



CHAPTER 3: NEEDS ASSESSMENT

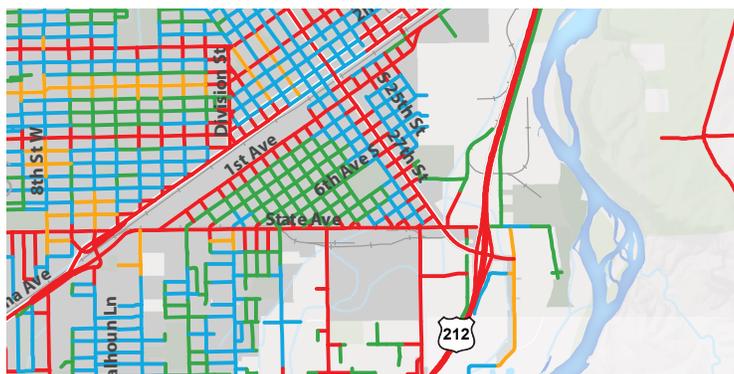
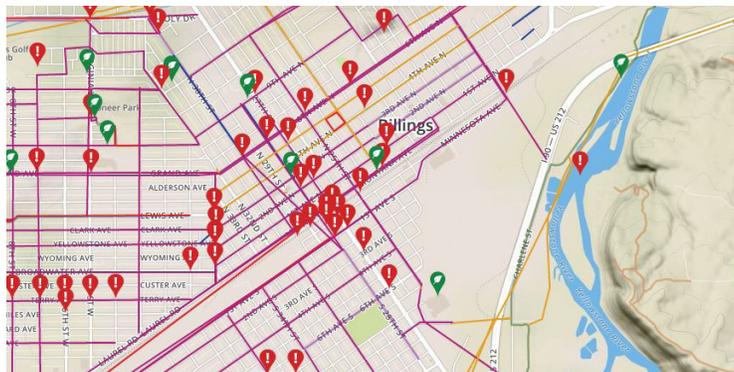


3.1 NEEDS ASSESSMENT INTRODUCTION

The existing conditions chapter created a baseline for the current status of bikeway and trail infrastructure in Billings area. The Needs Assessment chapter builds on this foundation and assesses the supply of bicycle and trail facilities in the Billings area to determine how well the supply meets the needs of bicyclists and trail users. The assessment of the supply of bikeway and trail infrastructure was informed by several layers of information, including a data-driven bicycle level of stress model and qualitative data collected through in-person meetings and online tools. These layers are described in detail, including a summary of the Bicycle Level of Traffic Stress model and the results of the online tools and in-person meetings. Combined, these layers illustrate where the most significant needs for improvements exist.

Additionally, this chapter provides an overview of the benefits that could be realized if the community were to increase the rate of implementation of trail and bikeway infrastructure, which in turn would increase the rates of people walking and bicycling in the community. These benefits include health, economic and environmental benefits, and are presented as low, medium and high estimates to model different levels of growth in walking and bicycling rates.

The chapter concludes with a summary of innovative bikeway designs that have been implemented in recent years in many North American cities, including cities in Montana.



Both quantitative and qualitative sources of data and information were analyzed to assess the needs for multimodal transportation in Billings area.

DATA DRIVEN MODELS



BICYCLE LEVEL OF TRAFFIC STRESS

WORKSHOPS + MEETINGS



FOCUS GROUP MEETINGS

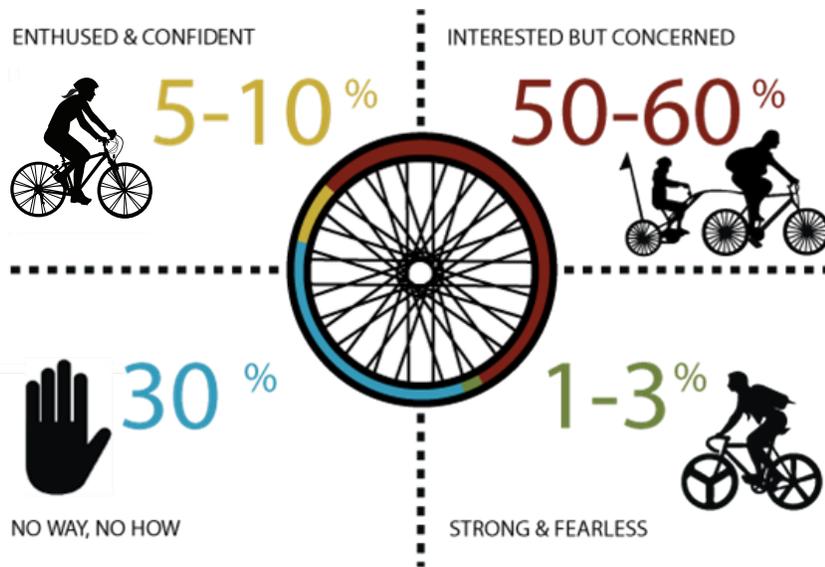
PUBLIC MEETINGS

ONLINE TOOLS



ONLINE INPUT MAP

ONLINE SURVEY



Research into bicycling mode choice has indicated that all Billings area residents generally fall into four categories: Strong and Fearless riders, who will ride despite challenging traffic conditions (1-3%); Enthused and Confident riders, who will ride in most traffic conditions but prefer dedicated bicycle facilities (5-10%); Interested but Concerned Riders, who would ride but only if comfortable bicycle facilities are provided (50-60%); and those who will never ride a bicycle, for personal or physical reasons (30%). This research indicates that the majority of people in the United States (56-73%) would bicycle if dedicated bicycle facilities were provided. However, only a small percentage of Americans (1-3%) are willing to ride if no facilities are provided.

Source: Roger Geller, City of Portland Bureau of Transportation. *Four Types of Cyclists*. <http://www.portlandonline.com/transportation/index.cfm?&a=237507>, 2009; 2 Dill, J., McNeil, N. *Four Types of Cyclists? Testing a Typology to Better Understand Bicycling Behavior and Potential*. 2012.

3.2 BICYCLE CONDITIONS-LEVEL OF TRAFFIC STRESS ANALYSIS

A bikeway and trail network is likely to attract a large portion of the population if its fundamental attribute is low-stress connectivity. In other words, a network should provide direct routes between origins and destinations that do not include links that exceed one’s tolerance for traffic stress. Each user is different and will tolerate different levels of stress in their journey, so this analysis should be used as a general guide rather than an absolute.

The methods used for the Level of Traffic Stress Analysis were adapted from the 2012 Mineta Transportation Institute (MTI) Report 11-19: *Low-Stress Bicycling and Network Connectivity*. The approach outlined in the MTI report uses the following variables to classify roadways:

- Posted speed limit
- The number (and width) of travel lanes
- The presence of bicycle lanes

In Map 3-1, road segments are classified into one of four levels of traffic stress (LTS) based on these factors:

- LTS 1 is assigned to roads that would be tolerable for all ages and abilities, including children and elderly adults, to ride
- LTS 2 roads are those that could be comfortably ridden by the average adult population
- LTS 3 is the level assigned to roads that would be acceptable to current “enthused and confident” bicyclists
- LTS 4 is assigned to segments that are only acceptable to “strong and fearless” bicyclists, who will tolerate riding

on roadways with higher motorized traffic volumes and speeds. Sometimes, even the presence of a dedicated bicycle lane is not sufficient to make a high-speed and volume roadway comfortable to a significant portion of the population.

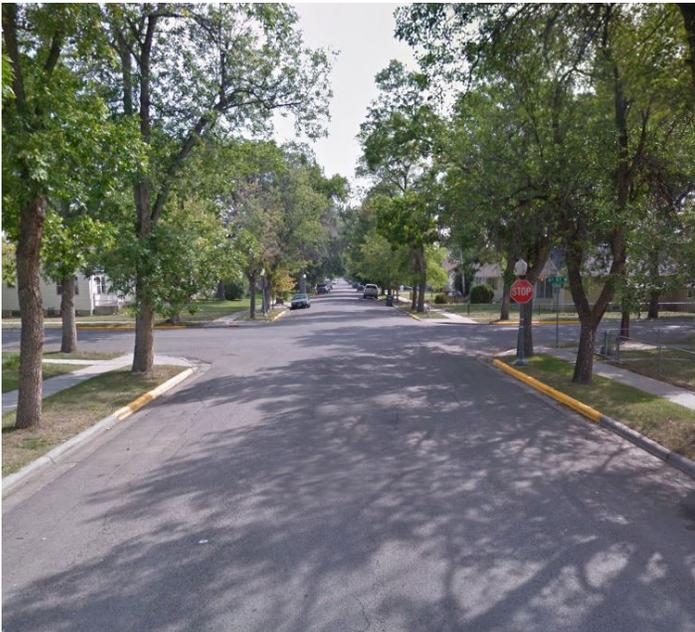
Images displaying LTS scores 1 to 4 in Billings area are displayed on page 3-3.

