat downtown.

To showcase Green streets, a local nursery or volunteers could supply

potted plants for use in the road to create a Green streets-for-a-day, featuring painted bicycle lanes, and marked out areas on both sides of the path for plants to simulate greenspace and green infrastructure. This pop-up Green streets could be open for a weekend along a road with little through traffic/ an abundance of city owned properties. It could be possible to also tie this or another pop-up event to a block party, with the party at the end of the bicycle/pedestrian route.

#### Notification Along the Pathway and Green streets Route

The location of any KPGP segment also provides an opportunity to engage and motivate residents who live along the path or who own private property that could be part of the future Phase Three Pathways Network. Residents and businesses should be notified in advance of the implementation of any KPGP segment with an encouragement to enjoy the newly constructed segment upon its completion. Not only will this engender interest in the upcoming installation, advance notice may also reduce post-installation complaints by individuals who wanted additional opportunities to weigh-in on the network.

# 4. Project Conclusion

The goals of the KPGP are to increase safety and connectivity for bicyclists and pedestrians in Keokuk, reduce aging street infrastructure costs, and address stormwater runoff in a cost-effective manner. The analyses and recommendations within this plan are based on guiding principles that including equity, safety, quality of life, ecological stormwater management, and financial efficiency. Professional best practices, existing programs in other communities, resident preferences, and existing conditions in Keokuk were combined to create a cost-effective and flexible network that is responsive to community needs and planning principles.

The Pathway Network provides needed mobility options in a safe and inclusive manner with cost effective treatment recommendations and project phases to prioritize implementation:

- Phase One includes priority connections to address immediate safety concerns on high-volume streets with inadequate bicycle and pedestrian infrastructure;
- Phase Two increases network penetration into residential neighborhoods and recreation destinations; and,
- Phase Three recommends trails for community recreation and enjoyment.

The Green streets matrix provides an analysis framework for the placement and intensity of green street infrastructure in Keokuk. Green streets suitability scores from the developed matrix provide Keokuk with a range of options and infrastructure best choices that combine site specific information, the extent of the existing network, and fiscal considerations for city consideration and final decisions.

Cost-effective implementation options for both Pathways and Green streets treatments are recommend, with suggested treatments requiring the least amount of physical interventions and properly project timing to achieve the KPGP principles of increased safety, community equity, fiscal responsibility, increased community flood mitigation capacity, and an improved quality of life for current and future residents and visitors to Keokuk.

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# APPENDIX

## PROJECT COSTS

### Pathways

Costs of the Pathway network can be estimated by taking the length of the network and applying treatment rates to the network. Estimates for treatment costs exist in both published research and Iowa examples. Cost estimates come from the Keokuk State Highway Study (Weigand, McNeil, & Dill, 2013). Shared lane costs from West Des Moines Iowa (Pratt, 2014). These costs are only an estimate and do not consider site specific costs, and the Pathways could be less costly than these estimates. Dollar amounts have been adjusted to February 2020 dollar amounts.

The Keokuk Pathway network has the following breakdown of trail type. The network features:

4.14 miles of conventional bicycle lanes;

.83 miles of buffered bicycle lanes;

1.35-6.11 miles of multi-use trail (up to 4.76 miles of recreational trails could be natural trails); and,

22.1 miles of shared lanes.

Total costs of the Pathway treatments may range between \$609,938-\$1,465,678. Due to the wide range in estimated cost, the estimates should be a starting point for implementation. Engineering and other site costs vary, so each treatment in Keokuk will be unique, but these estimates give examples of what the treatments could cost.

**Table 1: Bicycle Treatment**

Treatment	Length
Conventional Bicycle Lane	4.14 MI
Buffered Bicycle Lane	0.83 MI
Shared Lanes	22.1 MI
Multi-use Trail	1.35 - 6.11 MI
Natural Trail	4.76 MI

