12TH AVENUE
NEIGHBORHOOD BIKEWAY
FEASIBILITY STUDY

Denver to Aurora Connector
Neighborhood Bikeways
Contents

Introduction.............................................. 1
Existing Conditions..................................... 2
Community Outreach..................................... 4
Concept Plan............................................. 10
Planning Cost............................................ 17
Project Priority......................................... 18
Implementation.......................................... 19
Appendix.................................................. 21
Introduction

Denver Moves is the City and County of Denver’s Bicycle and Walking Action Plan. Denver Moves identified the 12th Avenue corridor between Garfield Street and Yosemite Street (City of Aurora) as an ideal candidate to become a neighborhood bikeway (formerly known as bicycle boulevard). The 12th Avenue Neighborhood Bikeway was envisioned with new design features that would enhance bicycling and walking for a wide range of people. It would support motor vehicle traffic traveling at speeds that are consistent with the posted limits of 25 MPH. It would not rely on traditional bike lanes. The 12th Avenue Neighborhood Bikeway would utilize a collection of treatments including traffic calming, signing, marking, and intersection improvements. The treatments would be specific to each location and evolve as travel patterns adjust over time.

The information from Denver Moves was combined with stakeholder input and national design guidelines to prepare a plan for the 12th Avenue Neighborhood Bikeway. The City’s project team collected information over a nine-month process that included distributing flyers to every household in the corridor, two neighborhood workshops, and meeting with registered neighborhood organizations (RNOs). This document summarizes the stakeholder input process, evaluation of the proposed treatments, and concept design for the 12th Avenue Neighborhood Bikeway.

Input from the process highlighted 12th Avenue as an important east-west bicycling and walking route that connects neighborhoods, business districts, parks, and the City of Aurora bicycle network. When implemented, this plan will link key business destinations to neighborhoods, provide active living opportunities to families, strengthen neighborhood character, and work toward the City’s safety goals. The input obtained during the outreach process was critical in preparing this plan and serves as the basis for the recommendations and overall project implementation.

The 12th Avenue Neighborhood Bikeway Plan is based on neighborhood input at two public workshops and fieldwork conducted between December 2014 and September 2015.
Existing Conditions

An inventory of existing conditions was conducted along 12th Avenue. The full data collection results can be found in Appendix A: Data Collection. Generally, data about land use, current traffic, street characteristics and measurements, parking utilization, and crashes were collected and analyzed to understand the existing conditions in the corridor. During data collection, the project team conducted a full day corridor evaluation. Riding bicycles and walking in the corridor during the field evaluation allowed the project team to experience current conditions and interact with neighborhood residents. Some of the key findings from the existing conditions data collection include:

- Existing traffic volume ranges from 400-1,300 vehicles per day
- Posted speed limit is 25 miles per hour
- Parking is lightly used except near the medical campus, Colorado Boulevard, and Teller Elementary
- Pavement condition is generally good
- Sidewalks are provided but become sporadic further east in the corridor
- Crosswalks are provided in appropriate locations
- Stop signs are generally spaced every 1/4 mile, consistent with best practices
- RTD bus route 10 runs along 12th Avenue between Garfield Street and Colorado Boulevard
- Teller Elementary is the only school in the corridor - located at 12th Avenue and Garfield Street
- Limited redevelopment potential in the built corridor (except CU medical campus)

The following summarizes specific data and observations of the existing conditions at major intersections in the corridor.

**Colorado Boulevard**
- Challenge to cross due to roadway width, vehicular travel speed, and overall traffic volumes (58,400 vehicles per day)
- Bicyclists are routed onto the sidewalk via a mountable curb and indirectly routed through the intersection with Hale Pkwy
- 6 of the 10 bicycle crashes on the 12th Avenue corridor from 2009-2013 occurred at the intersection with Colorado Boulevard

**Monaco Parkway**
- Vehicular traffic is heavy during AM and PM peak periods and routinely blocks the east intersection with 12th Avenue due to northbound vehicle queues extending back from the 13th Avenue signalized intersection
- Visibility issues with routing of bicyclists and pedestrians through median due to extended tree canopy along interior parkway
- No sidewalks except in center parkway which have poor alignment with crossing locations
- No traffic signals
- Roughly 27,600 vehicles per day on Monaco in 2013
Quebec Street
- Fast-moving traffic on Quebec Street
- Lack of gaps in traffic between north and southbound vehicles to safely allow bicyclists or pedestrians enough time to cross during the AM or PM peak periods
- Missing sidewalks
- Sight distance challenges due to vertical curve and limited visibility on north leg of intersection
- Roughly 19,000 vehicles on Quebec Street per day in 2010
- From 6:30AM-9:30PM less than 10% of gaps between passing vehicles were viable gaps for a pedestrian to cross the Quebec Street at a walking speed of 3.5 feet per second