In general, streets with separated bicycle facilities or streets with low volumes and speeds would qualify as a low-stress (LTS 1) bikeway, while roadways shared with motor vehicle traffic operating at high speeds and volumes would receive a higher-stress score. The results of the LTS analysis help to identify existing areas with a high level of service, as well as focus areas for improvement. The LTS analysis is specifically focused on the street environment. Adjacent shared-use paths (if present) offer a more comfortable facility type that is not reflected in the LTS score.

LTS provides an intuitive framework to describe the benefits of bicycle infrastructure and demonstrates that some roadways may require more intervention than others to provide a truly comfortable experience. For example, the only time a standard bike lane is considered acceptable for all ages and abilities is a 6-foot-wide facility on a roadway with posted speed of 30 mph or lower, and the best score achievable on a roadway with four or more travel lanes without installing a separated bike lane is LTS 3.



LTS 1



Residential streets, such as Yellowstone Avenue, are low-volume and low-speed (25 MPH speed limit) and are comfortable for a wide range of bicyclists, including children and older adults, even without dedicated facilities.

LTS 2



Streets with bicycle lanes and low to moderate speeds and volumes can be attractive for the mainstream population, as in this example on Lewis Avenue at 24th St.

LTS 3



Collector roadways tend to carry more traffic and have higher speeds, making riding along them more stressful and comfortable only for more confident bicyclists. This example on Midland Rd provides no dedicated facility for bicyclists.

LTS 4

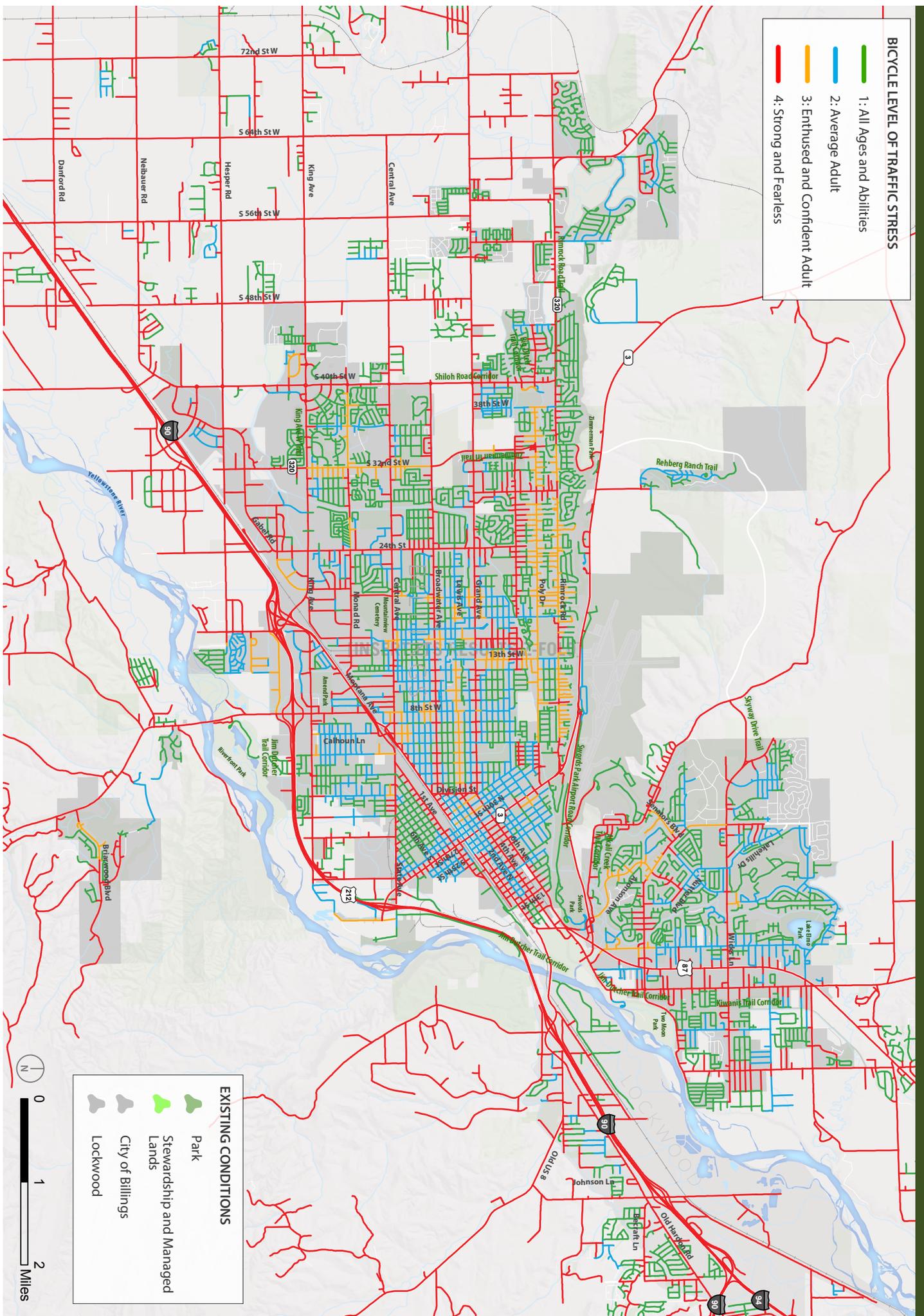


Sharing the traffic lane or riding in the shoulder on streets with high traffic volumes and speeds is not comfortable for the majority of bicyclists, such as this example on 13th St.

MAP 3.1: BICYCLE LEVEL OF TRAFFIC STRESS

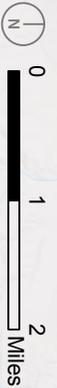
BICYCLE LEVEL OF TRAFFIC STRESS

- 1: All Ages and Abilities
- 2: Average Adult
- 3: Enthusiased and Confident Adult
- 4: Strong and Fearless



