

**CITY OF BOULDER
TRANSPORTATION ADVISORY BOARD
AGENDA ITEM**

MEETING DATE: September 8, 2014

AGENDA TITLE: Staff briefing and TAB input regarding Bicycle Living Laboratory evaluation update and next steps

PRESENTERS: Tracy Winfree, Director of Public Works for Transportation
Michael Gardner-Sweeney, Transportation Planning and Operations Coordinator
Bill Cowern, Transportation Operations Engineer
Kathleen Bracke, GO Boulder Manager
Marni Ratzel, Senior Transportation Planner

EXECUTIVE SUMMARY

This memo provides a status report, check-in and opportunity for the Transportation Advisory Board (TAB) to provide input on the Bicycle Living Laboratory evaluation and next steps.

The “Living Lab” pilot projects program began as part of the Transportation Master Plan (TMP) update to test innovative strategies within the Complete Streets focus area to encourage more bicycling by “interested yet concerned” bicyclists. The Living Lab Phase I projects have been installed and monitored over the last year and staff has conducted qualitative and quantitative evaluation of each site.

The Sept. 8 TAB meeting will include a brief update on the Living Laboratory Phase I pilot projects underway, remaining treatments to be installed this fall and a more in-depth discussion of potential Phase II pilot projects to experiment with complete street repurposing and right sizing as identified in the updated TMP. This memo outlines the proposed technical analysis and community engagement process for the Phase II pilot projects.

Staff is seeking feedback from TAB on the Living Lab projects from Phase I as well as input to help shape the Phase II projects for 2014-2015, including the scope of community engagement process at the various stages of the project planning, installation and evaluation process.

New material:

- Phase I Living Laboratory evaluation key findings
- Phase II Living Laboratory pilot project discussion on proposed technical analysis and community engagement process

Memo headers for the above topics are highlighted in yellow.

TAB ACTION REQUESTED

Review and provide feedback on the Bicycle Living Laboratory Phase I projects and provide input on the proposed recommendations and next steps to advance potential Phase II Living Laboratory projects.

BACKGROUND

Achieving an increase in bicycle mode share from 10 to 15 percent by 2020 and ultimately to 30 percent by 2035 is an objective of the TMP. In support of this objective, the city is focusing efforts on attracting and better accommodating “Interested but Concerned Cyclists” and, in particular, increasing trips by older adults, women and families with children - accommodating bicyclists from 8-80 years old. Engineering improvements coupled with strategies to encourage, educate, enforce, and evaluate bicycling are the five “E’s” that comprise a comprehensive approach to increasing bike mode share.

As part of the TMP update, the City introduced a Living Laboratory to test a variety of new bicycle facilities and programs and evaluate their long-term application and appropriateness in Boulder. The Living Lab bicycle pilot projects include innovative treatments that offer the opportunity to experiment with enhancements to the existing system that aim to encourage use by all types of riders for a variety of trip purposes.

Several Living Lab pilot projects have been active since September 2013. The City has installed four treatments including buffered bike lanes along Spruce Street from 15th to Folsom and along University Ave. from 9th Street to Broadway, back in angle parking on University Ave. from Broadway to 17th Street and a protected bike lane along Baseline Road from 30th to 35th Streets. In February 2014, the city began a pilot program to test use of electric assist bicycles on certain hard surfaced multi-use paths, not including paths on Open Space and Mountain Park lands or sidewalks except those designated as multi-use paths. **Attachment A** shows hard-surface multi-use paths on city land managed by OSMP. The first segment of the multi-way boulevard along the south side of Pearl Parkway opened in October 2013. This treatment and the planned shared street along Junction Place are being integrated into the Living Lab initiative and evaluation process.

Additional bike pilot project treatments are planned as part of the remaining Phase I Living Lab roll out. Fall 2014 installations include an advisory bike lane along Harvard Lane; the 13th Street Bicycle Boulevard, including branding and promotion of Boulevard Green Wave and ECO-Totem along the corridor; a bike box for southbound Folsom Street at Canyon Boulevard; and a

treatment to replace the buffered bike lanes along University Avenue with a bike lane protected by on-street parking.

In response to community, Board and Council input, the updated TMP and Action Plan incorporate an action item to explore opportunities for Complete Street corridor projects to repurpose or “right size” the street as part of the Living Laboratory approach and program. As part of the implementation phase of the TMP, staff is proposing several street corridors for consideration as the Phase II Living Lab program for 2014-2015.