Yosemite Street
- Minimal gaps in traffic between north and southbound vehicles to safely allow bicyclists or pedestrians enough time to cross during the AM or PM peak
- According to DRCOG, Yosemite St at 11th Avenue had an ADT of 11,585 in 2013
Community Outreach

Community Workshop #1
Working with the neighborhood residents along 12th Avenue was a critical part of this project. The first of two community meetings was hosted on March 25, 2015 from 7AM to 7PM. People were invited to drop in and learn about neighborhood bikeways as well as provide comments about the corridor through the Neighborhood Bikeway Game - a map based tool for facilitating conversation about the 12th Avenue corridor existing conditions as well as the future vision for the corridor.

To proactively reach all members of the neighborhood who are not accustomed to attending workshops, flyers were sent to each of the registered neighborhood organizations (RNOs) that surround 12th Avenue. Additionally, flyers were sent out with the e-newsletter at Teller Elementary School and sent home at Palmer Elementary School (located on Grape between 9th and 11th Streets). Finally, flyers with information about the community meeting were delivered to every home and business along 12th Avenue between Garfield Street and the Yosemite Street.

The outreach strategy resulted in over 70 people who live in the corridor participating in the process. This included students from the local elementary school. They provided information about drainage issues and unsafe crossing locations along the route of their walking school bus. The elementary students and their parents who attended the workshop stressed the need to enhance crossings at major intersections near the school. Local neighborhood residents also attended the workshop. They provided information about the current conditions of 12th Avenue.

Most workshop attendees made comments about the difficulty crossing Colorado Boulevard on 12th Avenue. Crossing at Monaco Parkway and Quebec Street were also discussed. Additionally, workshop attendees highlighted opportunities for traffic calming between Monaco and Ivy as well as missing sidewalk between Cherry and Dahlia.

The following pages show the boards that were used to explain neighborhood bikeways. A summary presentation from the community workshop can be found in Appendix B: Community Outreach.

Over 70 meeting attendees played the Neighborhood Bikeway Game and shared ideas and concerns about 12th Avenue. They provided over 50 comments about the corridor.
The City and County of Denver is implementing Denver Moves neighborhood bikeway recommendations. Please join us to discuss the exciting opportunities for the 12th Avenue and Garfield Street corridors.

12th Avenue between Garfield Street and Yosemite Street
Garfield Street between City Park and the Cherry Creek Trail

Drop in at any time between 7AM and 7PM to provide feedback about the project.

March 25, 2015
7:00AM - 7:00PM

Learn more and watch a short video about neighborhood bikeways at www.denvergov.org/neighborhoodbikeways

1,500 flyers were distributed to publicize the first community meeting. Flyers were delivered to every home and business along 12th Avenue. They were also sent home with every student at Teller and Palmer Elementary Schools.
What is a Neighborhood Bikeway?

A neighborhood bikeway is designed for people walking, bicycling, and driving. The design is flexible to fit with a neighborhood’s unique character and safety needs. Safety for all people riding bikes is communicated through the roadway design, signage, and traffic calming measures.

Learn more and watch a short video about neighborhood bikeways at www.denvergov.org/neighborhoodbikeways
Elements of a Neighborhood Bikeway

Neighborhood bikeways improve awareness for all people sharing the road. The following design treatments are commonly found on neighborhood bikeways.

**Elements of a Neighborhood Bikeway**

- **Bicycle Pavement Markings**
- **Modify Stop Signs to Prioritize People on Bikes**
- **Neighborhood Bikeway Signs**
- **Wayfinding Signs to Destinations**
- **Safety Improvements at Large Intersections**
- **Traffic Calming to Limit Traffic and Speed**
Community Workshop #2
The second community workshop took place at Montclair Civic Center on August 31, 2015 from 5PM to 7PM. Capital Hill United Neighbors (CHUN) coordinated with all of its members as well as overlapping RNO memberships to encourage meeting attendance. The evening open house was attended by 25 people. A presentation given at the open house outlined the process of developing the concept plan for the 12th Avenue corridor as well the recommendations for the corridor. The open house detailed concept recommendations and provided the opportunity for discussion to better understand the recommendations.