EXISTING CONDITIONS

- Park
- Stewardship and Managed Lands
- City of Billings
- Lockwood

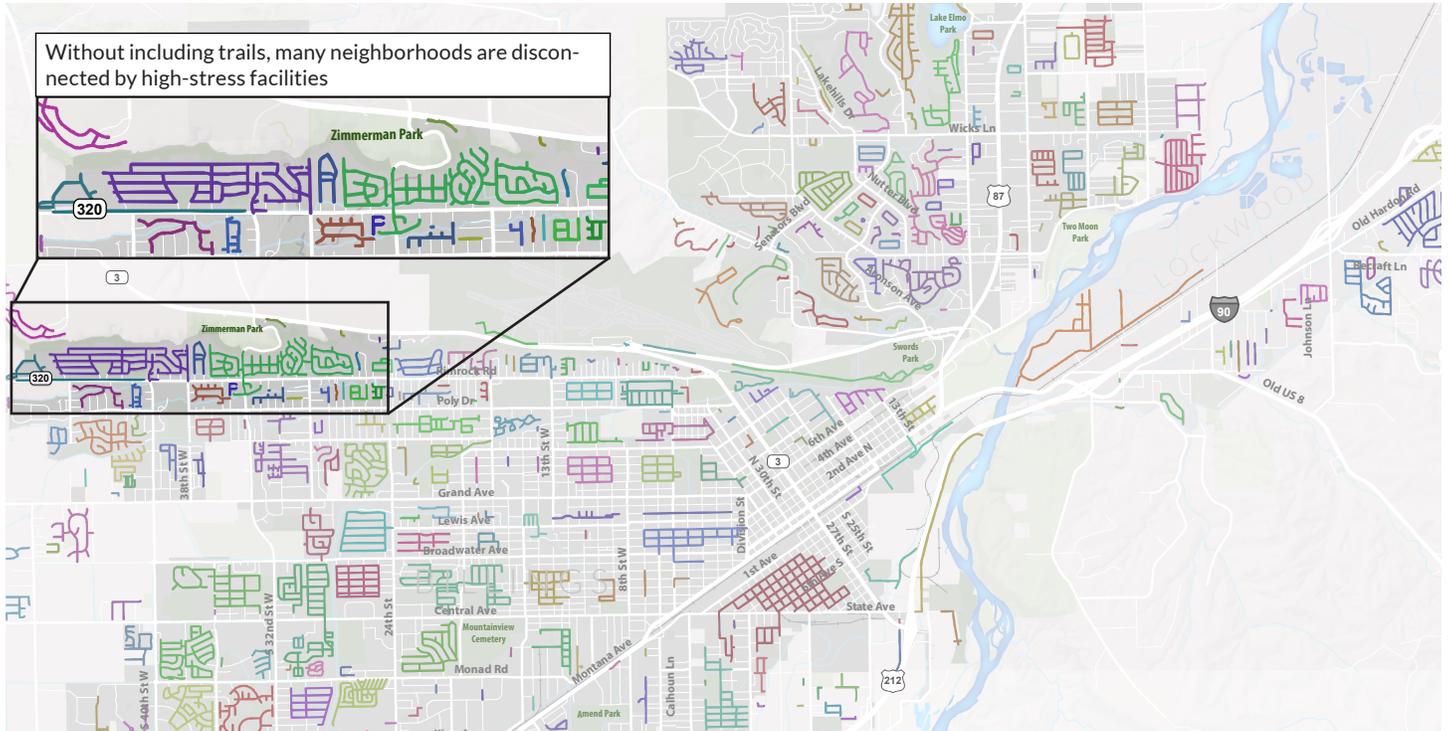




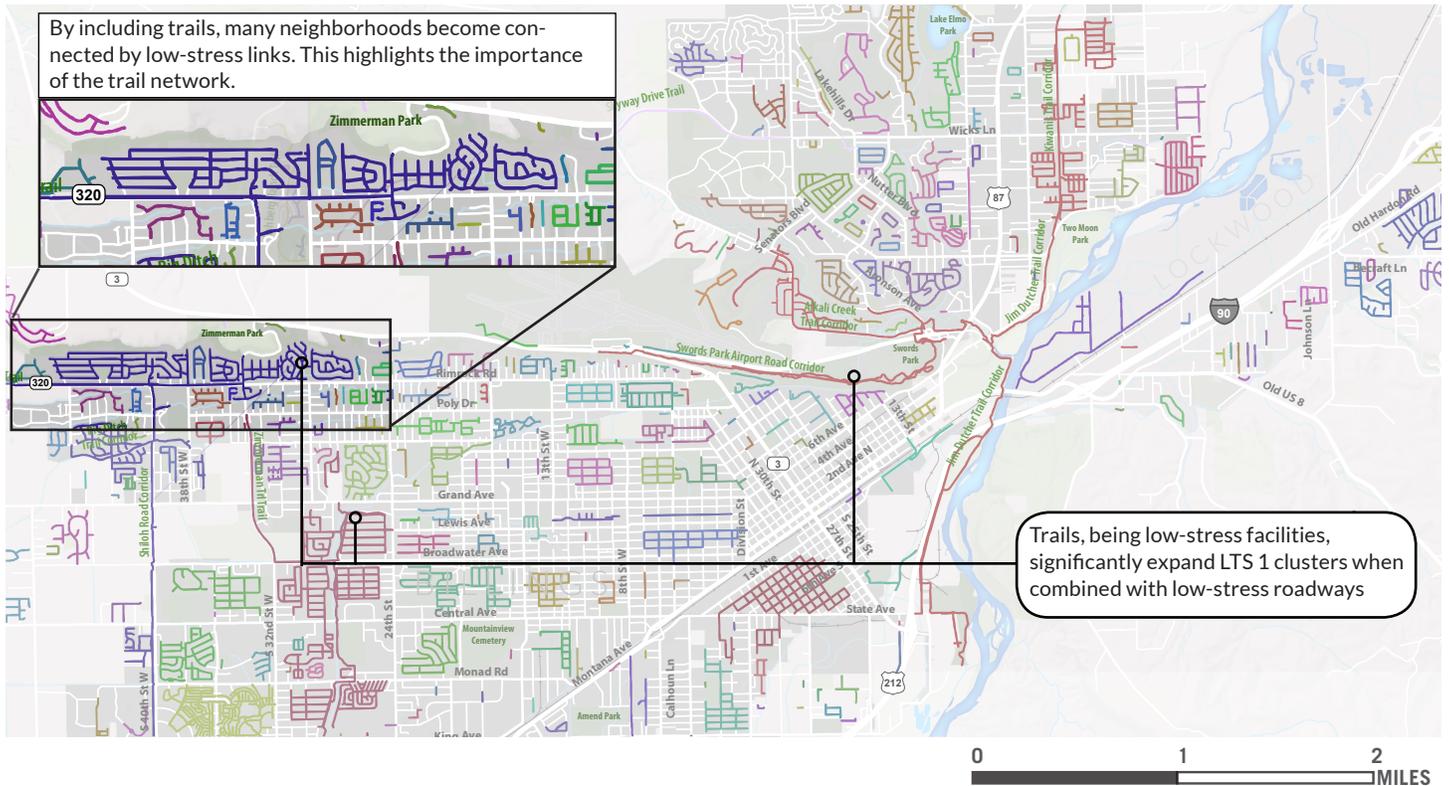
3.2.1 Low-Stress Network Connectivity

Connectivity clusters depict connectivity of roadways classified as suitable for all ages and abilities. The top map depicts connectivity clusters on public roadways that score as an LTS 1. The bottom map includes paved trails in addition to the roadways. Each color represents a cluster that is connected. Trails increase network connectivity and result in fewer disconnected islands of facilities.

MAP 3.2: LTS 1 ROADWAYS



MAP 3.3: LTS 1 ROADWAYS + PAVED TRAILS





3.3 PUBLIC INVOLVEMENT SUMMARY

The Bikeway and Trails Master Plan update incorporated a robust public involvement process to solicit input about existing bicycling and trail conditions in the community, where improvements should be focused, and how infrastructure should be funded. Several outreach methods were used to ensure a wide cross-section of the public was engaged through the planning process. These methods included a public open house, focus group meetings, online public input map, and an online survey. Each of these methods provided different information, but generally, consistent themes were identified. This section summarizes the input collected through the outreach process.

3.3.1 Public Open House

On Wednesday, July 29, the project team facilitated a public open house, which provided a forum where people could learn about the project and provide input about how bicycling and trails could be improved in the community. The meeting kicked-off with a presentation about existing bicycling and trail conditions in the community. Attendees were then invited to work over maps, and document challenges to bicycling and trail use, and opportunities to improve conditions. More than fifty people attended the meeting, and feedback gathered through it was used to guide the plan's recommendations.



At the Open House, the public had the opportunity to document opportunities and challenges to bicycling and trail use in the community.

3.3.2 Focus Group Summary

In July, the project team facilitated a series of focus group meetings with stakeholders in the community to understand perceptions surrounding bicycling and trail use in the Billings area, and areas where improvement is needed. In total, four focus group meetings were held, and each meeting was oriented towards different groups of stakeholders. The groups were: 1. Equity Service Providers, which included representatives from agencies that assist at-risk youth or adults, people with physical disabilities, and the elderly; 2. City/County Staff, which included representatives from different governmental departments from the City and Yellowstone County; 3. Community Advocates, which included representatives from organizations in the city that advocate for improved bicycle

OUTREACH METHODS

WORKSHOPS + MEETINGS



FOCUS GROUP MEETINGS

PUBLIC MEETINGS

ONLINE TOOLS



ONLINE INPUT MAP

ONLINE SURVEY

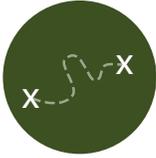
and pedestrian accommodations; and 4. Business Leaders, which included representatives from employers in-and-around Billings. Questions were asked to each group. Some of the questions were general, while others were targeted towards each group.

A summary of the responses to these questions is provided in the Appendix. All responses were collected anonymously so that the conversations remained open. In total, the team met with more than fifty representatives from different organizations in-and-around Billings, and collected a wealth of information that was used to inform the plan's recommendations. A high level summary of the major themes consistently identified across the groups is provided on page 3-7.



