

City of Chandler, AZ

# Protected Bike Lane Feasibility Study

Executive Summary & Regional Significance Report | October 2023

## ACKNOWLEDGMENTS

This study effort was conducted in partnership and funding provided by the Maricopa Association of Governments (MAG) and led by Y2K Engineering.



Photo Sources: Y2k Engineering, City of Chandler, Bike Portland, Google, and Streetsblog

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# OVERVIEW



During the 2019 update of the Chandler Transportation Master Plan, residents expressed a **strong interest** in being able to bike as a realistic form of everyday transportation. However, this strong interest was equally countered by the indication that residents didn't feel safe riding in bike lanes next to high-speed traffic on Chandler streets.

Recognizing the need for increased bicyclist comfort and safety on Chandler streets, as well as the reality of finite resources, the City of Chandler established this study to evaluate the feasibility of upgrading existing bike lanes in the city to **protected bike lanes (PBLs)**. Additionally, this study effort developed a prioritized list of locations based on a series of priorities, while working with the community for input.

The study also sought to establish design considerations for PBLs (including lane width, buffer zones, vertical elements and signing and striping considerations), utilizing the City's preferred lane widths as a base. Additionally, this study effort provides an adaptable framework for other local agencies throughout the Maricopa County region to be able to replicate for consideration of protected bike lanes.



Establish PBL design considerations to set the needed dimensions for different cross sections of Chandler arterials and collectors



Determine feasibility of converting existing arterial and collector bike lanes to PBLs without removing any vehicle lanes



Conduct a prioritization process to recommend feasible locations for PBLs for future implementation



Engage the community to understand and integrate their thoughts on priorities to install PBLs



Provide high-level cost estimates for four different vertical elements for PBLs

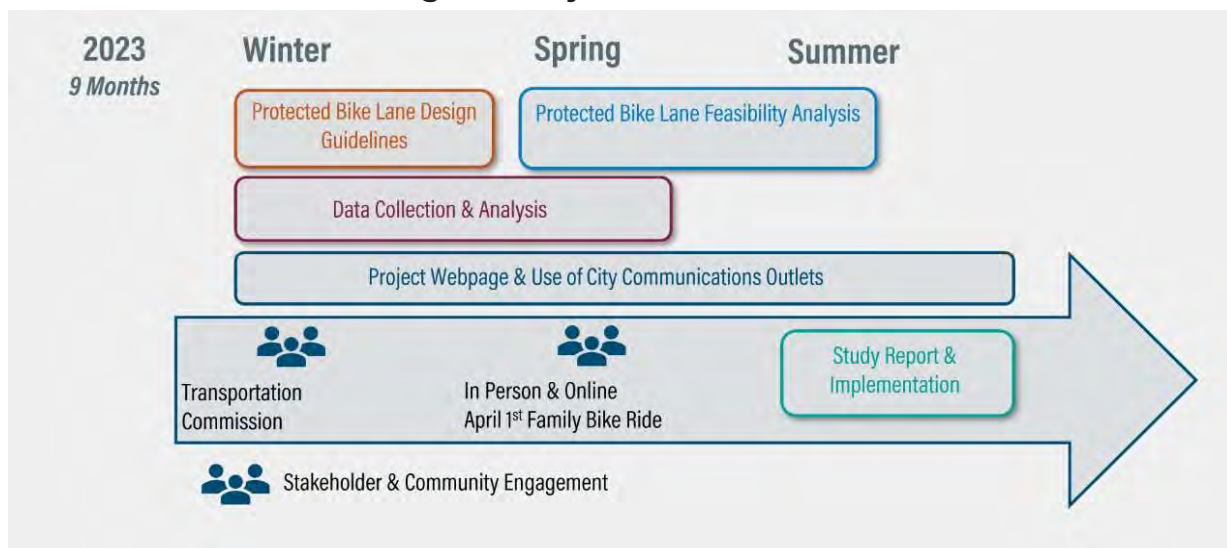
The Protected Bike Lane Feasibility Study IS and IS NOT:	
IS	IS NOT
A feasibility analysis. This study determines where space is available to add PBLs within the existing curb-to-curb space, while not removing any vehicle lanes and maintaining Chandler's preferred lane widths.	A master plan recommending that PBLs be installed at each feasible location.
	A road diet plan. This study recommends that no vehicle lanes be removed to accommodate a PBL.
Design Guidelines - this study developed considerations to be factored in when advancing a PBL toward implementation.	Design standards - this study is only meant to provide guidance for the City to consider when developing design criteria. Deviations may be needed as a project advances.
	Final Design - Additional design work will be needed before any corridor can be advanced.
A high level spatial analysis to help the city prioritize potential PBL corridors.	A safety study demonstrating precise locations where PBL installation will definitively reduce bike and pedestrian crashes.
	A comprehensive planning effort detailing the exact order in which PBLs should be installed.