Treatment	Cost per Unit	Pathway Cost					
		Phase One Length	Phase One Cost	Phase Two Length	Phase Two Cost	Phase Three	Phase Three Cost
Conventional Bicycle Lane	\$91-\$7.00 per foot	2.79 mi	\$13,405 - \$103,118	1.35 mi	\$6,486 - \$49,896	-	
Buffered Bicycle Lane	\$2.30-\$10.28 per foot	.83 mi	\$10,079 - \$45,051	-	-	-	
Shared Lanes	\$55-\$65 per Shared Lane Marking@ 1 per 250 feet	5 mi	\$5,808 - \$6,864	15.87 mi	\$18,434 - \$21,786	1.23mi	\$1,428 - \$1,688
Multi-use Trail	\$151,329 per Mile	3.35 mi	\$506,952 - \$836,849	-	-	2.58 mi*	\$0 or \$390,428
Natural Trail	\$10,367 per Mile	5.53 mi*	\$0 - \$22,600	-	-	2.58 mi*	\$0 or \$26,746
<b>Total Cost per Phase</b>		<b>0-2.18*</b>	<b>\$556,844 - \$1,001,880</b>		<b>\$24,920 - \$71,682</b>		<b>\$28,174 - \$392,116</b>

\*Phase One can minimally include 3.35 miles of trail for use on Highway 136 and Main Street. Recreational trail in McCredie park may be multi-use trail or nature trail, which accounts for the variation in length and cost. Phase 3 also includes Pathway that can be either multi use trail or nature trail. Multi-use trail is necessary as there is not currently sidewalk on a large portion of Main Street for residents to walk to grocery stores and employment as well as high traffic volume that makes off street bicycle facilities ideal. Since other treatments are paint, multi-use trails are the most expensive treatment type due to the need for paving the trails.

### Green Treatment Costs

Cost estimates for green infrastructure are site-specific and can vary drastically. Since total project costs for green infrastructure projects vary so drastically, a common unit is often used to estimate cost. This is usually either per cubic foot of treatment or per cubic foot of water treated. These standardized units of cost help when comparing different green treatment options. Following is a table of cost estimates prepared for the Minnesota Pollution Control Agency (Barr Engineering, 2011).

Green Treatment (Minnesota Pollution Control Agency, 2011) Cost per Water Quality

These cost estimates are averages, each based on at least three projects. It should be noted that these are per unit cost estimates and that total construction costs will vary greatly. For example, although pervious pavement has a low per unit cost compared to other options, total project cost will likely be high.

**Green Street Cost**

<b>Green Treatment (Minnesota Pollution Control Agency, 2011)</b>	<b>Cost per Water Quality Volume / ft3 in 2010 dollars</b>
Bioretention Basin	<b>\$15.00</b>
Biofiltration Basin	<b>\$58.00</b>
Large Wet Detention Basins treating more than 100,000 ft3	<b>\$2.00</b>
Small Detention Basins treating less than 10,000 ft3	<b>\$145.00</b>
Infiltration Trenches	<b>\$11.00</b>
Infiltration Basins	<b>\$21.00</b>
Underground infiltration	<b>\$213.00</b>
Pervious Pavement	<b>\$16.00</b>

In addition to city resources, grant opportunities to help pay for network treatments are essential to implementing the KPGP. While treatment cost was considered in creating the network, Keokuk should not bear the burden alone. Grants will enable Keokuk to implement the network to its full extent in a cost-effective way while ensuring a safe network that will improve the quality of life in Keokuk.

**Grant Funding**

Funding for the Pathways and Green streets plan can come from a variety of sources. While local funding is a primary source of resources, Keokuk can augment their own resources using private, state, and federal grants and loans. For larger projects, a combination of funding sources is often necessary. Sometimes, private individuals, families, and companies choose to donate land or dollars to develop projects that they can view as a legacy or significant improvement to the community’s quality of life.

**City and County Funding**

When applying for grants, investments beyond the stated minimum match may signal that Keokuk places a high priority on this project and provide additional reassurance that any approved grant will result in a finished project. This commitment should be officially documented in some way, like adding the project to Keokuk’s Capital Improvement Program or memorialized in a resolution from the City Council.

**Donations**

A trails or bike/pedestrian-targeted “Friends” group could be developed for the network, especially for the more aspirational “Phase III” trail extensions. “Friends” groups can assist with fundraising efforts, public demonstrations, and in rallying support for City Council approvals or letter writing campaigns in support of grants proposals. Donations from private sources may also contribute to local matching requirements for grants applications. Even small contributions or in-kind contributions of materials or volunteer labor from local sources provides grant reviewers additional information on the level of local support a project command.

When deciding who to contact for private support, keep in mind specific beneficiaries of the Pathways and Green streets network. Look to property owners along the routes, local businesses that have increased community connections because of the Pathway network or apartment complexes whose residents will enjoy increased connectivity or greenspace because of the project. Parent teacher organizations and Boosters may also be a source of support. These beneficiaries could be approached for letters of support or a pledge for materials, labor, or monetary contributions if the programs is implemented.