FOCUS GROUP SUMMARY - A SNAPSHOT

CONNECTIVITY + ACCESS



- Limited direct and comfortable routes to access destinations
- Bikeway and trail system has critical gaps
- People frequently need to drive to access trails
- Better integration of transit and non-motorized network needed

DESTINATIONS



- Prioritize links to destinations and develop a network that better serves commuter trips
- Identify key employment areas for traditionally underserved populations
- Provide secure bicycle parking at employment centers
- Identify resources for commuters to “freshen up” prior to the start of a workday

SAFETY



- Interactions between people driving, bicycling and walking can be tense
- Need for consistent law enforcement of all modes
- Clarification of the law on bicycle riding on sidewalks needed
- Intersections along desirable routes are barriers to connectivity

INCLUSION



- The development of infrastructure in the community should cater to a wide range of users, young and old, able-bodied and disabled
- Education programs should be broad-based, highlighting the needs of all non-motorized roadway users, including those with mobility impairments

INFRASTRUCTURE



- The South Side Neighborhood requires more dedicated facilities – could become case study area for implementation and education programs
- The Rims, River and Canals are major opportunities to install trail facilities
- Improvements need to be made at intersections to facilitate active transportation
- The busy streets in downtown deter people from walking/biking downtown

EDUCATION



- Very important component – critical need for more education in the community
- Education should focus on the interactions between different modes
- Education should teach all users how to understand the rules of the road to make walking, bicycling and driving more predictable
- Enforcement needs to be increased to support the education programs
- A variety of non-traditional media sources needs to be used for the education programs, such as social media and internet radio stations

RECREATION VS. TRANSPORTATION



- Most bicycling in the community is perceived to be recreational bicycling
 - The percentage of those commuting via bicycle appears to be increasing
- Providing infrastructure that facilitates recreational and commuter bicycling is important for the community’s employers
 - It will help them to attract and retain talent, as these features are important to the Billings’s “Quality of Life Package”

FOCUS GROUPS - BY THE NUMBERS

4 MEETINGS THAT INCLUDED MORE THAN

50 REPRESENTATIVES FROM OVER

25 BUSINESSES, ORGANIZATIONS + DEPARTMENTS



3.3.3 Community Surveys Summary

In 2016, various departments and organizations in the community distributed several statistically valid surveys, which included questions relevant to this Plan. Answers to questions provide insight into recreation, walking and bicycling conditions, and health in the community. Additionally, these surveys help to identify what the community's priorities are for improvement. The surveys include the National Citizen Survey (2016), the Parks and Recreation Needs Survey (2016), and the Community Health Needs Assessment (2016), and key responses from these surveys are summarized on pages 3-8 and 3-9. The responses support the notion that there is a need and community desire to improve trail and bikeway facilities in the Billings area. **Key responses from the National Citizen Survey are summarized on this page.**

TRANSPORTATION

RANKED
AS
THE **#2**

MOST PRESSING ISSUE FOR THE CITY OF BILLINGS

FIVE OF TEN RESIDENTS THINK THE EASE OF WALKING IS GOOD OR EXCELLENT



THREE OF TEN RESIDENTS THINK THE EASE OF BICYCLING IS GOOD OR EXCELLENT



SIX OF TEN RESIDENTS THINK RECREATIONAL OPPORTUNITIES ARE GOOD OR EXCELLENT



THREE OF TEN RESIDENTS THINK TRAFFIC ENFORCEMENT IS GOOD OR EXCELLENT



Source: All data presented on this page was developed from the National Citizen Survey: Billings, MT Community Livability Report. Published 2016.



Like communities across the country, the majority of Yellowstone County residents could stand to get more physical activity. Data provided through locally administered, statistically valid surveys highlight this need. Low levels of physical activity is a contributing

factor to higher rates of obesity, which is linked to other negative health outcomes. By improving trail and bikeway facilities in the community, more people could potentially reach the daily activity levels recommended by the Centers for Disease Control.¹

YELLOWSTONE COUNTY RESIDENTS NEED MORE PHYSICAL ACTIVITY

OF ADULTS:



18% REPORTED NO LEISURE TIME ACTIVITY



76% DO NOT MEET RECOMMENDED PHYSICAL ACTIVITY LEVELS
As defined by the Centers for Disease Control

OF CHILDREN:



29% DO NOT MEET RECOMMENDED PHYSICAL ACTIVITY LEVELS
As defined by the Centers for Disease Control

Source: 2016-17 Yellowstone County Community Health Needs Assessment.

LOW LEVELS OF PHYSICAL ACTIVITY HAVE CONTRIBUTED TO HIGH LEVELS OF OBESITY



66% OF ALL ADULTS ARE OVERWEIGHT



34% OF ALL ADULTS ARE OBESE



29% OF ALL CHILDREN ARE OVERWEIGHT

*Many factors contribute to one's health outcomes, including diet, genetics and levels of physical activity.

Source: 2016-17 Yellowstone County Community Health Needs Assessment.

MOST PEOPLE GET ACTIVITY THROUGH ACTIVE TRANSPORTATION

MORE THAN

50% OF RESIDENTS WALK OR BIKE FREQUENTLY*

INSTEAD OF DRIVING

*Frequently = those who responded always/sometime or more than once a month

Source: National Citizen Survey: Billings, MT Community Livability Report. Published 2016.

MOST IMPORTANT FACILITIES BASED ON RESIDENTS' TOP FOUR CHOICES

From the Community Interest/Opinion Survey

WALKING & BIKING TRAILS 54%

SMALL PARKS 50%

LARGE PARKS 23%

HIGHEST PRIORITY FOR INVESTMENT BASED ON RESIDENTS' CHOICES AND UNMET NEEDS

WALKING AND BIKING TRAILS

Source: 2016 City of Billings Community Interest and Opinion Survey

¹ The Centers for Disease Control recommends 150 minutes of moderate intensity activity (i.e., brisk walking) every week for adults and 60 minutes of aerobic activity every day for children



3.3.4 Online Survey Summary

In addition to the statistically valid surveys completed recently, the Billings Bikeway and Trail Master Plan included an independent survey to assess filling gaps in the trail and bikeway system, funding non-motorized improvements, and barriers to walking and bicycling more. The answers to the seven questions are summarized in Graphic 3.1. Respondents expressed the expansion of the bikeway and trail network should be roughly split between

recreational and commuter routes, and they were supportive of investing to expand the bikeway and trail network. Development fees were identified as the most popular local funding source for growing the system, and the top priority for investment noted was expanding the trail system. The most frequently identified barrier to walking/bicycling more was lack of continuity in existing facilities. While not statistically valid, the online question and answer survey was completed by 168 Billings area residents and provides some insight into the needs and preferences of participating individuals.

GRAPHIC 3.1: ONLINE SURVEY SUMMARY

WHERE SHOULD IMPROVEMENTS BE FOCUSED?



RECREATIONAL SYSTEM
56.3%



COMMUTER ROUTES
43.8%

TOP SEVEN MOST CRITICAL GAPS IN THE SYSTEM

1. RIVERFRONT TRAILS ALONG THE YELLOWSTONE RIVER (34.8%)
2. CONNECTIONS FROM WEST BILLINGS TO DOWNTOWN (20.7%)
3. CONNECTION ATOP THE RIMROCKS FROM 27TH ST TO ZIMMERMAN TRAIL (15.9%)
4. CONNECTION FROM BILLINGS HEIGHTS TO DOWNTOWN (13.4%)
5. CONNECTION FROM THE RIVER/ LOCKWOOD TO DOWNTOWN (6.1%)
6. CONNECTION FROM THE RIMROCKS TO DOWNTOWN (5.5%)
7. CONNECTIONS FROM SOUTH BILLINGS TO DOWNTOWN (3.7%)

ALLOCATING LOCAL TRANSPORTATION FUNDS



3 OF 4 RESPONDENTS SUPPORT ALLOCATING LOCAL FUNDS TO EXPAND THE BIKEWAY AND TRAIL NETWORK

ADDITIONAL TAXES OR FEES FOR BIKEWAYS/TRAILS



SUPPORT

66.1%



NEUTRAL 7.1%



OPPOSE

23.9%

FUNDING SOURCE PRIORITY RANKING

The following funding sources are ranked by order of popularity (based upon average weighted scores) as ways to fund bikeway and trail improvements in-and-around Billings:

1. DEVELOPMENT FEES

2. GAS TAX

3. LOCAL OPTION SALES TAX

4. GO BOND

5. SPECIAL TRANSPORTATION DISTRICT

6. PROPERTY TAX

TOP THREE RANKED PRIORITIES FOR INVESTMENT

#1



PRIORITY

EXPANSION OF TRAIL NETWORK

#2



PRIORITY

MAINTENANCE OF EXISTING BIKEWAY AND TRAIL NETWORK

#3



PRIORITY

EXPANSION OF EXISTING ON-STREET BIKEWAYS

THE TOP THREE BARRIERS THAT PREVENT RESPONDENTS FROM WALKING/BICYCLING MORE



CONTINUITY OF FACILITIES
32.5%



DISTANCES FROM HOME TO DESTINATIONS
26.3%



PERCEPTION OF SAFETY ALONG BUSY STREETS
22.5%



3.3.5 Online Input Map Summary

The online mapping software, Wikimapping, allows users to draw lines and drop points within an online map, and add comments to other people’s input. Subsequent visitors can add additional comments and agree or disagree with existing comments, which provided the planning team with an understanding of the relative interest of each recommendation. The online input map used for the Plan included the following base layers: existing street, bikeway and trail infrastructure. In total, the map recorded 668 individual interactions, including lines being drawn, points being placed and people commenting on lines and points that others had drawn.

People were asked to identify comfortable existing bike routes, existing bicycle facilities that needed improvement, desired on-street bicycle facilities, and desired off-street bicycle facility/trails. The categories that recorded the greatest number of miles drawn using the online map were desired *on-street* bicycle facilities (217 miles) and desired *off-street* bicycle facility/trails (120.3 miles), showing a preference for the implementation of new connections.

Users were also asked to place points representing two categories, including locations where bicycle and pedestrian crossing improvements were needed and where better trail access was desired. Participants placed 127 points indicating where crossing improvements were needed, and 57 points where trail access could be improved. Key statistics representing interactions with the online input map are displayed in Graphic 3.2.

Maps 3.4 and 3.5 on page 3-12 display the line and point comments collected via the online input map. Specifically, Map 3.4 shows the line features that were drawn indicating where linear improvements are desired. Map 3.5 shows the location of desired spot improvements by category. This tool resulted in a robust dataset that the planning team referenced throughout the development of the plan’s recommendations.

BILLINGS URBAN AREA

BIKEWAY + TRAILS
MASTER PLAN UPDATE

Please use the map below to **DRAW ROUTES** and **PLACE POINTS** to share your thoughts about bicycling and using trails in the Billings area. Please concentrate comments within and around the City of Billings!

Interact with the map!

1

Click Routes or Points in the menu bar below

2

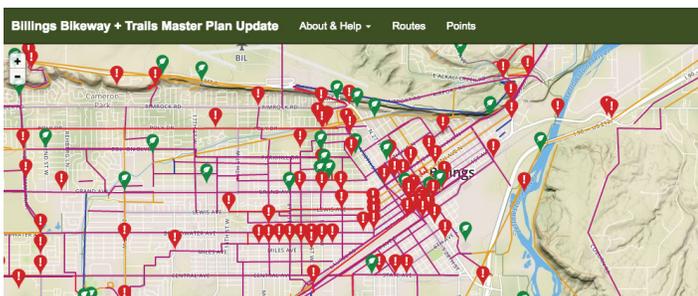
Draw your point or route comments onto the map

3

Add a comment

Existing:

- Multi-Use Path
- Neighborhood Trail
- Unpaved Trail
- Bike Lane
- Shared Lane



The online input map recorded over 650 individual interactions, including people drawing lines, placing points, and commenting on other user’s input

GRAPHIC 3.2: ONLINE INPUT MAP SUMMARY

OVERALL INTERACTIONS

PARTICIPANTS ADDED

274 LINES & 184 POINTS

THAT GENERATED

210 ADDITIONAL COMMENTS

MILES OF ROUTE COMMENTS DRAWN

120.3 MILES DESIRED OFF-STREET BICYCLE FACILITY/TRAIL

217 MILES DESIRED ON-STREET BICYCLE FACILITY

21.8 MILES EXISTING BICYCLE FACILITY NEEDS IMPROVEMENT

8.3 MILES COMFORTABLE EXISTING BICYCLE ROUTE

NUMBER OF LOCATION COMMENTS PLACED

127 POINTS BIKE/PED CROSSING IMPROVEMENT NEEDED

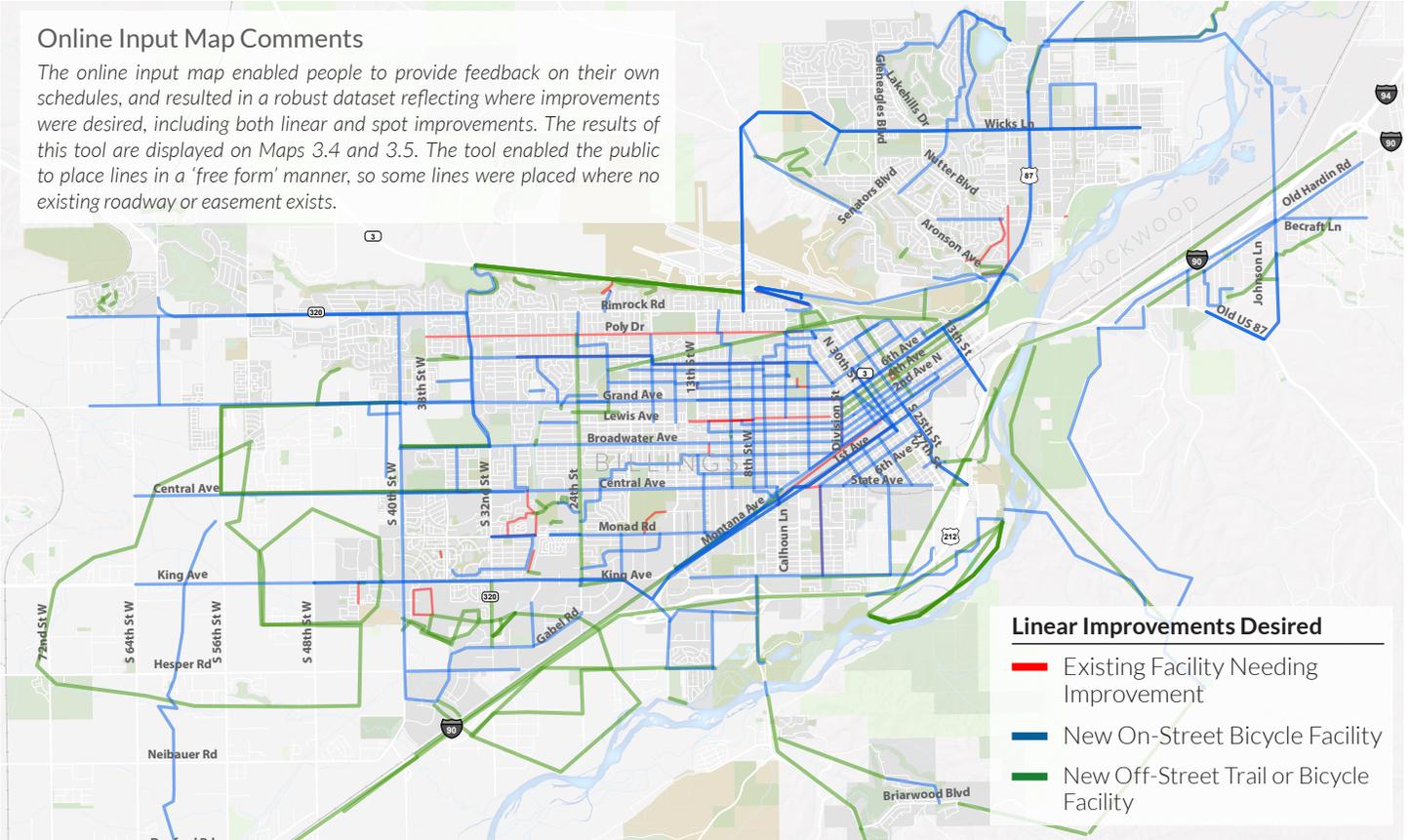
57 POINTS BETTER TRAIL ACCESS DESIRED



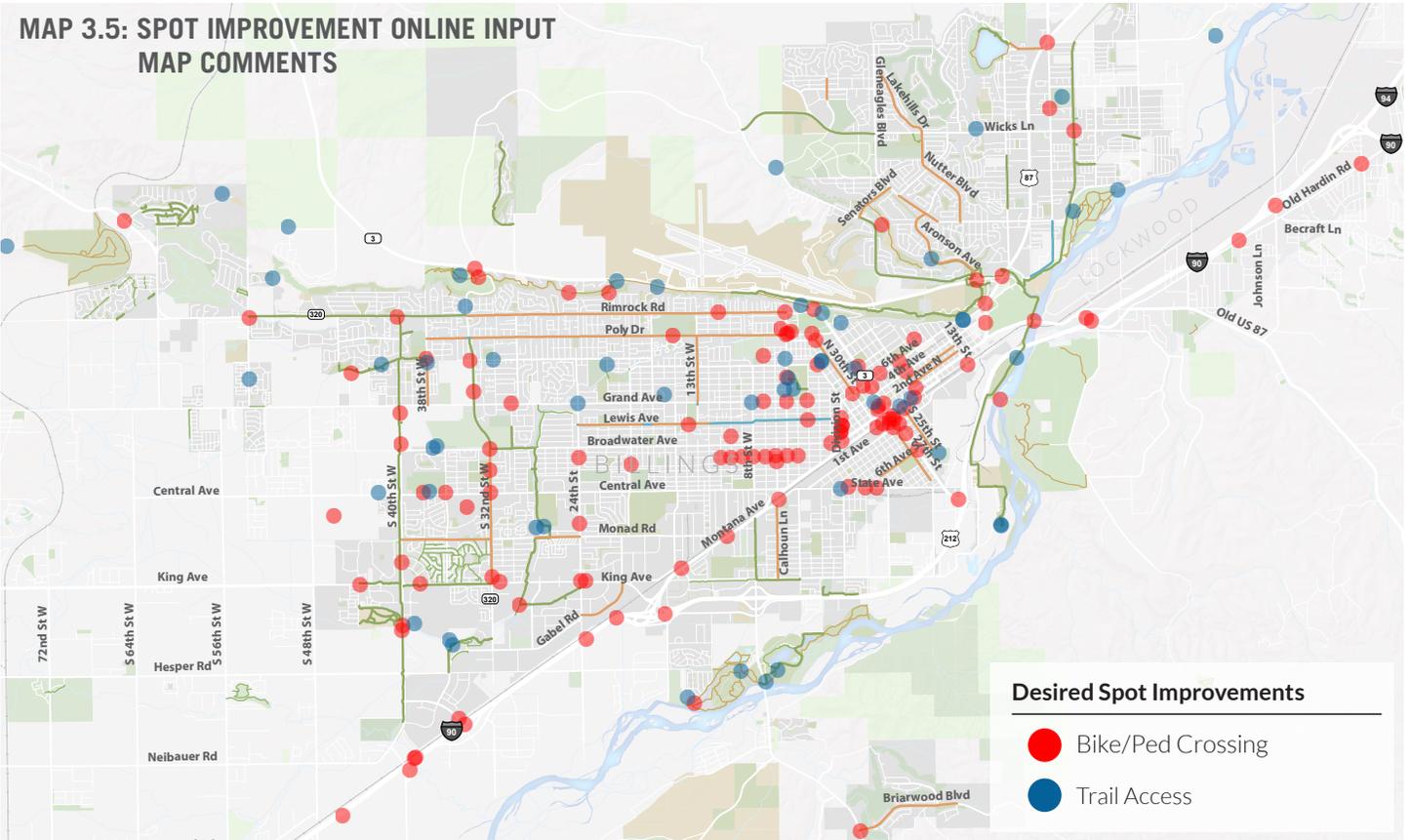
MAP 3.4: LINEAR ONLINE INPUT MAP COMMENTS

Online Input Map Comments

The online input map enabled people to provide feedback on their own schedules, and resulted in a robust dataset reflecting where improvements were desired, including both linear and spot improvements. The results of this tool are displayed on Maps 3.4 and 3.5. The tool enabled the public to place lines in a 'free form' manner, so some lines were placed where no existing roadway or easement exists.



MAP 3.5: SPOT IMPROVEMENT ONLINE INPUT MAP COMMENTS





3.4 ACTIVE TRANSPORTATION BENEFITS

Walking and bicycling produce community benefits beyond the individuals participating in these active modes. A benefits analysis was conducted using a combination of local data, data collected from communities with similar bicycle and pedestrian infrastructure to what will be proposed in the Billings area, and national sources of data such as the USDOT TIGER BCA Resource Guide (2014), the National Household Transportation Survey (2009), the National Center for Safe Routes to School travel data (2010), the American Community Survey (2010-2014), and the Automobile Association of America. For Billings, the peer communities of Boise, ID; Columbia, MO; Helena, MT; Fargo, ND; Bend, OR; Salt Lake City, UT; and Spokane, WA were analyzed.

Several types of benefits were evaluated, including health, environmental, and transportation benefits. The benefit analysis also includes projections based on the most recent five-year estimates from the ACS, which were then extrapolated through the use of various multipliers derived from national studies and quantified in terms of monetary value where appropriate. The

estimated monetary values were calibrated to baseline values and compared to bicycle and walk mode commute splits of peer cities. While the results of this analysis are informative, it likely under represents the existing levels of bicycling and walking, as it is heavily influenced by the National Household Transportation Survey. A local comprehensive travel survey is recommended to provide more accurate data for Billings.

Future estimates were derived from an estimate of future mode share in Billings based on the peer city analysis. Low, mid, and high mode share growth scenarios were considered for a planning window from 2016 to 2030, the planning horizon of this plan. The growth scenarios for bicycling and walking increases are displayed in chart form on page 3-14. Billings' projected population at 2030 is included in this analysis. The estimates presented in Table 3.3 are not intended to be mode share targets or policy goals, but rather are intended to quantify some of the benefits that increasing active transportation mode share might bring.

TABLE 3.1: PROJECTED MODE SHARE

Source	Existing		Projected Low-Growth		Projected Mid-Growth		Projected High-Growth	
	Bike (%)	Walk (%)	Bike (%)	Walk (%)	Bike (%)	Walk (%)	Bike (%)	Walk (%)
Estimated Commute Mode Share (ACS)	0.93	3.18	1.18	3.46	2.22	3.78	3.50	5.88
Estimated Overall Mode Share for all Trip Purposes (ACS+NHTS)	7.85	17.4	8.86	18.51	13.02	19.79	19.03	28.19

BIKING AND WALKING IS GOOD FOR YOUR HEALTH:

SAFER THAN SITTING ON A COUCH

Bicycling health benefits outweigh safety risks **9 to 1**

(Source: de Hartog, 2011)



GOOD FOR THE HEART



Those who are physically active generally live longer and have a lower risk for heart disease, stroke, Type 2 diabetes, depression, some cancers, and obesity.