Beginning in November 2022, This study effort took 10 months and had 5 main tasks that culminated into this report. **Figure 1** outlines the overall project schedule and the five major project tasks:

Data Collection

- PBL Design Guidelines
- PBL Feasibility Analysis
- Prioritization of Feasible Locations
- Community Engagement

**Figure 1: Project Schedule**



# DATA COLLECTION & FEASIBILITY ANALYSIS



There were three steps undertaken to identify locations that are feasible for protected bike lanes: inventory and screening of roadway locations with existing bike lanes, identification of the needed space for the protected bike lane envelope, and then determining feasibility.

**Figure 2: Data Collection & Analysis Process**



Step 1 included a review of existing roadway cross sections, needed vehicle lane widths, and bike lanes to determine if there is enough street width to add protection to the bike lane, without removing a vehicle lane or widening the roadway.

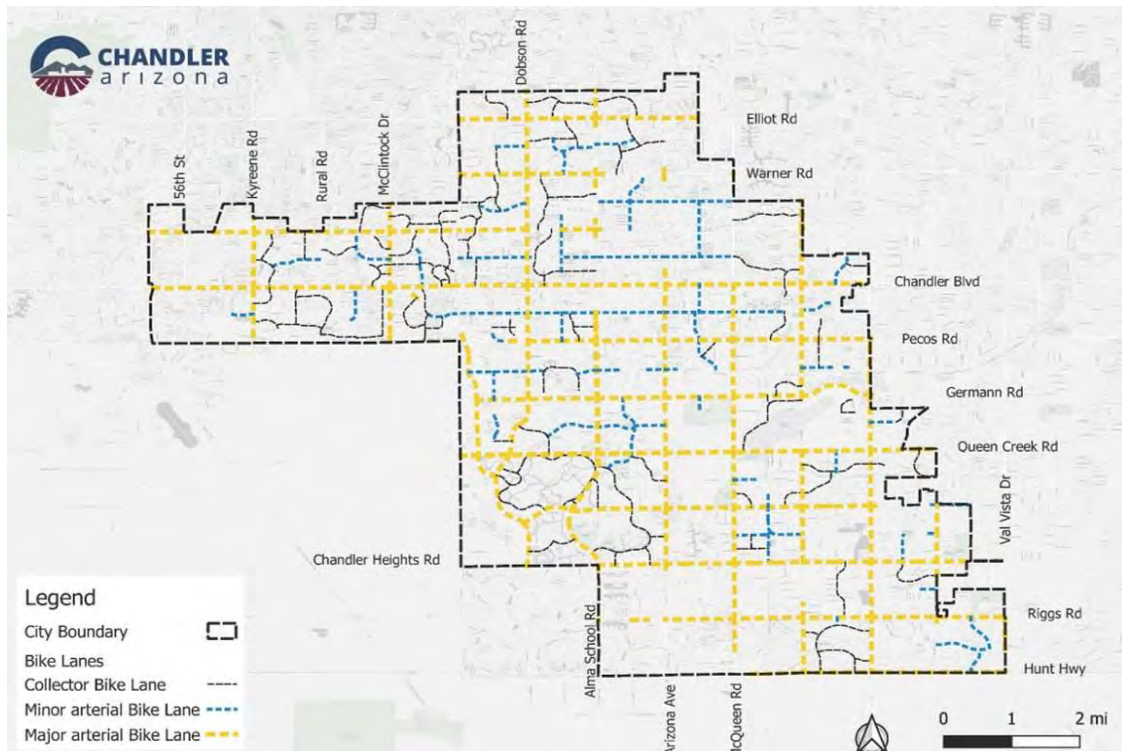
The consultant team conducted a data driven, mapping analysis to assess and inventory over **300 miles of roadway**, and identify arterials and collectors with existing bike lanes in Chandler. From this inventory, the team conducted a spatial review to identify the roadway attributes and cross-sections that help determine the availability of space (feasibility) to install a PBL. **Table 1** provides details of existing bike lanes on Chandler roads, and **Figure 3** identifies these locations.