It is equally important to recognize local contributions to the implementation of the Pathways and Green streets Network. Known as “stewardship”, donors should receive regular updates on the status of the project, its progress towards completion, and some form of recognition when the project is completed. Examples of recognition may include:

- A segment of the network could be named for a major donor
- Signs along the route could name a local group and thank them for their contribution
- A memorial plaque could be placed in a prominent segment of the network listing donors
- An acknowledgment of thanks could be made in City Council proceedings or on the City of Keokuk’s webpage
- A ribbon cutting ceremony could be held with special invitations and recognition of donors and local advocates.

**PATHWAYS FOCUSED GRANT OPPORTUNITIES**

**AARP Community Challenge**

This grant program funds projects that improve transportation and mobility options, which may include permanent and temporary improvements for connectivity, walkability, bikeability, and access to transit. Applications are due in May, awardees are notified in June, and projects must complete by November.

## America Walks Community Change Grants

This grant program funds projects that create healthy, active, and engaging places to live, work and play. With a \$1,500 maximum award, projects may be small but impactful and must be completed within a year of award.

## Community Attraction and Tourism (CAT) – Iowa Economic Development Authority

The CAT program is designed to assist communities in the development of multiple purpose attraction, recreation, education, entertainment, and cultural facilities. CAT funding is limited to 45 percent of total project costs and must be the “last dollar” to complete the project. Awards are typically closer to 10-20 percent of project costs. Applications are reviewed by the Enhance Iowa Board quarterly. The board policy is to not award more than \$1 million to a single project. Broad local support is needed for a successful CAT application.

## Federal Recreational Trails – Iowa DOT

The Federal Recreational Trails program typically provides about \$1 million annually for projects in Iowa, with a maximum award of 80 percent of the project cost. Applications are due on October 1 each year.

## Iowa Clean Air Attainment Program (ICAAP) – Iowa DOT

The ICAAP program is to finance projects and programs that result in attaining or maintaining the National Ambient Air Quality Standards (NAAQS) of the 1990 Clean Air Act Amendments. The focus is on reducing volatile organic compounds, nitrogen oxides, carbon monoxide, and, under certain conditions, particulate matter. This may be done by reducing motor vehicle congestion. To the extent that walking and biking can replace vehicular trips, some trail, bikeway, and sidewalk projects may be eligible for this funding. The maximum award is 80 percent of the project cost. Applications are due on October 1 of each year.

## Land and Water Conservation Fund (LWCF) – Iowa Department of Natural Resources

This is a federally funded grant program that provides match funds of 50 percent for outdoor recreation area development and acquisition. Iowa’s cities and counties are eligible to participate. A wide range of recreational projects are eligible, including land acquisition and multi-purpose trails. Communities with a population between 5,001 and 10,000, like Keokuk, are eligible for up to \$100,000 per project. There is typically between \$650,000 and \$850,000 available each year. Applications are due on March 15 of each year.

## PeopleForBikes Community Grant Program

This national program awards up to \$10,000 to worthy projects and programs that support bicycling. The grant cannot fund more than 50 percent of the project budget. The program is competitive, a low funding rate of 10 – 15 percent. There are two grant cycles each year, with applications opening in June for the fall submittal, and in December for the spring submittal. Applicants must submit a letter of interest to PeopleForBikes in advance of submitting a full grant application.

## Prairie Meadows Community Betterment Grant

This statewide program awards grants between \$100 and \$99,999. A variable amount of funds, which may be near \$2 million, is available to be awarded in four categories:

- Arts & Culture;
- Economic Development;
- Education; and,
- Health and Human Services.

Trails are eligible under the Economic Development category. The Community Betterment Grant requires that the project be completed within a year.

Prairie Meadows also offers a Legacy Grant for requests of \$100,000 to \$1 million, which must have at least 50 percent of the project budget secured. Applicants cannot apply for both the Community Betterment Grant and the Legacy Grant for the same project.