STAFF ANALYSIS

Living Laboratory Phase I Installed bicycle treatment evaluation

Evaluation of the first wave of installed Living Lab demonstration projects has included community feedback, field observations, and “before” and “after” comparison for both quantitative and qualitative measures. Observational data collection and evaluation included bicycles riding in the intended zones, interactions between bicyclists and pedestrians, interactions between bicyclists and motorists at intersections and mid-block, motor vehicle travel speeds and volume, maintenance/snow plowing, vehicle parking relative to the bike lane, e-bike user speed, volume, and gender on multi-use paths.

The Fox Tuttle Hernandez Transportation Group (FTH) has been assisting city staff with field observations and data analysis for all projects implemented to date. FTH has completed 32 hours of before and after study, during which time approximately 2,400 bicycles, 2,650 car interactions, 500 pedestrians, and 300 parked cars have been observed. Analysis of the Living Lab projects provides an opportunity to better understand how pedestrians, bicyclists, and auto drivers interact with these new transportation facilities.

To gather qualitative feedback from the community, the Transportation Division hosted a number of opportunities for input including bike audits (guided community bike rides), on-line surveys, in-person feedback at public events, including the large Walk & Bike Summit, social media/Inspire Boulder, and a self-guided Bike Audit map and route was published in the first issue of the Bike Life Boulder magazine in Summer 2014.

The quantitative and qualitative analysis suggests that the existing living laboratory projects are overall successful based on the evaluation criteria. In general, the Living Lab projects did not result in new safety issues, and there were no increases in the number of collisions at the project locations. Experience shows that education and enforcement are necessary, particularly for less intuitive projects such as the back-in angled parking. Maintenance costs did not increase due to the new facility types and no new maintenance equipment was needed to clean the facilities. The Living Lab projects are an effective tool to gain community feedback and design input for future projects. Interestingly, we have learned that Boulder’s Living Lab approach is being used as a model for other communities in Colorado.

Key findings for each treatment are briefly detailed below.

Protected bike lane (Baseline Road, from 30th to 37th Streets)

Most comments from cyclists on the protected bike lanes express support. The aesthetic treatment of the protected bike lane has prompted a mixed response from community members. Some drivers have stated that the concrete blocks and flexible poles are distracting, camouflaged, and are impediments that require defensive driving. Cyclists have expressed concern for the lack of opening in the barrier to facilitate left turning movements.

- Bicyclists using the protected bike lanes and roadway drivers identified the need for additional study and design changes to gauge the effectiveness of the current design
 - Current close spacing of the bumper blocks requires two-stage left turns for cyclists at intersection.
 - Intersections with acceleration and deceleration lanes may have lower levels of compliance and require additional education or adjusted designs to reduce motor vehicle use of the protected bike lane.
 - Bus stops adjacent to the protected bike lanes will require additional education with the drivers to achieve compliance and conform to ADA standards
 - Interactions and yielding between motor vehicles and bicyclists at intersections was predictable.
 - Two-stage snow plowing with the large plows was effective.

Buffered bike lanes (Spruce Street, from 15th to Folsom and University, from 9th Street to Broadway)

The experimentation with buffered bike lanes included installation of three configurations that varied the width and placement of the buffer adjacent to the bike lane. An objective was to narrow the motor vehicle travel lane to 10 feet wide and parking lane to 7 feet wide. The remaining roadway width was dedicated to the buffer and bike lane striping. Along University, a five foot bike lane was buffered from both the adjacent travel lane and parking lane. Along Spruce Street, one segment included a five foot bike lane buffered from the adjacent travel lane and a second segment delineated a four foot bike lane buffered from both the adjacent travel lane and parking lane. The buffer zone was a minimum of two feet wide, though a wider buffer was striped when additional width was available.

Overall, the buffered bike lane treatments have been well received and cyclists support the buffering in the “door zone”. Observations confirm that motor vehicle driver compliance is good with only 2 to 6 percent of vehicles driving in the buffer area. Likewise, almost all cyclists are riding within the designated bicycle lane, though up to 9 percent were observed traveling within the buffer zone along Spruce Street. This may be because the bike lane and buffer combination are narrower on Spruce than on University Avenue.