**Table 1: Existing Bike Lane Inventory\***

Roadway Type	Total Amount of Roadways (Centerline Miles)	Total Amount of Roadways w/ Bike Lanes (Centerline Miles)	% Of Roadways with Bike Lanes
Arterial	201	153	76%
Collector	103	57	55%
<b>Total</b>	<b>304</b>	<b>210</b>	<b>69%</b>

\*Numbers are rounded to the nearest mile

**Figure 3: Existing Bike Lane Inventory Map**

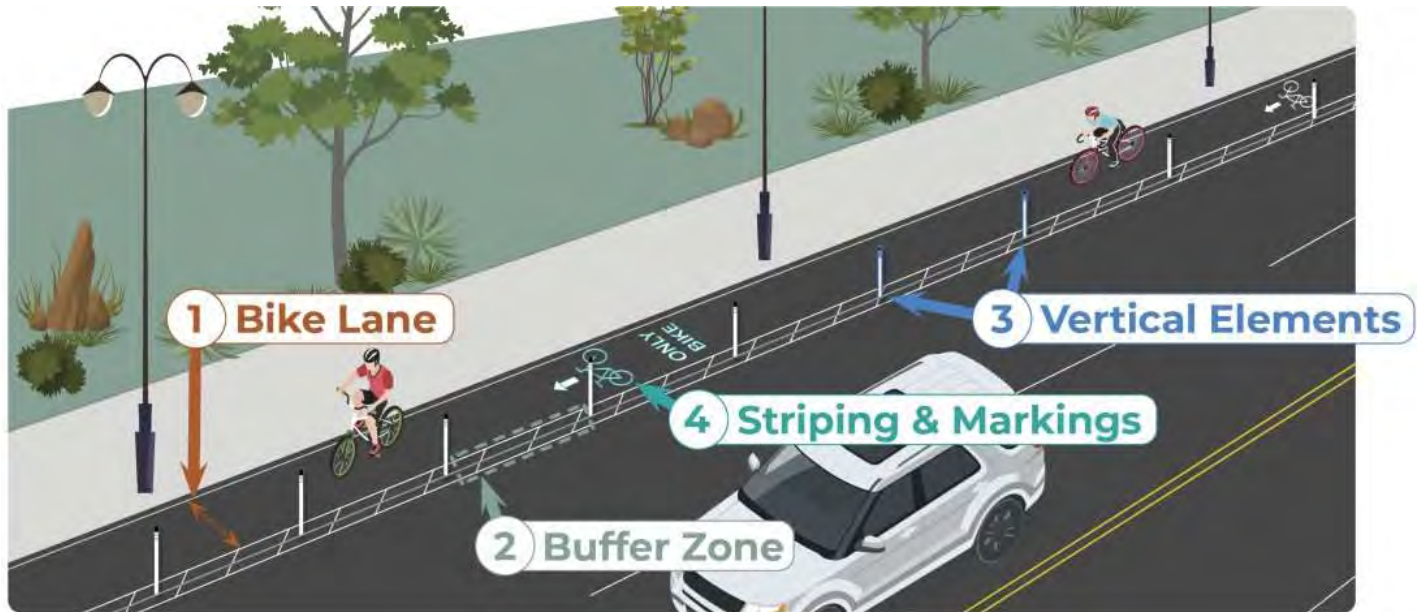


Step 2 identified the needed width of a protected bike lane. **A protected bike lane includes 4 main elements:** the bike lane, the buffer zone, the vertical element, and signing and striping (**Figure 4**). Chandler recommends total preferred width of 8 feet for a protected bike lane with a minimum of 7 feet. Details are explained in **Table 2**. The envelope was recommended based on the City of Chandler’s Engineering and Design Standards Manual, and review of design guidelines from FHWA and other local agencies throughout the country.