The community provided feedback and their preferred implementation strategy for each corridor. Each meeting participant was given a series of dots, which they placed on the recommended intersection concept plans they preferred to have implemented in the 12th Avenue corridor. Attendees were also given dots to provide input on the implementation strategy for corridor recommendations.
You are invited to a community meeting at Montclair Civic Center! The recommended neighborhood bikeway designs for 12th Avenue and Garfield Street will be on display for your review. We need your input on project implementation. Come provide your feedback about the recommendations and implementation of neighborhood bikeways on the 12th Avenue and Garfield Street corridors.

12th Avenue between Garfield Street and Yosemite Street
Garfield Street between City Park and the Cherry Creek Trail

Community Meeting
August 31, 2015
5:00-7:00PM
Montclair Civic Center
6829 E. 12th Ave.
Denver, CO 80220

Learn more and watch a short video about neighborhood bikeways at www.denvergov.org/neighborhoodbikeways

Based on the comments and dot exercise, the feedback from meeting participants was supportive of the 12th Avenue Neighborhood Bikeway. Over the two hour session many neighborhood residents provided detailed comments on design features in and near their property. Those comments were reviewed by the project team and cross-checked with national guidelines for implementing neighborhood bikeways. Most of those comments have been incorporated in the design plans and will be included in the final design phase as possible. Concept plan details are found in the next section.
Concept Plan

Using the information gathered during data collection and the first phase of community outreach, the project team developed a concept plan for 12th Avenue. The following pages detail crossing enhancements in locations where community members expressed concern or where the data evaluated identified locations that necessitate change. The conceptual plan shows intersections from east to west. Additional details along with a complete corridor aerial identifying the location for proposed traffic calming, stop sign reorientation, sharrow placement, and wayfinding signage can be found in Appendix C: Concept Plan.

Corridor Recommendations
The concept plan for 12th Avenue recommends some consistent changes throughout the entire neighborhood bikeway. Locations with sidewalk ramps that do not comply with ADA (Americans with Disabilities Act) regulations will be updated to compliant ramps when work is performed at the individual intersections. The following changes are recommended along the entire corridor to designate a neighborhood bikeway.

**Install signing and striping to identify the corridor as a neighborhood bikeway**
Reorient stop signs to minimize unnecessary stops for people riding bicycles

Install and evaluate neighborhood traffic circles to encourage slower travel speeds
**12th and Colorado Boulevard - West Side**

The proposed changes at the 12th Avenue and Colorado Boulevard intersection were supported by residents and stakeholders who participated in the two community workshops. The concept plan for the west side of the intersection includes the following changes:

- Adjust the block of 12th Avenue between Harrison Street and Colorado Boulevard to one-way eastbound vehicle traffic with a westbound contraflow bike lane
- Install a raised crosswalk at 12th Avenue and Colorado Boulevard
- Widen the existing two-way multi-use trail on the west side of Colorado Boulevard to meet current FHWA and NACTO standards
- Paint bicycle conflict markings across Colorado Boulevard to direct people on bicycles to and from the proposed multi-use path
- Install bicycle signal heads that control bicycle travel across Colorado Boulevard
- Install a flush radial pedestrian ramp on the northeast corner of the 12th Avenue and Colorado Boulevard intersection
- Adjust the current signal timing to include leading bicycle and pedestrian signal intervals
- Widen the existing sidewalk on the north side of 12th Avenue east of Colorado Boulevard to provide adequate space for a multi-use trail

The proposed design creates designated space for people walking and bicycling and a clear route through the intersection continuing east or west along the neighborhood bikeway.
12th and Colorado Boulevard - East Side

The proposed reconfigurations between Colorado Boulevard, Hale Parkway, and 12th Avenue will clarify how people riding bicycles, walking, and driving can safely travel through this uncommon set of intersections. The concept plans for the east side of the intersection include the following changes that were supported by residents and stakeholders who participated in the two community workshops:

- Widen the existing sidewalk on the north side of 12th Avenue east of Colorado Boulevard
- Adjust the roadway travel lane markings and median width along 12th Avenue east of Colorado Boulevard
- Install a two-way cycle track on the north side of 12th Avenue, east of Albion Street (All access points to properties will be retained. Alley and driveway access for a few properties would need to be reconfigured)
- Install/modify the raised landscape median island separating the cycle track from Hale Parkway east of Albion Street
- Add bicycle crossing warning signs and pavement markings consistent with FHWA and MUTCD guidelines
- Identify opportunities to implement storm water retention features as part of improvements to the existing median islands along Hale Parkway as funding is available

The two-way cycle track between Colorado Boulevard and Ash Streets offers protection from moving vehicles and direct connections for people riding bicycles east-west.
12th Avenue and Monaco Parkway
The Monaco Parkway and 12th Avenue intersection is frequently blocked with queued traffic during peak travel periods in the morning and evening. This is due to vehicle queuing that extends back from the 13th Avenue signalized intersection. The recommended improvements to the 12th Avenue and Monaco Parkway intersection include the following:

- Reconfigure the center median multi-use path
- Signalize intersections on the northbound approach to the east side of 12th Avenue and the southbound approach to the west side of 12th Avenue (these will operate in coordination with existing signals at 13th Avenue and Richthofen Parkway)
- Add bicycle-specific pavement markings to direct people riding bicycles across Monaco Parkway
- Add passive bicycle signal detection and pedestrian push buttons to active the 12th Avenue signal for people crossing on bicycles, running and walking
- Install accessible ramps at the west leg of 12th Avenue at Monaco Parkway

Reconfiguration of the multi-use path will provide direct alignment across Monaco Parkway
12th Avenue and Quebec Street
The Quebec Street and 12th Avenue intersection does not have stop signs (on Quebec Street) or a traffic signal. The intersection is also located just south of a vertical curve that restricts sight lines between southbound vehicles and people crossing the street. The recommended improvements to the 12th Avenue and Quebec Street intersection include the following:

- Install raised pedestrian refuge median islands to slow traffic to posted speed limits and reduce crossing distances for people crossing the street
- Add curb extensions with accessible ramps
- Add marked crosswalks
- Conduct additional safety evaluations and add traffic control devices as funding is available

*The City is evaluating the appropriate enhanced bicycle/pedestrian crossing treatment at this location including traffic control devices such as Rectangular Rapid Flashing Beacons, Pedestrian Hybrid Beacons (HAWK), and Traffic Signals. Selection of the preferred treatment method will be made during the subsequent design phase of the project.*

The City is evaluating enhanced bicycle/pedestrian crossing treatments at this location including traffic control devices such as Rectangular Rapid Flashing Beacons, Pedestrian Hybrid Beacons (HAWK), and Traffic Signals. Selection of the preferred treatment method will be made during the subsequent design phase of the project.
12th Avenue and Yosemite Street
The Yosemite Street and 12th Avenue intersection does not have stop signs (on Yosemite Street) or a traffic signal. This intersection is near multi-family housing that is a designated school bus stop for Denver Public Schools. Subsequently, there are multiple parents and children walking and playing in the area during peak travel times. Denver Parks and Recreation are currently studying the addition of a trail along Westerly Creek, which crosses beneath E 12th Avenue three blocks west of the intersection with Yosemite. The new trail is scheduled for construction in Summer 2016. The concept plan for the intersection includes the following changes:

- Install pedestrian refuge medians to slow traffic to posted speed limits and reduce crossing distances for people crossing the street
- Add curb extensions with accessible ramps
- Add marked crosswalks
- Conduct additional safety evaluations and add traffic control devices as funding is available
- Consolidate driveway access points on the northwest side of the intersection in front of the multi-family housing to reduce sidewalk conflicts with motor vehicle parking

Yosemite Street is the border between Denver and Aurora. Aurora’s bike plan also recommends neighborhood bikeway improvements on 12th Avenue in Aurora.
Planning Costs

Planning level costs were prepared for each of the treatments along the 12th Avenue Neighborhood Bikeway. The cost estimates use preliminary planning costs based on estimates from similar construction projects. For instance, ADA ramps at all four corners of an intersection cost approximately $28,000 while new curb and gutter costs $60/linear foot. More information about cost estimate assumptions can be found in Appendix D: Planning Costs.

The following are the planning level costs for each project.

| Corridor Signing and Striping       | $183,300 |
| Colorado Boulevard                 | $393,900 |
| Monaco Parkway                     | $1,000,100 |
| Quebec Street                      | $488,200 |
| Yosemite Street                    | $300,000 |
Project Priority

This planning effort establishes the priorities for implementing the 12th Avenue Neighborhood Bikeway. The City does not currently have funding to construct the 12th Avenue Neighborhood Bikeway. However, the information obtained from neighborhood residents and stakeholders will be used to prioritize funding when it becomes available. The following provides a summary of the input received on project priorities.

**Project Priority**

- Colorado Boulevard
- Monaco Parkway
- Quebec Street
- Yosemite Street
- Corridor Signing and Striping
- Garfield Street

*Colorado Boulevard received the highest priority ranking from community residents and stakeholders.*
Implementation

The projects needed to develop the 12th Avenue Neighborhood Bikeway can be considered in three implementation tiers.

**Signing & Striping**
These projects are low cost and would take approximately 3-6 months to design. Examples include bicycle pavement markings (sharrow), wayfinding signage, and street sign installation. 12th Avenue Neighborhood Bikeway projects that fall into this category include:

- Corridor Signing and Striping
- Garfield Street

**Signal & Intersection Upgrades**
These projects are moderate cost and would take approximately 6 months to two years to design and implement. Examples include modification or addition of a new signal, ADA curb ramps, signage and striping, and coordination with other departments (such as Parks & Recreation). 12th Avenue projects that fall into this category include:

- Quebec Street
- Monaco Parkway
- Yosemite Street

**Significant Intersection Reconstruction**
These projects are high cost and would take approximately 2-3 years to design and implement. Examples include right-of-way purchases, new signals, access reconfiguration, parking restrictions signage, curb modifications, significant drainage improvements, and coordination with other agencies (such as the Colorado Department of Transportation). 12th Avenue Neighborhood Bikeway projects that fall into this category include:

- Colorado Boulevard

Community polling at workshop #2 revealed that signal & intersection upgrades are the preferred implementation priority.
Additional projects to develop the 12th Avenue Neighborhood Bikeway include traffic calming and stop sign reorientation.

**Candidate Traffic Circles**

Traffic circles are recommended for a number of intersections on the 12th Avenue Neighborhood Bikeway corridor. Traffic circles slow vehicular traffic while posing little or no interruption to bicyclists and pedestrians. The recommended candidate traffic circle design will consider emergency vehicle clearance and produce optimal traffic calming effects. In most cases, traffic circles require an 18-foot clearance between the outer edge of the circle and intersection corners, and a 6-inch high, two-foot wide mountable curb apron. These standards vary depending on the existing intersection geometry. Traffic circles do not need stop signs to control traffic, however, the project team has recommended keeping or reorienting stop signs at some locations where candidate traffic circles are proposed. The project team also proposes that space within the traffic circle be xeriscaped and maintained by local residents.

Several locations are recommended for reorientation of stop signs either to prioritize movements on the neighborhood bikeway corridor, or in conjunction with the installation of a candidate traffic circle. On the 12th Avenue Neighborhood Bikeway this generally means reorienting the stop signs from the east and west approaches to the north and south approaches to control north and southbound traffic while reducing stops for east and westbound traffic traveling on the bikeway. In some cases stop sign re-orientation involves converting a 4-way stop to a 2-way stop.

Locations on 12th Avenue where traffic circles and/or stop sign reorientation are recommended include:

- Jersey Street - install traffic circle, reorient 2-way east/west stop to 2-way north/south stop
- Niagara Street - install traffic circle, reorient 2-way east/west stop to 2-way north/south stop
- Pontiac Street - install traffic circle, reorient 2-way east/west stop to 2-way north/south stop
- Poplar Street - reorient 2-way east/west stop to 2-way north/south stop
- Xanthia Street - install traffic circle, reorient 2-way east/west stop to 2-way north/south stop

The City does not currently have a policy for traffic calming installation. As such, to implement the candidate traffic circles and stop sign reorientation, the City will embark on a traffic calming trial. They will conduct additional analysis and data collection and then design and implement temporary traffic circles and stop sign reorientation. These changes will be monitored to evaluate the candidate traffic circles and stop sign reorientation. The City plans to conduct these evaluations in 2016.
Appendix

This document has electronic appendices that include the following:

**Appendix A: Data Collection**
**Appendix B: Community Outreach**
**Appendix C: Concept Plan**
**Appendix D: Planning Costs**

The files can be found on the project website

**www.denvergov.org/neighborhood bikeways**