- The various buffered bike lanes treatments were effective at positioning all roadway users in the proper position, which assists with mutual traveler predictability:
 - Most motor vehicles drove within the new travel lane designations

- Most motor vehicles parked within the new parking lanes
- Most bicyclists rode in the new bike lanes

Back in Angle Parking (University Avenue from Broadway to 17th Street)

Some community members have expressed concern for and displeasure with the back-in angle parking along University stating their concern for the new configuration and challenges with people learning to use the new configuration appropriately.

Compliance with the back in policy change was poor at the beginning of the experiment with most drivers not backing into the parking spaces. This has improved over time through education and enforcement efforts. In the initial weeks after installation, parking enforcement officers distributed an informational flier and warnings. This was followed by targeted enforcement, which resulted in issuing parking summons and warnings. Local print and television news media coverage also helped inform the public of this change. To help raise awareness on the new parking policy, staff produced an instructional video and placed signs along the corridor as well. These educational and enforcement efforts significantly improved compliance. The city has also received comments from the University of Colorado supporting the continuation of back-in parking in this area.

- Back In Angled parking has resulted in more predictable interactions for all roadway users
 - 50% increase in bicycles riding in the center of the bike lane
 - High compliance associated with yielding cars leaving spaces when bicycles are present
 - High compliance with motor vehicles parking within the striping and staying clear of bicycle lanes
 - There have been no accidents associated with vehicles maneuvering into or parked within back-in angled parking spaces on University Avenue since the start of the demonstration.

Attachment B provides a summary of Phase I Living Lab projects. Based on the analysis, staff is recommending that the existing Spruce buffered bike lanes and the back-in angled parking on University Avenue demonstrations remain in place and be used as examples when considering future bicycle facility projects throughout the community. In addition, staff is planning to extend the protected bike lane treatment along Baseline to the east and modify the installation by removing or reducing the use of the concrete blocks to address concerns regarding left turning bicyclists as well as to test options for integrated protected bike lanes with transit stops. As an additional test, the buffered bike lane experiment on University Avenue is being replaced with a demonstration of a bicycle lane protected by parking this fall.

E-Bike evaluation

Fieldwork conducted in August 2014 and key findings indicate that allowing e-bikes to ride on multi-use paths has not resulted in large numbers of e-bikes using the trail system and approximately 85% of all bicycles (e-bikes and “regular” bikes) are traveling at or below the posted 15 mph speed limit on multi-use paths.

- Key findings from approximately 7 hours of observations at four multi-use path locations included the following:
 - Approximately 1,000 bicycles were observed
 - Of the 1,000 bicycles observed three (3) were E-bikes
 - 16 MPH 85th Percentile Speed
 - 82% of cyclists were traveling at or below the 15MPH speed limit
 - Less than 1% of cyclists experienced near miss conflicts during observations
 - 67% of all cyclists observed were male
 - 33% of all cyclists observed were female
 - 10% of cyclists observed wore a “full lycra cycling kit”
 - 7% of cyclists observed were children

Based on the results to-date, staff recommends proceeding with a request through Boards and City Council this fall to consider allowing e-bikes on the multi-use paths on an on-going/permanent basis when the current pilot program ends in December 2014.

In addition, the city is working with Community Cycles to launch the “Way of the Path” courtesy campaign this summer and fall, with particular emphasis during the Back to School timeframe, to encourage safe behaviors for all trail users. Staff is recommending this campaign continue on an on-going basis through 2014-2015 regardless of whether the e-bike pilot program continues or not.

Living Lab Phase I – Remaining projects for Fall 2014 Installation

Several additional bike pilot project treatments are planned as part of the remaining Phase I Living Lab roll out. Fall 2014 installations include an advisory bike lane along Harvard Lane; the 13th Street Bike Boulevard; a bike box for southbound Folsom Street at Canyon Boulevard; and a treatment to replace the buffered bike lanes along University Avenue with a bike lane protected by on-street parking.

These projects will be evaluated using similar criteria as the other bicycle innovations from the Phase I Living Lab program. Each will be installed for 12 to 18 months. Community engagement will continue to use Inspire Boulder, a project web page and informational materials, similar to the one detailed in **Attachment C** to promote these Living Lab projects and encourage bicyclists to try out these new facilities and provide feedback. A status update for each treatment is detailed below.

13th Street Bike Boulevard

Elements of the Bike Boulevard project are to better brand and publicize 13th Street as a preferred route alternative to Broadway. The recently implemented signal timing improvements in the Downtown district along 13th Street and real-time ECO-Totem bicycle counter will be highlighted as part of branding the corridor.