(Source: CDC, 2015)

STRONG BRAIN

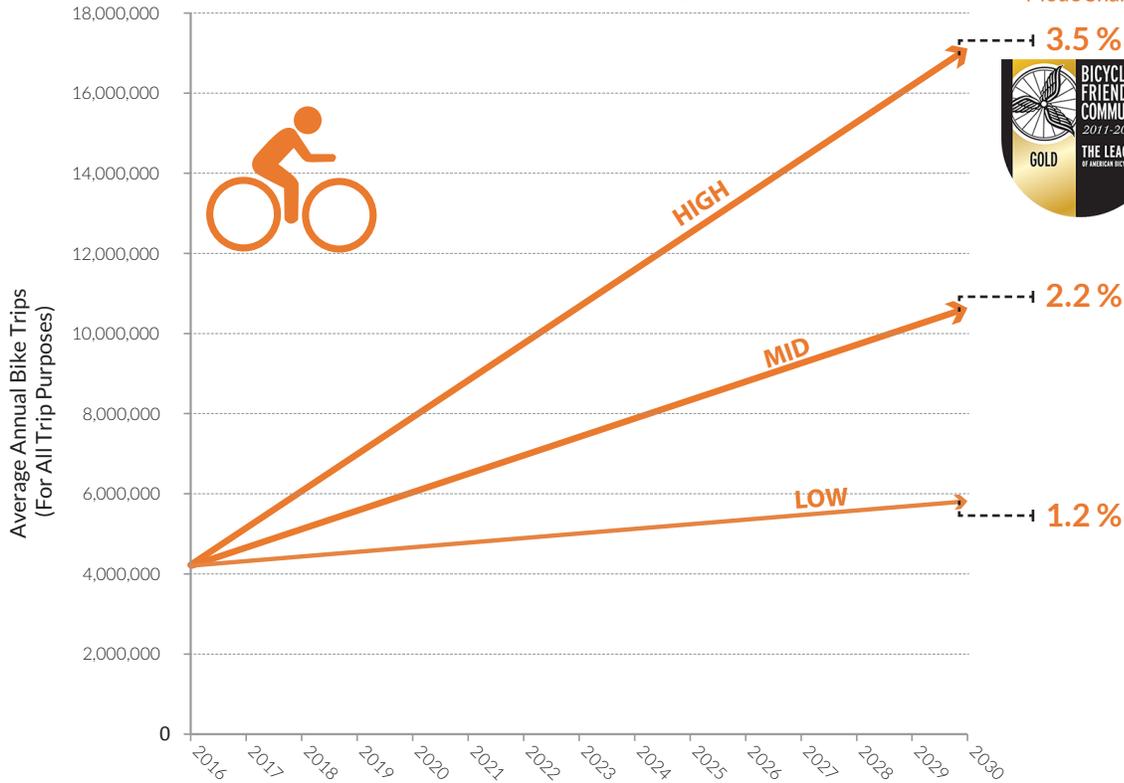


Regular physical activity has been shown to reduce the risk of dementia, including Alzheimer's disease, by as much as 50 percent.

(Source: Erickson, 2013)



BICYCLE TOTAL TRIP GROWTH SCENARIOS (2016-2030)



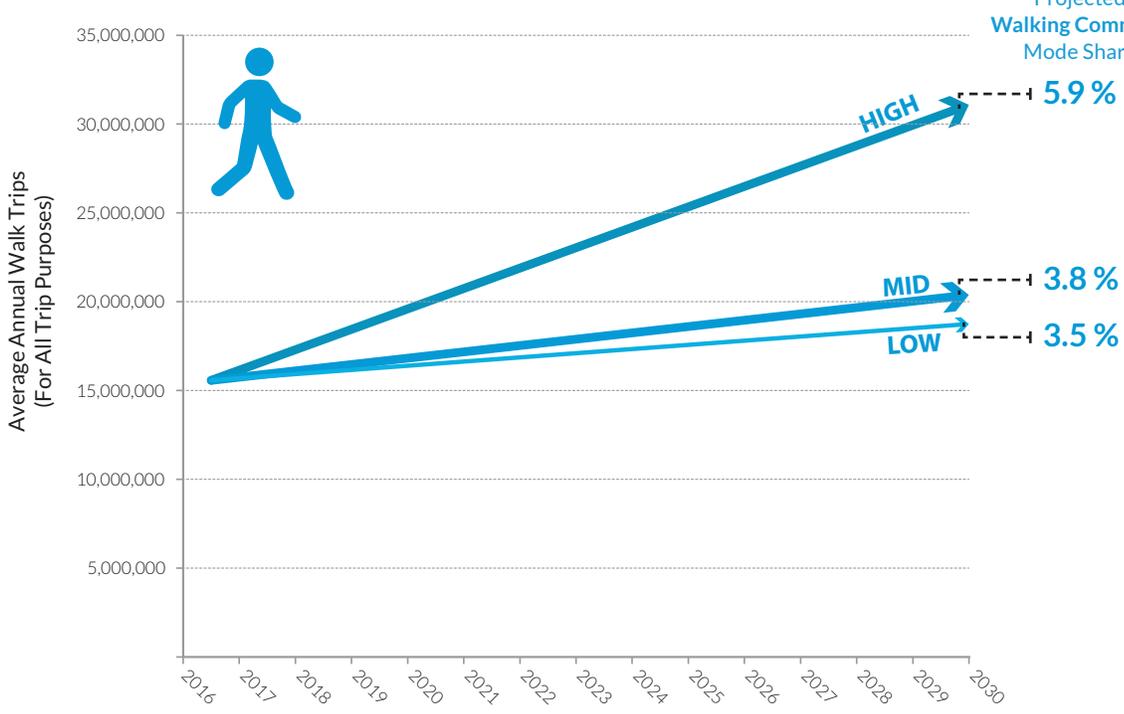
Projected Bicycle Commute Mode Share

3.5%



At a 3.5% bicycle commute mode share, Billings would be eligible to become a **Gold Level Bicycle Friendly Community**. The League of American Bicyclists gives this designation to communities that have prioritized bicycling, exhibited by a range of factors including bicycle programs, infrastructure, and mode share.

WALKING TOTAL TRIP GROWTH SCENARIOS (2016-2030)



Projected Walking Commute Mode Share

5.9%

3.8%

3.5%



3.4.1 Health Benefits

Billings’s projected levels of bicycling and walking equate to a great deal of physical activity. The Benefit Impact Model quantifies the existing estimated physically active people and projected increases of mode share. Benefits include newly active people as a result of increased mode share, resulting in improved community health and reduced household healthcare spending. The primary inputs into the health components of the Benefit Impact

Model were derived from 2010 to 2014 ACS journey to work data, 2009 NHTS, and historic Safe Routes to School data. Existing bicycle and walk commute data were multiplied by national trip purpose ratios to generate mode split estimates that include all trip purposes. These balanced mode split estimates were indexed against the mode split data of Billings’ peer cities and multiplied by various health factors. Table 3.2 tabulates the estimated health benefits.

TABLE 3.2: HEALTH BENEFIT ESTIMATES

Source	Existing	Projected Low-Growth		Projected Mid-Growth		Projected High-Growth	
	Total	Total	Difference	Total	Difference	Total	Difference
Average Annual Bike Trips	4,245,000	5,848,000	1,603,000	10,955,000	6,710,000	17,016,000	12,771,000
Average Annual Walk Trips	15,575,000	18,841,000	3,266,000	20,690,000	5,115,000	31,679,000	16,104,000
Healthcare Cost Savings from Newly Active Persons	\$1,007,000	\$1,377,000	\$370,000	\$2,471,220	\$1,464,220	\$3,817,000	\$2,810,000

3.4.2 Environmental Benefits

The existing levels of walking and bicycling provide environmental benefits to the community by not generating emissions from vehicle trips. Building off of the health benefits analysis and the mode share growth scenarios, the implications for hydrocarbon, particulate matter, nitrous oxides, carbon monoxide, and carbon dioxide emissions can be estimated. This analysis uses national methodologies to determine trip replacement. Every walking or bicycling trip is not equal to a vehicle trip. Based on a review of air emissions studies, each pound of emissions was assigned an equivalent dollar amount based on how much it would cost to clean up the pollutant or the cost equivalent of how much damage the pollutant causes to the environment. Other potential ecological services associated with the bicycle and pedestrian projects such as water regulation, carbon sequestration, carbon storage, and waste treatment exist but the quantifiable value of these services are negligible. Table 3.3 presents the estimated environmental benefits of active transportation modes.



TABLE 3.3: ENVIRONMENTAL BENEFIT ESTIMATES

Source	Existing	Projected Low-Growth		Projected Mid-Growth		Projected High-Growth	
	Total	Total	Difference	Total	Difference	Total	Difference
CO2 Emissions Reduced (lbs)	6,260,000	8,014,000	1,754,000	11,014,000	4,754,000	18,865,000	12,605,000
VOCs Reduced (lbs)	15,000	19,000	4,000	27,000	12,000	46,000	22,000
Total Environmental Benefits	\$316,000	\$412,000	\$96,000	\$566,000	\$250,000	\$879,000	\$563,000



3.4.3 Transportation Benefits

Active transportation increases transportation options and access to activity centers for Billings area residents and visitors. Cost savings can be estimated from the reduced costs associated with congestion, vehicle crashes, road maintenance, and household vehicle operations. Using annual vehicle miles travelled (VMT) reduction estimates, which also determined the calculations of the health and environmental savings, transportation-related costs savings were estimated. By multiplying the amount of VMT reduced by established multipliers for traffic congestion, vehicle collisions, and vehicle operating costs, monetary values were assigned to the transportation-related benefits.