## Resource Enhancement and Protection Grant (REAP) – Iowa Department of Natural Resources

REAP funds are appropriated by the Iowa Legislature and divided amongst various categories, with 15% going to City Parks and Open Space. Projects may be for the acquisition, establishment, and maintenance of natural parks, preserves and open spaces. Grants may include expenditures for multipurpose trails, rest room facilities, shelter houses and picnic facilities, museums, parks, preserves, parkways, city forests, city wildlife areas as well as other open space-oriented acquisition and development projects. Cities with a population between 5,001 and 10,000, like Keokuk, are eligible for up to \$100,000 per project. Applications are due on August 15 each year.

Counties are also eligible for REAP funding. Some funds are allocated automatically each year; additional funds are allocated based upon population of the county if the county is dedicating at least 22¢ per \$1,000 of the assessed value of taxable property in the county for county conservation purposes. A third portion of funds are available through the competitive grant application process, which also requires the county to be dedicating 22¢ per \$1,000 of the assessed value of taxable property to conservation.

## Statewide Transportation Alternatives Program (TAP) – Iowa DOT

TAP is a portion of the Federal Surface Transportation Program (STP) funding received by the State of Iowa. Applicants compete on a statewide level for a portion of the TAP fund, which may be used for a wide array of projects, including trails and other bicycle and pedestrian facilities. Projects should be statewide in scope, such that they impact communities across the state. While technically eligible, local and regional projects will not score highly enough to be funded. This may provide an opportunity to tie-in part of the Pathways Network into continuation or improvements with the Mississippi River Trail.

## State Recreational Trails – Iowa DOT

The amount of State Recreational Trails funding varies from year to year, but it is often between \$1 million and \$3 million. The maximum award is 75 percent of the project cost. Applications are due on July 1 of each year.

## Transportation Alternatives Program

This program is the new iteration of the previous Moving Ahead for Progress in the 21st Century Act (MAP-21). The following categories of activities are eligible for funding under Iowa’s TAP Program:

- Transportation Alternatives (as defined by 23 U.S.C. 101(a)(29), in effect under MAP-21),
- Infrastructure-related or non-infrastructure-related projects formerly eligible through the Safe Routes to School program (as defined under Section 1404(f) of the SAFETEA-LU), and
- Projects eligible through the Recreational Trails Program under 23 U.S.C. 206.

Grants through this program refunds up to 80 percent of planning and construction costs. Completed applications are due by October 1 each Fall.

## Traffic Safety Improvement Program (TSIP) – Iowa DOT

The purpose of this funding is to study or solve traffic safety concerns on any city, county, or state road. It is not meant to be a funding source for trails or bicycle facilities, but a bicycle or pedestrian facility may be part of a solution to a traffic safety issue. The TSIP provides funds within the following three categories:

- Site-specific - construction or improvement of traffic safety and operations at a specific site or corridor with a crash history.
- Traffic control devices - purchase of materials for installation of new traffic control devices, such as signs, signals, pavement markings; or replacement of obsolete signs or signals
- Research, studies, and public information - transportation safety research, studies, or public information initiatives, such as signing or pavement marking research, driver education/information, work zone safety, and crash data analysis improvements.

Future modifications along Main Street may qualify for TSIP funding and upgrades with an eye towards Pathway and Green streets implementation should be considered. The program can award up to \$500,000 and no match is required. Applications are due on August 15 each year.

Urban State Traffic Engineering Program (U-STEP) and County-State Traffic Engineering Program (C-STEP) -Iowa DOT

The purpose of this funding is to solve traffic operations and safety concerns on an Iowa DOT primary road like Main Street. It is not meant to be a funding source for trails, but a bicycle or pedestrian facility may be part of a solution to a transportation issue. An engineering analysis of the project area is required. U/C-STEP can award up to \$200,000 for a spot improvement, such as a crosswalk or intersection, and up to \$400,000 for linear improvements in. The program can award up to 55 percent of the project cost. Letters of request are accepted by the Iowa DOT District Engineer year-round.

## Wellmark MATCH Grant Matching Assets to Community Health (MATCH)

This grant is awarded by the Wellmark Foundation to promote policies and projects that help communities in Iowa and South Dakota create safe, healthy, and active environments. Two challenge grant opportunities are available—the Large MATCH and Small MATCH.

The Large MATCH program awards up to \$100,000 with a one-to-one local match requirement. The Small MATCH program awards up to \$25,000, with a 50 percent local match requirement. Applications are due in March each year.