Bike Box

The Bike Box is currently not a national standard traffic marking. This treatment requires the city to apply for a Federal Highway Administration (FHWA) Request to Experiment (RTE) with this treatment. Timing for installation of the Bike Box will be guided by the FHWA process to approve our RTE.

Parking Protected Bike Lane

The transportation related ordinance amendment to allow experimentation with this treatment is scheduled for Council review this fall, with a first reading on Sept. 16 and a second reading on Oct 7, 2014. An open house meeting will follow to share the proposed pilot project design. Adjacent property owners and residents will be invited and notified by direct mail.

With respect to Protected Bike Lane treatments, the Transportation Division also will draw from Lessons from the *Green Lanes: Evaluating Protected Bike Lanes in the U.S.*, a recently released study by Portland State University. The study analyzed use, perception, benefits, and impacts of protected bicycle lanes in five cities: Austin, TX; Chicago, IL; Portland, OR; San Francisco, CA; and Washington, DC. It is the first known analysis of United States protected bike lanes and presents findings in support of protected bike lanes, concluding that these bike lane facilities resulted in a measured increase in observed ridership and improved bicyclist comfort. TAB members may [download the whole report](#) for additional background.

In addition, staff is a member of and actively participating in the National Association of City Transportation Officials (NACTO) and using information from NACTO as a resource for developing Boulder's Living Laboratory innovations. More detailed information, including national case studies, is available at: www.nacto.org

Living Lab Phase II Complete Streets repurposing and right sizing experiments

In response to input from the community, Boards, and City Council during the Transportation Master Plan update, the Transportation Division is developing the next wave of Living Lab projects to test options for repurposing or "right sizing" certain multi-lane arterial roadways to enhance access and safety for all modes of travel.

To date, staff has developed an initial list of potential candidate "Complete Street" corridors that include portions of Iris Avenue, Folsom Street, 55th Street, and 63rd Street. These initial streets have been identified as potential candidates for the Living Laboratory program through an initial analysis of multimodal transportation operational criteria including bicycle level of stress and use, motor vehicle volume, travel time, speed (posted and actual), as well as land use context and connectivity to primary destinations.

The Transportation Division is evaluating the geometry and conditions on these corridors and is working to develop conceptual alternatives to present and get feedback on from the TAB and Boulder community. The alternatives will include details on potential enhancements to improve walking, bicycling, and transit facilities and redesign the vehicle lane configuration and

intersections. Additional data collection and analysis to develop the conceptual alternatives will be collected over the next several months. This additional technical work is scheduled to be complete this fall. The Transportation Division proposes to host a public open house meeting in January 2015 to inform and seek feedback on the proposed pilot project(s) from the greater Boulder community. Adjacent property owners and residents of the proposed projects would be notified of the project and open house through direct mail. TAB and Council input would be sought in January/February to guide ongoing Phase II corridor project process and installation in Spring 2015.

Staff is seeking feedback from TAB regarding the level of community engagement process for these Phase II corridor pilot projects. Our desire is to be responsive to the Board and City Council direction to expedite implementation of the TMP strategies and action items, while recognizing the need to ensure the Boulder community and adjacent residents and businesses are informed about and involved in these projects prior to installation.

There will also be an active, on-going community engagement process throughout the duration of the Living Laboratory Phase II program to seek feedback from the community on their experiences using the new street configurations. This community feedback will be used along with the technical analysis of the Phase II projects to determine future phases for the Living Lab program.

Another TMP Action Plan item underway in the Complete Streets Immediate Action Plan is to conduct Corridor Studies. Envision East Arapahoe (Folsom to 75th St.) has begun and Canyon Boulevard associated with the Civic will begin in 2015. Colorado and 30th Streets associated with CU's Main and East Campus area will follow East Arapahoe and Canyon. These larger, integrated corridor studies involve larger institutions, key agency partners (such as CDOT, RTD, CU), and include potential and / or significant land use changes. Each of these larger corridor studies will also consider repurposing existing public right-of-way as well addressing the pedestrian/bicycle crossing barriers. Other community design issues will be considered in these projects as well, such as public art, urban design and placemaking.

Summary of staff recommendations

- Based on the quantitative and qualitative analysis, keep the existing buffered bikelanes on Spruce and back in angled parking on University. Extend and modify the Baseline protected bikelanes and change University buffered bikelanes to new protected bikelanes.
- Use these locations as examples when developing the bicycle facility design guide (future TMP action item) and when considering future bicycle facility improvements throughout the community.
- Proceed with a request through Boards and City Council this fall to consider allowing e-bikes on the multi-use paths on an on-going/permanent basis when the current pilot program ends in December 2014.
- Proceed with implementation of the remaining Phase I projects and continuing analysis and community engagement process.