TABLE 3.4: TRANSPORTATION BENEFIT ESTIMATES

Source	Existing	Projected Low-Growth	Projected Mid-Growth		Projected High-Growth		
	Total	Total	Difference	Total	Difference	Total	Difference
Annual VMT Reduced	6,337,000	8,111,000	1,774,000	11,148,000	4,811,000	17,321,000	10,948,000
Traffic Congestion Cost Savings	\$352,000	\$450,000	\$98,000	\$619,000	\$267,000	\$962,000	\$610,000
Vehicle Collision Cost Savings	\$2,106,000	\$2,693,000	\$587,000	\$3,701,000	\$1,595,000	\$5,751,000	\$3,645,000
Household Vehicle Operation Cost Savings	\$3,975,000	\$5,082,000	\$1,107,000	\$6,984,000	\$3,009,000	\$10,852,000	\$6,877,000
Total Transportation Benefits	\$6,433,000	\$8,225,000	\$1,792,000	\$11,304,000	\$4,871,000	\$17,565,000	\$11,132,000

3.4.4 Total Benefits

Further improving the walking and bicycling system in Billings will result in more trips being taken via these modes. Increases in mode share can yield significant annual benefits to Billings and its residents. As summarized in Table 3.5, Billings currently experiences approximately \$8.7 million

in annual benefits from active modes of transportation, and based on mid-growth projections in walking and bicycling rate increases, could experience a further \$1.3 to \$25.5 million in additional benefits depending on population growth and varying levels of future mode share increases.

TABLE 3.5: TOTAL BENEFIT ESTIMATES

Source	Bicycling and Walking			
	Existing (2017)	Low Growth Proj.	Mid Growth Proj.	High Growth Proj.
Health Benefits	\$1,007,000	\$1,377,000	\$2,471,220	\$3,817,000
Environmental Benefits	\$316,000	\$412,000	\$566,000	\$879,000
Transportation Benefits	\$7,351,000	\$8,225,000	\$11,304,000	\$17,565,000
Total Benefits	\$8,674,000	\$10,014,000	\$14,341,220	\$22,261,000
Total Additional Benefits	--	\$1,340,000	\$5,667,220	\$13,587,000



By 2030,
BILLINGS, MONTANA
 MIGHT REALIZE

WALK TRIPS

10,354,000

MILES WALKED PER YEAR *

That's the equivalent of

395,190

TRIPS AROUND THE PROPOSED BILLINGS MARATHON LOOP TRAIL



BIKE TRIPS

16,432,500

MILES BIKED PER YEAR **

That's the equivalent of

48,330

ROUND TRIPS FROM BILLINGS TO YELLOWSTONE NATIONAL PARK!



REDUCED HEALTHCARE COSTS

\$2,471,220

IN ANNUAL HEALTHCARE COST SAVINGS

That's the equivalent of 4,900 trips to the doctor!



REDUCED VEHICLE CRASHES

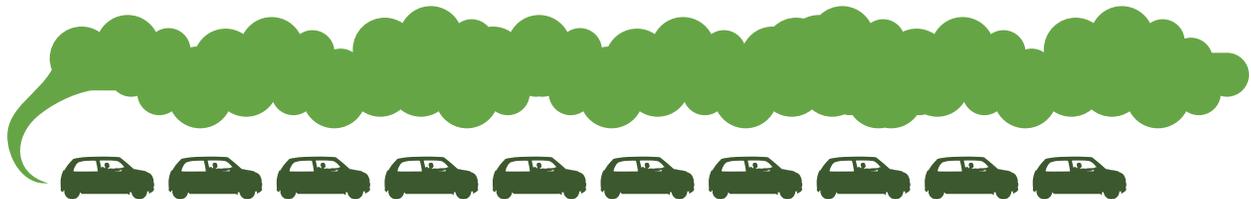
\$3,701,000

IN ANNUAL COST SAVINGS FROM REDUCED COLLISIONS



REDUCED VEHICLE EMISSIONS

11,014,000 lbs IN REDUCED CO2 VEHICLE EMISSIONS PER YEAR



*Calculated based on median trip distance of 0.5 miles <http://www.ncbi.nlm.nih.gov/pmc/articles/PMC3377942/>

**Calculated based on 50th percentile score trip distance of 1.5 miles derived from National Household Travel Survey



3.5 NEW BIKEWAY TYPES

To provide low stress connections for bicyclists in areas of high traffic volumes, and increase bicyclist visibility at intersections for greater driver awareness, there are a number of new bikeway treatments that have been implemented across the country. The rapid increase in innovative bikeway design has been driven by the publication of new manuals that provide planners and engineers guidance on how to implement appropriate facilities in varied roadway contexts. The first guide focused on innovative bikeway design was The National Association of City Transportation Officials' (NACTO) Urban Bikeway Design Guide (2013). This guide offered comprehensive and substantive guidance for cities seeking to improve infrastructure for bicycle transportation. The guide includes a full spectrum of bicycle facility design, from signed routes and bicycle boulevards, to protected bicycle lanes and bicycle signalization. The bikeway treatments in this design guide reflect the current state of modern practice and are found in many cities around the US and internationally.

In recent years, federal and state transportation agencies have published their own manuals providing guidance to transportation engineers and planners. The Federal Highway Administration's (FHWA) Separated Bike Lane Planning and Design Guide was the first federal guide to include national best practice of design strategies to provide separation for one way and two way bike lanes, as well as considerations at driveways, transit stops, parking and loading zones. The guide also details intersection design by specifying signalization, pavement markings, and signage.

The following pages outline bikeway treatments detailed in these guides, which could be applicable as new treatments to improve the on-street bicycle network in the Billings Area.



Missoula, MT two-way separated bike lane

Separated Bike Lanes

Of all on-street bicycle facilities, separated bike lanes offer the most protection and separation from adjacent motor vehicle traffic. Separated bike lanes are bicycle facilities that are physically separated from motor vehicle traffic by a painted buffer and physical barriers such as flexible delineators, curbs, or planters. Parking lanes can also be used as a means of separation if there is a buffer space between the bike lane and the parking lane. Separated bike lanes are ideally placed on streets with few driveways or mid-block access points for motor vehicles. Eight feet is the minimum recommended total width for a protected bike lane, five feet of bike lane and three feet of physical buffer zone.



Bicycle Boulevards

Bicycle Boulevards are local streets with low motorized traffic volumes and speeds that have been designated as bicycle routes. Bicycle boulevards should have a maximum posted speed of 25 mph and target motor vehicle volumes of less than 1,500 vehicles per day (with a maximum 3,000 vehicles per day). Many streets in Billings exhibit these characteristics already, and minor modifications, such as the addition of signage and pavement markings, could cost-effectively designate key corridors as bicycle boulevards. These improvements, combined with modifications at major intersections, make this type of facility intuitive and comfortable for a wide range of people to ride a bicycle or walk.



Jackson Hole, WY Neighborhood Greenway

Buffered Bike Lanes

Buffered bike lanes are conventional bike lanes that are enhanced through the application of a diagonally striped buffer space. While not providing physical separation, this creates a wider buffer area between vehicles and bicyclists than a conventional six inch bike lane stripe. In areas with high parking turnover, the buffer can be located on the parking side of the bike lane to mitigate potential 'dooring' issues, when a car door opens and extends into the path of travelling bicyclists. By providing the buffer, bicyclists ride further away from vehicles, and this facility type provides a higher level of comfort compared to conventional bike lanes as traffic volumes and speeds increase.



Billings, MT Buffered Bike Lane

Intersection Treatments

There is a range of intersection treatments that can be implemented to facilitate crossings for bicycles. The keys to effective intersection design are increasing motor vehicle driver awareness that a bicyclist will be moving through the intersection, increasing the predictability of bicycle and motor vehicle movements through the intersection, and increasing the visibility of bicycles, so as they approach and move through the intersection, they remain in the sight lines of drivers. A range of bikeway intersections treatments have been developed that achieve these goals and increase safety as bicyclists move through intersections.



Missoula, MT Bicycle Intersection Treatment