**Table 2: Total Minimum & Preferred Widths**

Protected Bike Lane Components		Total Widths	
Bike Lane Width Range (Includes Gutter Pan)	Buffer	Minimum	Preferred
5.5ft to 6.5ft	1.5 ft+	7ft	8ft

**81 Miles** of roadway (arterials and collectors) were identified that meet the width requirements as determined in Step 2.

**Figure 4: PBL Elements**

These locations that met Step 2 criteria moved forward to Step 3 for further evaluation of additional factors that could positively or negatively affect the application of a PBL. In this analysis, each factor was evaluated and categorized into supportive or non-supportive for the installation of protected bike lanes. For example, if the number of driveways, driveway spacing, and intersections along a corridor is high, this will be categorized as non-supportive.

**The 7 factors that were identified to make a corridor infeasible include:**

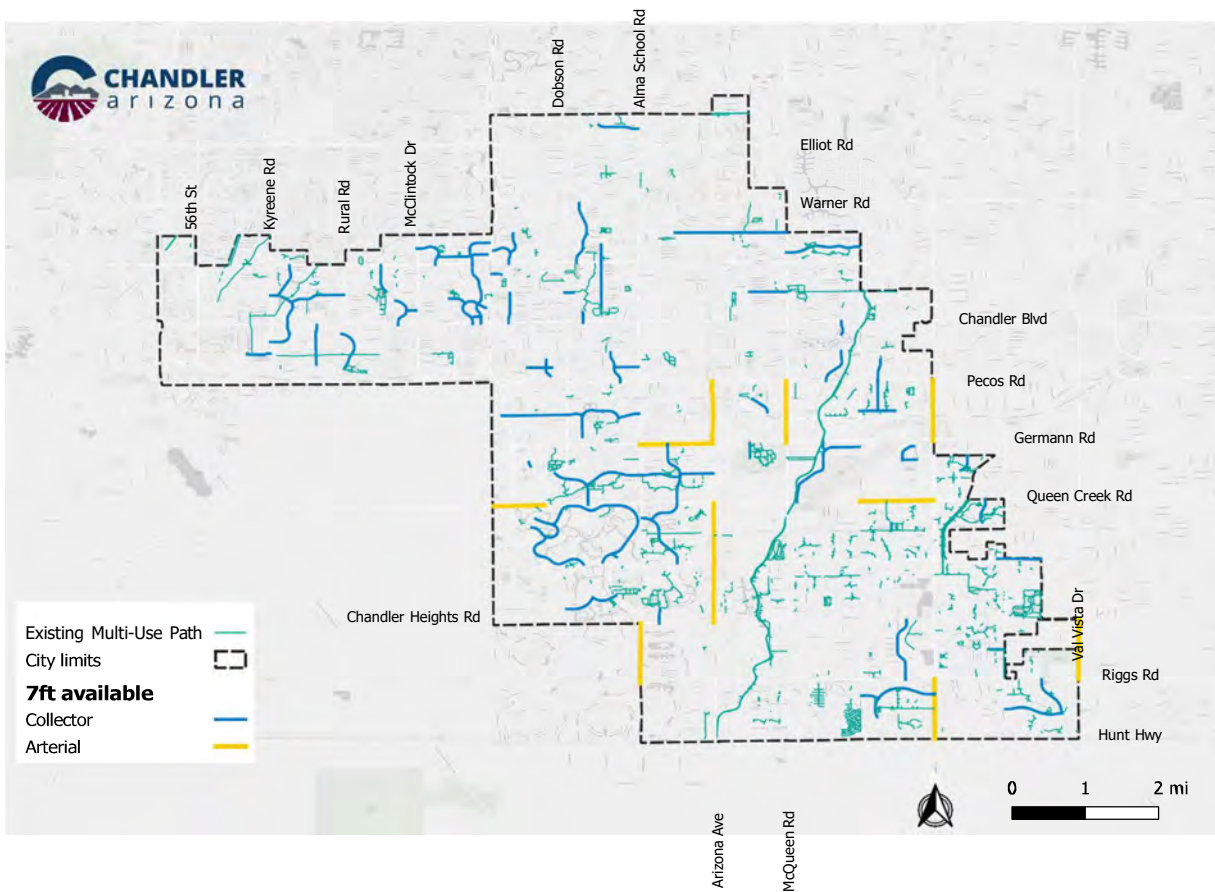
1. High number of front facing housing/number of residential driveways
2. Missing existing curb and gutter
3. Missing street lighting presence
4. High number of signalized intersections
5. High number of unsignalized intersections
6. High number of commercial driveways
7. High concentration of driveways

The results from the Step 3 analysis further reduced the number of potential roadway locations for improvements to 53 miles with the minimum 7 ft available for a PBL, and 42 miles that meet the preferred width of 8 ft. **Table 3** shows the types of roads, cross sections, and length of segments that are feasible, and **Figure 5** shows these locations that are feasible for a 7 foot PBL. Appendix A provides detailed maps of the analysis for Task 1.

**Table 3: Feasible Roadways for PBL Upgrades**

7+ ft Available on Both Sides		8+ ft Available on Both Sides	
Roadway Type	Sum of Length of Segment (Miles)	Roadway Type	Sum of Length of Segment (Miles)
Arterial	10	Arterial	5
Collector	43	Collector	37
<b>Total</b>	<b>53</b>	<b>Total</b>	<b>42</b>

**Figure 5: Feasible Roadways for PBL Upgrades**



# PUBLIC ENGAGEMENT



Understanding the community’s viewpoints on riding bicycles, feeling safe and comfortable, and priorities for upgrading bike lanes were key components in this study effort. The feedback was essential in prioritizing feasible locations, selecting protection types, and meeting the overall goals of this study effort. Both in-person and virtual tools were deployed to gather as much feedback as possible, including an online survey open from April to May, and a pop-up event at the annual Chandler Family Bike Ride that helped to demonstrate the different types of vertical elements available.

## PUBLIC ENGAGEMENT TIMELINE

<b>Chandler Transportation Commission</b> .....	<b>January 18th, 2023</b>
<b>Family Bike-Ride Registration</b> .....	<b>February - March 2023</b>
<b>Family Bike-Ride In-Person Engagement</b> .....	<b>April 1st, 2023</b>
<b>Online Survey</b> .....	<b>April 1st - May 1st, 2023</b>
<b>Chandler Transportation Commission</b> .....	<b>May 17th, 2023</b>
<b>Chandler Transportation Commission</b> .....	<b>August 9th, 2023</b>

- 380** People completed the Family Bike Ride registration and answered survey questions about feeling safe riding a bike on different types of streets.
- 70** People participated in the Family People participated in the public engagement activity boards at the Family Bike Ride Event that focused on prioritization factors and types of vertical elements.
- 600** People answered the questions in the on-line survey, focused on prioritization factors and types of vertical elements.

At the last public engagement opportunity, the Chandler Transportation Commission on August 9, 2023, two members of the public and the commission discussed the results of the study. Themes that were discussed included: consider the length and connectivity (to existing bike lanes, off street network and future protected bike lanes) when implementing protected bike lanes, consider implementation of PBLs on Arizona Ave. and Chandler Blvd., consider an additional data source to identify current bike activity along the transportation network, and consider future bike network improvements in north Chandler.

**KEY FINDINGS FROM THE PUBLIC ENGAGEMENT ACTIVITIES WERE:**

- **46%** of the people that registered for the Family Bike Ride **do not feel safe bicycling** in bike lanes on arterials
- **Connectivity and Safety** are the important factors for prioritizing locations for protected bike lanes
- Online survey respondents strongly support protected bike lanes on **Arizona Avenue and Chandler Boulevard**
- In person and online survey respondents have strong preferences for **concrete barriers, delineator posts and a combination of elements** for protected bike lanes



The full Public Involvement Summary is contained in Appendix B.

# PRIORITIZATION RESULTS



The outcome of the feasibility analysis determined that there are 53 miles (107 unique locations) of feasible locations for a protected bike lane (PBL), which assumes a minimum 7-foot PBL envelope. This was the starting point for the prioritization approach. In coordination with Chandler staff, discussions with the Chandler Transportation Commission, and feedback from public engagement, **the prioritization process is focused on evaluating 5 priorities:**

1. Crash History
2. Land Use Connectivity
3. Bike Connectivity
4. High Amount of Current Bike Activity
5. Disadvantaged Areas

Supporting these categories, nine data factors were analyzed and assigned a series of points for the prioritization of the 107 PBL locations. Aligning with City goals and public input priorities, crash history and connectivity were assigned the highest points, up to 4 points each. PBL locations that connect to parks, schools, activity or employment centers could receive up to 3 points. Locations with high bike activity (from STRAVA data) can receive 2 points, and corridors adjacent or in disadvantaged areas receive 1 point. **In total, a feasible PBL location can receive up to 14 points.** The data factors and points are explained in **Table 4.**

**Table 4: Data Analysis Factors and Possible Points**

Priority	Data Factors	Data Factor Points	Points
<b>Crash History</b>	Pedestrian/Bicycle Crashes	0 to 2	<b>4</b>
	Fatal and/or severely injured (KSI) Crashes	0 to 2	
<b>Land Use Connectivity</b>	Park Access	0 or 1	<b>3</b>
	School Access	0 or 1	
	Activity and Employment Centers	0 or 1	
<b>Bike Network Connectivity</b>	Canal or Trail Access	0 or 1	<b>4</b>
	Potential for Connected PBL	0 to 3	
<b>Current Activity</b>	Current High Bike Activity	0 or 2	<b>2</b>
<b>Disadvantaged Areas</b>	Federally defined Transportation Disadvantaged Census Block Group	0 or 1	<b>1</b>

Based on the analysis results, the **107 locations were grouped into 5 tiers** for prioritization. This supports the flexibility for implementation and future input from the community. The first tier represents the highest priority and corresponds to the highest number of points. The fifth and last tier corresponds to lowest priority and corresponds to zero priority points. **Table 5** shows a summary of the tier distribution and **Figure 6** shows the tier results in a map. Appendix C provides the data analysis results in a sequence of maps.

**Table 5: Summary of Prioritization Results**

Tier	Amount of Total Points	Number of Feasible Locations for PBL	Number of Miles
1	7 to 9	20	12.6
2	5 to 6	29	16.9
3	3 to 4	21	10.5
4	1 to 2	26	9.5
5	0	11	2.8

**Table 6** provides the Tier 1 results for feasible locations for PBLs. Appendix D contains results for all five tiers.

## ADVANCING A FEASIBLE LOCATION TOWARD IMPLEMENTATION OF A PBL

The list of feasible corridors and this study’s prioritization into tiers is meant to provide guidance only. The City may determine that some of these feasible PBL corridors (even some within the top tiers) may not be ideal candidates to advance to implementation. In determining which PBL corridor to advance toward implementation, the following considerations should be made, even if it results in a Tier 2 or 3 corridor being installed before a Tier 1 corridor.

**Street type:** PBL implementation should focus on collector street locations until further analysis is conducted to determine an appropriate approach (if any) to PBL installation on arterial streets.

**Available Space for PBL:** Corridors with 8 feet available should be prioritized over corridors with 7 feet available.

**Connectivity:** Corridors that will result in longer-distance, high-comfort rides or corridors that make connections to paths, regional/ community parks, or other activity centers should be prioritized over corridors with limited connectivity.

**Paving Maintenance:** To minimize impacts to future maintenance projects, any PBL corridor installation should coincide with pavement maintenance projects whenever possible.

## IMPLEMENTING PROTECTED BIKE LANES

Five interrelated factors should be considered when implementing PBLs at feasible locations identified through this study: public input, design, cost estimates, funding, and installation.

**Installation:** The installation process refers to the different opportunities available to build a protected bike lane. These can include: a standalone PBL project, installation as part of another project, installation in coordination with pavement preservation, or another program. Whenever possible, PBLs should be coordinated with capital projects or pavement preservation work.

**Design & Cost Estimates:** It is recommended to use the PBL Design Guidelines as initial direction for design and consider the four vertical options presented in this memo. As part of the design efforts, a cost estimate for delivery and installation should be developed, and consideration of future maintenance needs.

**Funding:** It is recognized that the City of Chandler relies on a mix of funding options to support their transportation, multi-modal, and bicycle projects, and identification of funding is essential.

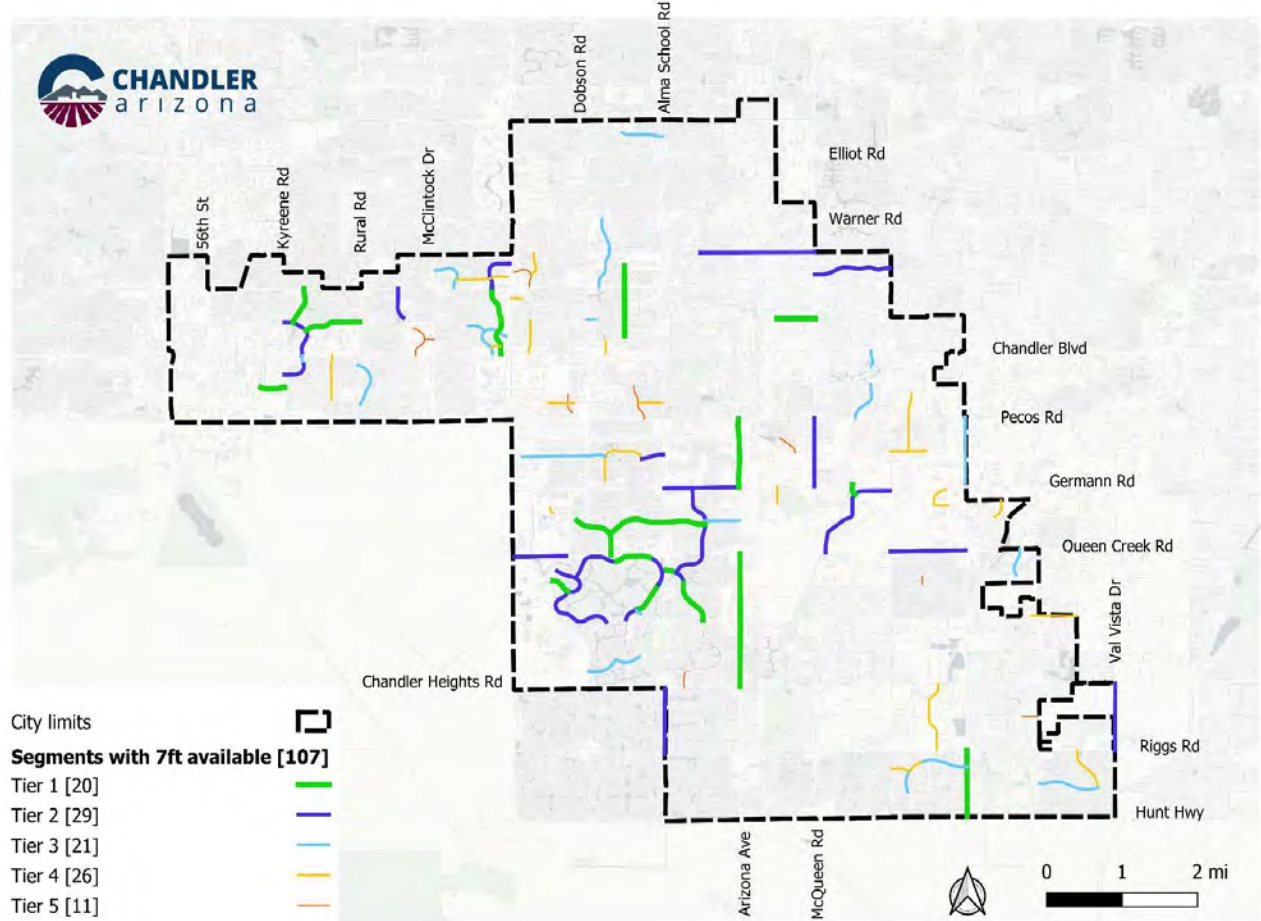
**Public Input:** While this study effort did a robust engagement effort, it was focused at a Citywide scale. When moving forward with a PBL at a specific location, additional community feedback should be taken into account.

**Table 6: Tier 1 Results**

Street On	Street From	Street To	Total Score
<b>Earl Blvd</b>	<b>Ryan Rd</b>	<b>Queen Creek Rd</b>	<b>9</b>
<b>Jacaranda Pwy</b>	<b>Oleander Dr</b>	<b>Rosemary Dr</b>	<b>9</b>
Arizona Av	Germann Rd	Pecos Rd	8
<b>Sandpiper r</b>	<b>Aster Dr</b>	<b>Ocotillo Rd</b>	<b>8</b>
Arizona Av	Chandler Heights Rd	Ocotillo Rd	7
Arizona Av	Ocotillo Rd	Queen Creek Rd	7
Gilbert Rd	Hunt Hwy	Riggs Rd	7
<b>N Arrowheadr</b>	<b>Jasper Dr</b>	<b>Andersen Blvd</b>	<b>7</b>
Federal S	Ray Rd	Chandler Blvd	7
<b>Frye Rd</b>	<b>Kyrene Rd</b>	<b>Roosevelt Ave</b>	<b>7</b>
<b>W Galveston t</b>	<b>Rural Rd</b>	<b>North Gila Spring Blvd</b>	<b>7</b>
<b>E Galveston t</b>	<b>Hamilton St</b>	<b>McQueen Rd</b>	<b>7</b>
<b>W Ryan R</b>	<b>Earl Blvd</b>	<b>Alma School Rd</b>	<b>7</b>
<b>W Ryan R</b>	<b>Alma School Rd</b>	<b>Hartford St</b>	<b>7</b>
<b>Day St</b>	<b>Ray Rd</b>	<b>Gila Springs Blvd</b>	<b>7</b>
<b>Earl Blvd</b>	<b>Dobson Rd</b>	<b>Ryan Rd</b>	<b>7</b>
<b>Market P</b>	<b>Dobson Rd</b>	<b>Jacaranda Pkwy</b>	<b>7</b>
<b>Jacaranda Pwy</b>	<b>Island Dr</b>	<b>Desert Gulf Dr</b>	<b>7</b>
<b>Sandpiper r</b>	<b>Alma School Rd</b>	<b>Bush Way</b>	<b>7</b>
<b>Airport Blv</b>	<b>Germann Rd</b>	<b>Aviation Dr</b>	<b>7</b>

Note: Highlighted results are Collector Streets with 8 feet available for PBL and buffer. These segments will be prioritized over non-highlighted segments, regardless of scoring. Additionally, more detailed analysis and design work will need to be done before any of these segments are considered appropriate for implementation.

**Figure 6: Final Prioritization Tier Results**



## NEXT STEPS

As previously stated, this study identifies locations where space exists to accommodate PBLs. The City should continue to conduct additional studies to better understand bicycling infrastructure opportunities, including PBLs and overall roadway safety.

**Roadway Safety Plan** - The City could leverage grant funding to enable the City to develop a comprehensive safety analysis and plan for its roadways.

**Bicycle Master Plan:** Developing a Bicycle Master Plan will help the City to better understand overall network connectivity and to develop a more comprehensive plan for installing PBLs and other bicycle improvements.