- Continue technical analysis and prepare for community engagement process for the Phase II complete streets projects, including the proposed street corridors along Iris, Folsom, 55th, and 63rd.

Key Questions for TAB:

- 1) Does TAB have feedback regarding the evaluation of installed bicycle treatments or planned installation of the remaining Phase I Living Lab treatments?
- 2) Does the TAB have input and/or questions on the proposed analysis and community engagement process proposed to advance the Phase II Living Lab Complete Street repurposing and right sizing experiments?

NEXT STEPS

The Transportation Division will conduct outreach to adjacent property owners and residents in the area of the existing Phase I pilot projects to seek additional feedback on these facilities and let people know that they are planned to remain in place. Staff is planning to proceed with rolling out of the remaining Phase I Living Lab projects.

Data collection and analysis on the Phase II corridor projects will be completed this fall to support a public open house in early 2015. A public hearing and consideration of the Phase II Living Lab corridor pilot projects is planned for the TAB in January or February 2015 meeting. Information regarding the Living Lab projects will be included as part of the TMP implementation check-in at the City Council Study Session in February 2015 to guide ongoing outreach, process and installation of Phase II.

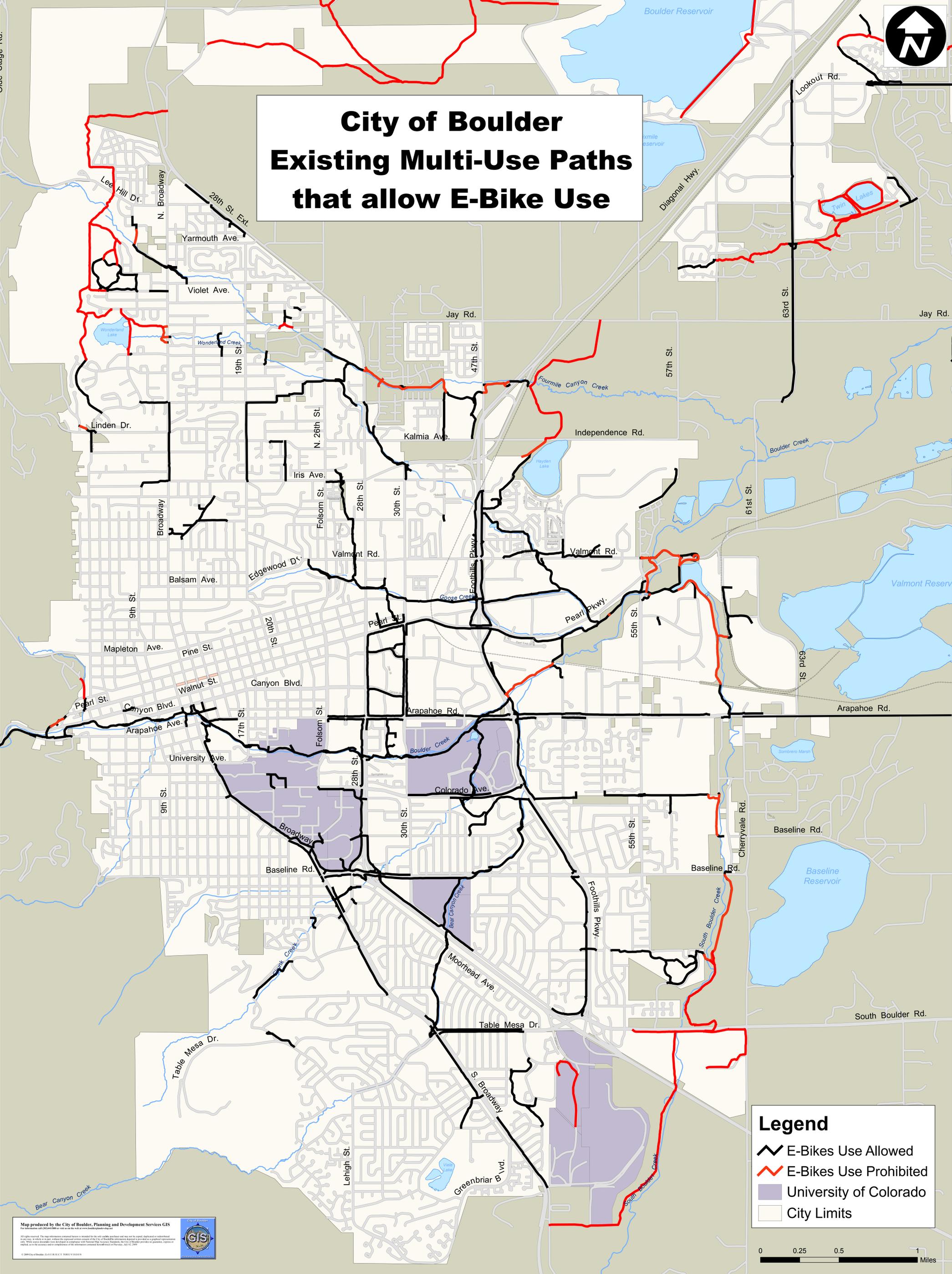
Based on direction from the community engagement process, TAB and Council, the Phase II projects would go to final design and a goal of a Spring 2015 installation.