## **GREEN STREETS FOCUSED GRANT OPPORTUNITIES**

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### Community Attraction and Tourism (CAT) – Iowa Economic Development Authority

The CAT program is designed to assist communities in the development of multiple purpose attraction, recreation, education, entertainment, and cultural facilities. CAT funding is limited to 45 percent of total project costs and must be the “last dollar” to complete the project. Awards are typically closer to 10-20 percent of project costs. Applications are reviewed by the Enhance Iowa Board quarterly. The board policy is to not award more than \$1 million to a single project. Broad local support is needed for a successful CAT application.

### Iowa Great Places – Iowa Department of Cultural Affairs

The Iowa Department of Cultural Affairs provides up to \$400,000 per award to communities and non-profit organizations. Communities must demonstrate a strong vision for innovation and strive to enhance community vitality and quality of life while maintaining its unique character. Awardees are designated as an Iowa Great Place. The average award is \$185,000. Letters of intent are usually due by May 1, with a grant application deadline in early June.

### Resource Enhancement and Protection Grant (REAP) – Iowa Department of Natural Resources

REAP funds are appropriated by the Iowa Legislature and divided amongst various categories, with 15% going to City Parks and Open Space. Projects may be for the acquisition, establishment, and maintenance of natural parks, preserves and open spaces. Grants may include expenditures for multipurpose trails, rest room facilities, shelter houses and picnic facilities, museums, parks, preserves, parkways, city forests, city wildlife areas as well as other open space-oriented acquisition and development projects. Cities with a population between 5,001 and

10,000, like Keokuk, are eligible for up to \$100,000 per project. Applications are due on August 15 each year.

Counties are also eligible for REAP funding. Some funds are allocated automatically each year; additional funds are allocated based upon population of the county if the county is dedicating at least 22¢ per \$1,000 of the assessed value of taxable property in the county for county conservation purposes. A third portion of funds are available through the competitive grant application process, which also requires the county to be dedicating 22¢ per \$1,000 of the assessed value of taxable property to conservation.

## TRANSPORTATION ALTERNATIVES PROGRAM

This program is the new iteration of the previous Moving Ahead for Progress in the 21st Century Act (MAP-21). The following categories of activities are eligible for funding under Iowa’s TAP Program:

- Transportation Alternatives (as defined by 23 U.S.C. 101(a)(29), in effect under MAP-21),
- Infrastructure-related or non-infrastructure-related projects formerly eligible through the Safe
- Routes to School program (as defined under Section 1404(f) of the SAFETEA-LU), and
- Projects eligible through the Recreational Trails Program under 23 U.S.C. 206.

Grants through this program refunds up to 80 percent of planning and construction costs. Completed applications are due by October 1 each Fall.

## GREEN STREETS MATRIX

The following matrix is designed to help guide the implementation of Green streets and other green treatments. The columns of the matrix are the different treatment options as described in this report. The rows of the matrix are street characteristics that are used to determine how suitable each treatment is for a specific one-block street segment. For street characteristics that are grouped, only one characteristic should be chosen. For example, a street segment is either in poor, fair, or good condition. Therefore, only one should be selected when using this matrix.

Cell values (0,1,2) are based on how suitable each treatment is based on a specific street segment. For example, a full Green streets conversion receives a zero score for any street segment surrounded by

industrial use and a two for a street segment surrounded by residential uses.

Determining which street characteristics to use when scoring is largely dependent on the user’s judgement. Traffic volume, street condition, and EPA reconstruction information can all be found in this report. In the future, staff may designate specific requirements for other characteristics. For example, a specific distance may be used when determining “located near school”.

Once the user has selected all the appropriate street criteria, the score for each treatment type should be added to determine a total score. Once all treatment types have a total score, the user can then compare scores to determine which treatments are most suitable for the specific one-block street segment.

		Green Treatments							
		Full Greenway Conversion	Partial Greenway	Bioretention Planter	Biofiltration Planter	Bioretention Swale	Street Tree	Permeable Pavement (entire road surface)	Permeable Pavement (partial)
Street Characteristics	Traffic Volume ≤ 1000	1	2	2	2	2	2	2	2
	Traffic Volume ≤ 2000	0	0	2	2	2	2	2	2
	Traffic Volume ≤ 3000	0	0	2	2	2	2	2	2
	Traffic Volume ≤ 6000	0	0	2	2	2	2	1	1
	Traffic Volume ≤ 12000	0	0	2	2	2	2	0	1
	Located near Pathway Network	1	2	2	2	2	2	1	1
	Located near school	2	2	2	2	2	2	1	1
	Located in or near downtown	1	2	2	2	2	2	1	2
	Pooling Water	2	2	1	2	1	2	1	1
	Sends Water Downstream	2	2	2	2	2	2	2	2
	Poor Street Condition	2	2	2	2	2	1	2	2
	Fair Street Condition	1	2	2	1	1	1	1	2
	Good Street Condition	1	1	2	1	1	1	1	1
	Scheduled for EPA reconstruction	2	2	2	2	2	2	2	2
	Limited ROW	1	2	2	1	1	1	1	1
	Adequate ROW	2	2	2	2	2	2	1	1
	City owns 50% of parcels along block	2	2	1	1	1	1	1	1
	Surrounding Uses - Residential	2	2	2	2	2	2	2	2
	Surrounding Uses - Commercial	0	0	1	1	2	2	0	0
	Surrounding Uses - Industrial	0	0	1	1	1	1	0	0
Adjacent to Greenway	2	2	1	1	1	1	1	1	
Alley with Garage Access on both sides	2	2	1	1	1	1	1	1	

Following is a workflow for using the decision matrix.

Step 1. Determine the one-block street segment to be analyzed: N 6th Street from Blondeau Street to Concert Street

	Full Greenway Conversion
Traffic Volume ≤ 1000	1
Traffic Volume ≤ 2000	0
Traffic Volume ≤ 3000	0
Traffic Volume ≤ 6000	0
Traffic Volume ≤ 12000	0
Located near Pathway Network	1
Located near school	2
Located in or near downtown	1
Pooling Water	2
Sends Water Downstream	2
Poor Street Condition	2
Fair Street Condition	1
Good Street Condition	1
Scheduled for EPA reconstruction	2
Limited ROW	1
Adequate ROW	2
City owns 50% of parcels along block	2
Surrounding Uses - Residential	2
Surrounding Uses - Commercial	0
Surrounding Uses - Industrial	0
Adjacent to Greenway	2
Alley with Garage Access on both sides	2
<b>Score</b>	<b>13</b>

Step 2. Begin selecting applicable street criteria

Highlighted in the first column are the street characteristics for N 6th Street from Blondeau Street to Concert Street. Maps included in this report and user judgement were used to determine which criteria are appropriate. Note that neither “pooling water” or “sends water downstream” are selected as neither are applicable for this specific street segment.

Step 3. Add the values for the treatment types to determine a total score.

A full Green streets conversion has a total score of 13 for N 6th Street from Blondeau Street to Concert Street.

Step 4. Repeat this step for all treatment options.

A total score for each treatment type is found. The treatment with the highest score is considered the most suitable for this specific street segment.

Following is a brief description of each street characteristic.

Traffic Volume: Based on data collected from the IDOT. Values are Average Daily Traffic (ADT)

Located Near Pathway Network: if the street segment being analyzed is within two blocks of a pedestrian or bicyclist facility outlined in the Pathway Network map included in this report, the criterion is satisfied.

Located near school: if the street segment being analyzed is within two blocks of a school, the criterion is satisfied.

Located near downtown: if the street segment being analyzed is in or within two blocks of the downtown area, the criterion is satisfied. What is considered “downtown” is up to the user.

Flooding: If the street segment is in a low-lying area and experiences pooling water during rain events, the “pooling water” criteria is satisfied. If the street segment is directly adjacent a low area and rainwater flows down the street, the “sends water downstream” criteria is satisfied. If the street segment does not experience pooling water and does not send water downstream, then these criteria are not applicable.

Street condition: Based on data collected by Keokuk Public Works and included in a map in this report.

Scheduled for EPA reconstruction: Based on the map of phases of EPA reconstruction included in this report.

Right of Way: Based on how much right of way is available for potential green treatments. Things like large bio swales or street trees may not be appropriate in residential areas where there is limited right of way. This criterion is up to user interpretation.

City owns 50% of parcels on block: Based on city data

Surrounding land use: Based on the predominant land use surrounding the street segment. If multiple uses exist, choose the most restrictive when scoring.

Adjacent to Green streets: If the segment being analyzed is connected to an existing Green streets, the criteria is satisfied.

Alley with garage access on both sides: If there is an alley with garage access for both sides of the street, the criteria is satisfied.

## Recommendation

This matrix should be used whenever a street is under construction. Whether it be minor utility work or complete resurfacing of the street, the potential cost savings that can be gained by incorporating green infrastructure into other construction projects should be explored. The highest scoring treatment options will require additional cost estimates and engineering to provide better insight as to how suitable they may be at specific locations.

### OPPORTUNITIES FOR COORDINATION WITH LOCAL PRIVATE LANDOWNERS

Phase One and Two of the Pathway Network is wholly contained on public lands and roads. Phase Three of the Pathway network would however involve private accommodations for public access by several utilities, railway, and private businesses in Keokuk. To expand the network onto private land would require the acquisition of easements for access, either through purchase of an easement or real property or from an access agreement from a willing property owner. Before Keokuk continues down this Pathway, the rights of the City and possible concerns of private owners should be understood.

To encourage landowners to open private lands to the public for recreation, Iowa has adopted recreational use states that provide legal liability controls for private landowners who are willing to allow public access for recreation. These statutes limit landowner liabilities in case of Pathway user injuries but also create a legal framework for compensation if users inflict damage through vandalism or trespassing. To help discourage this behavior, private landowners are advised to post no trespassing and no vandalism signs marking the end of the public easements (Economics, 2016).

Landowners are not relieved of all responsibilities towards Pathway users. Generally, a landowner has a reduced duty of care to alert users of dangerous conditions on a trail, and while they are relieved of the requirement to prevent harm towards users' landowners must also not engage in willful or malicious conduct towards these same users. Recreational use statutes, however, do not relieve the landowner from all responsibilities to recreational trail users. For example, landowners are not required to prevent harm to recreational users, but they must not engage in willful or malicious conduct.

Outreach was initiated to several private landowners near where Pathways Network Phase Three would run including: Roquette, BNSF, Alliant Energy, Liberty Utilities, and the City of Keokuk Water Treatment Department. As of the time of this report's printing, none of these partners were able to respond to requests for interviews. As the plan progresses, these and other landowners who may have property interests in the network should be contacted to establish easement access and address their concerns.

### Keokuk Oktoberfest and Football Game Survey Results

Of the 92 surveys collected from Keokuk residents. 32 were completed by minors and were excluded from the KPGP analysis. The full survey and consolidated results (minus those completed by minors) may be found in the attached excel document.

## Keokuk Comprehensive Plan

Keokuk Comprehensive Plan 2018: Vibrant Economy			Keokuk Pathways and Green streets
Goal	Objectives	Action Items	
Keokuk will leverage its existing local assets			Emphasize the Mississippi River Trail along the east side of town
	Emphasize Keokuk's geographic advantages and plentiful natural resource amenities		Emphasize the Mississippi River Trail along the east side of town
			Pursue a trail on the south side of town overlooking the Mississippi with designated viewpoints
Focus on the concept of sustainability as a catalyst for future development and job growth	Focus on the concept of sustainability as a catalyst for future development and job growth	Repave additional public streets, driveways, and parking lots with permeable pavers	Reduce VMT by promoting walking and bicycling and implement green infrastructure

Keokuk Comprehensive Plan 2018: Resilient Infrastructure			Keokuk Pathways and Green streets
Goal	Objectives	Action Items	
Keokuk will leverage its existing local assets			
	Emphasize Keokuk's geographic advantages and plentiful natural resource amenities		Emphasize the Mississippi River Trail along the east side of town
	Explore additional opportunities to utilize the Mississippi River as a recreation space		Pursue a trail on the south side of town overlooking the Mississippi with designated viewpoints
Keokuk's economy will have a foundation of sustainability	Focus on the concept of sustainability as a catalyst for future development and job growth	Repave additional public streets, driveways, and parking lots with permeable pavers	Pursue a trail on the south side of town overlooking the Mississippi with designated viewpoints

Keokuk Comprehensive Plan 2018: Lifestyle Amenities			Keokuk Pathways and Green Streets
Goal	Objectives	Action Items	
Keokuk will offer a well-connected network of recreational trails and bike routes	Expand the citywide network of off-road, multi-purpose trails		Pursue a multi-purpose trail on Highway 61 and along Soap Creek
	expand the supply of on-road bike routes in Keokuk	Establish dedicated bike lanes along strategically significant corridors where space for off-road facilities is not available	Develop a decision matrix to guide implementation of on-street bicycle facilities