Attachments:

- A. Map of Paved Multi-use paths on City of Boulder Open Space Lands
- B. Living Laboratory Key Findings Summer 2014
- C. Living Lab pilot project materials

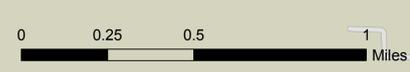


City of Boulder Existing Multi-Use Paths that allow E-Bike Use



Legend

-  E-Bikes Use Allowed
-  E-Bikes Use Prohibited
-  University of Colorado
-  City Limits



**SPRUCE STREET
BUFFERED BIKE LANES**

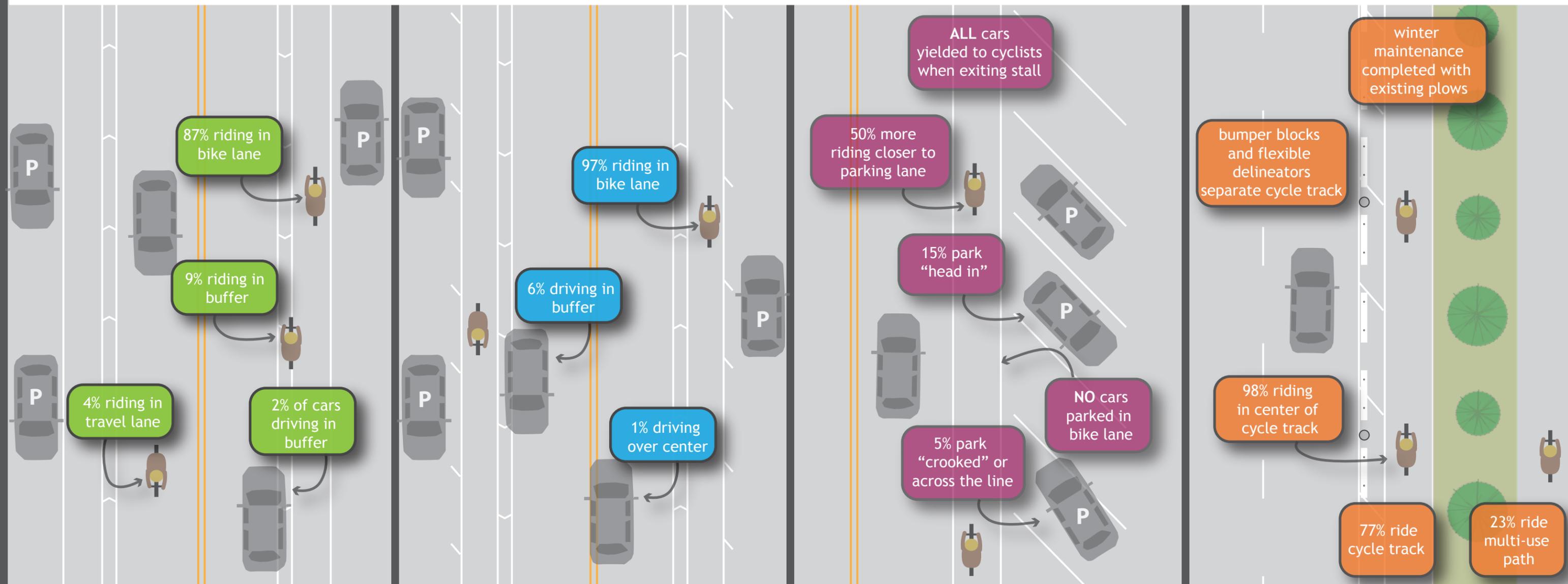
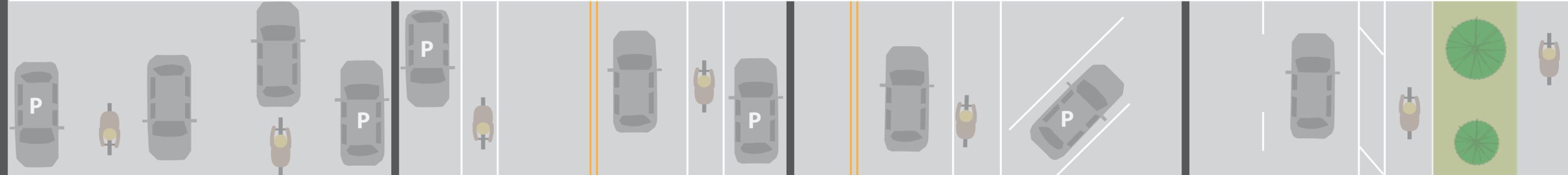
**UNIVERSITY AVENUE
DOUBLE BUFFERED BIKE LANES**

**UNIVERSITY AVENUE
BACK-IN-ANGLE PARKING**

**BASELINE ROAD
CYCLE TRACK**

BEFORE

AFTER

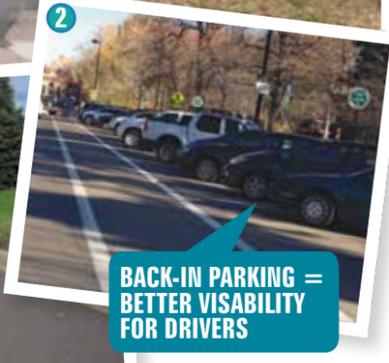


BIKE INNOVATIONS

Check out Boulder's 'Living Laboratory'

Boulder's bikeway network is second to none in the United States. Cyclists are afforded 159 miles of dedicated bikeways—with 68 of these miles comprising off-street multi-use paths supported by 79 grade-separated underpasses—in comparison to 305 centerline miles of roadway. While the system is substantially complete, there is still tremendous potential to increase the number of trips completed by bike—especially by women, older adults and families with children, and in comparison to trips by bike experienced by international cities.

To make bicycling more appealing and safe, the city is trying different bike facilities around town called Living Labs to test-fit what works best in Boulder. These temporary installations aim to enhance the on-street bike system so that it's appealing to people who want to bike but don't feel comfortable or confident sharing the roadway with motor vehicle traffic.



LABORATORY LOCATIONS

GO Boulder wants your feedback. See the map at right for details, take your bike for a spin to check them out, and go to InspireBoulder.com to share your input on the "Why" questions with the city and fellow Boulderites.

1. What: Buffered Bike Lanes (there are three different buffered lane designs)

Where: Spruce St. from 15th to Folsom; University Ave. from 9th St. to Broadway.

Why: How effective is each design in raising awareness and improving safety between cyclists and drivers in travel lanes or existing parked cars?

2. What: Back-in-Angle Parking

Where: University Ave. from Broadway to 17th St.

Why: Does back-in angle parking improve safety by reducing conflicts and documented crashes between cyclists and vehicles backing out blindly?

3. What: Cycle Track/ Protected Bike Lane

Where: Baseline Road from 30th to 35th St.

Why: Do cyclists feel more comfortable and safe? What are the impacts to winter maintenance and bus operation?

4. What: Multi-way Boulevard

Where: Pearl Parkway east of 30th to the railroad tracks

Why: How well does the Boulevard design create a unique, active public space while serving travel needs by bicyclists, walkers and drivers?

5. What: Allow electric-assist bicycle use on multi-use paths

Where: See a map at <http://tinyurl.com/EbikesBoulder>

Why: Can e-bikes co-exist with other multi-use path users?

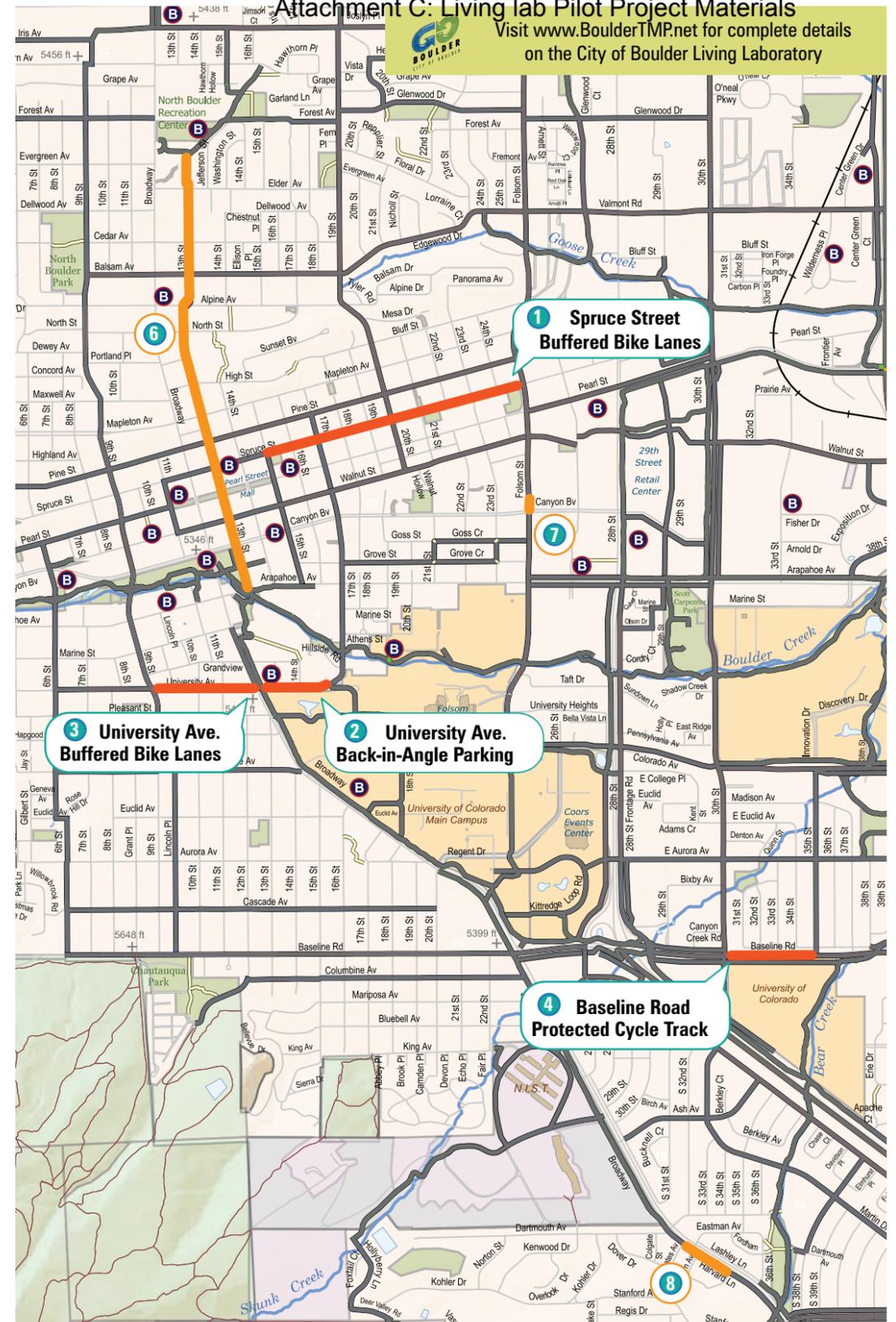
Living Laboratory Project Locations



The City of Boulder launched a 'Living Laboratory' to test new bike innovations and see if they are appropriate for Boulder.

The city is encouraging everyone to test ride the new bike innovations and share your experiences on InspireBoulder.com.

Attachment C: Living lab Pilot Project Materials
Visit www.BoulderTMP.net for complete details on the City of Boulder Living Laboratory



Living Laboratory Projects Include:

- 1 Spruce Street Buffered Bike Lanes
- 2 University Avenue Back-in-Angle Parking
- 3 University Avenue Buffered Bike Lanes
- 4 Baseline Road Protected Cycle Track
- 5 E-Bike Pilot Project
To view a map of off-street Multi-Use Paths that allow the use of electric-assisted bicycles (E-bikes), visit tinyurl.com/EbikesBoulder
- 6 13th Street Bike Boulevard
- 7 Canyon and Folsom Bike Box
- 8 Harvard Lane Advisory Bike Lane

Installation Planned For Summer 2014: