



City of Coppell, Texas

Bicycle and Pedestrian Master Plan

October 2015



Acknowledgements

The City of Coppel appreciates the efforts of the hundreds of citizens and community members who participated in the development of the Coppel Bicycle and Pedestrian Master Plan. Their creativity, passion, and commitment to a brighter future for bicycling and walking were integral to the success of this planning effort. The following citizens, City staff, and agency and organization representatives significantly contributed to the development of the Plan.

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Coppell Bicycle and Pedestrian Master Plan

Executive Summary

The Coppell Bicycle and Pedestrian Master Plan provides a framework for future investments and studies in bicycle and pedestrian infrastructure and programs, with a focus on improving connectivity to local destinations, tying into the regional trail network, improving safety and accessibility for all bicyclists and pedestrians, supporting economic development, and improving quality of life for Coppell residents.

Through a series of recommended physical improvements and supporting policies, programs, and activities, the Plan sets forth a comprehensive strategy that can strengthen and expand the trail and on-street bikeway network and encourage trail usage, walking and bicycling for transportation and recreation.



Plan Vision

The City of Coppell will be a community in which people of all ages and abilities can safely, comfortably, and conveniently travel by bicycle or on foot.

Plan Goals

To help achieve this vision, the Bicycle and Pedestrian Master Plan defines a number of goals and objectives to target specific community needs. These goals are broad, value-based expressions of the community's desires.



Goal 1: Improve and prioritize bicycle and pedestrian accommodations within the City of Coppell

Goal 2: Adopt local government policies, processes and standards that encourage and enhance walking, bicycling and other trail related activities in Coppell

Goal 3: Monitor the implementation of the Coppell Bicycle and Pedestrian Master Plan

Goal 4: Implement comprehensive education and encouragement programs targeted at all populations

Goal 5: Increase enforcement on City streets, trails and bikeways

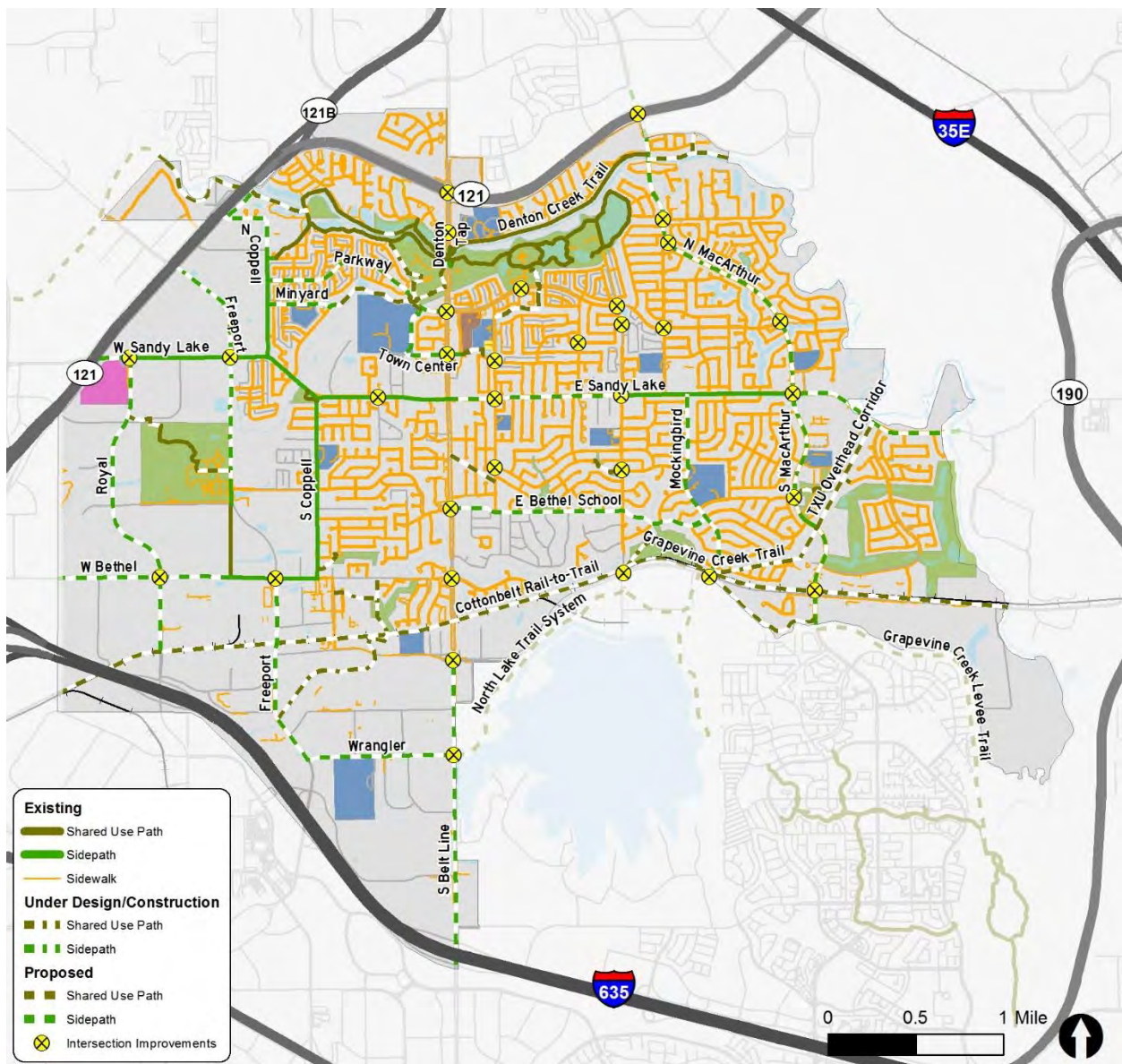
Goal 6: Promote healthy lifestyles and safe trail and bikeway facilities

Plan Recommendations

The Bicycle and Pedestrian Plan includes a comprehensive set of infrastructure and programming recommendations specifically tailored to make Coppel a premier community for walking and bicycling in the Dallas-Fort Worth Metroplex. These recommendations are built on a solid foundation of input from the public, City staff, and technical analysis.

Trails and Sidepaths

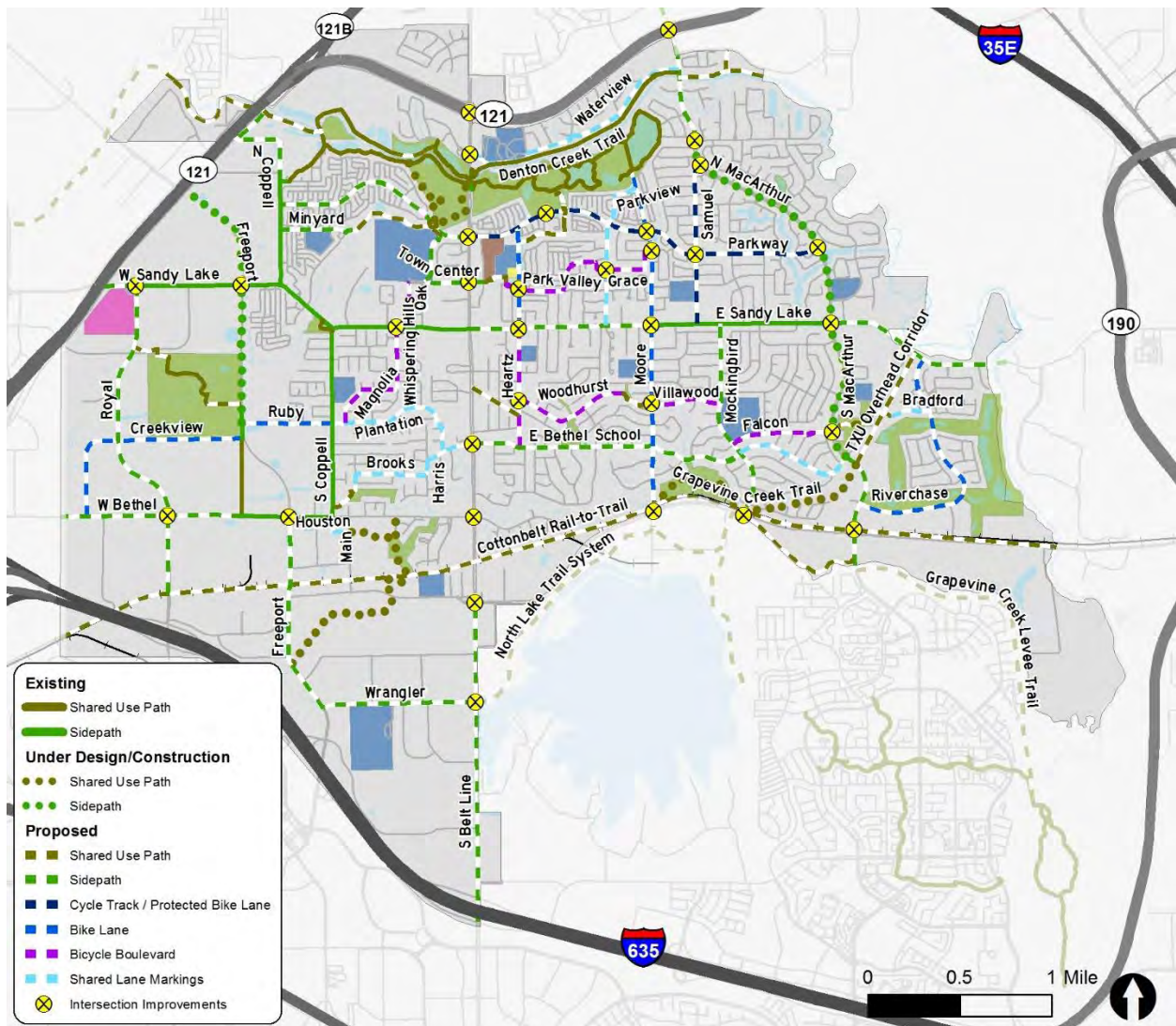
The Plan recommends nearly 35 miles of trails and paths for walking and bicycling, which will enhance safety, connectivity and accessibility for people of all ages and abilities. Whether going to the store, heading to school, commuting to school, getting some exercise, or just enjoying the outdoors, these shared use paths provide a safe and comfortable experience for everyone, including bicyclists, walkers, wheelchair users, joggers, and inline skaters. Once complete, these trails and sidepaths will be an important part of the DART transportation and recreation network in Coppel.



Map of Off Street Facilities – Existing and Proposed Trails and Sidepaths

On-Street Bikeways

The Plan also includes recommendations for 17 miles of on-street bikeways to connect residents and visitors to the trail system, local parks, and other popular destinations. These on-street bikeways range from shared lanes with marking and signage to protected bike lanes. Each bikeway recommendation takes into account roadway conditions like motor vehicle speeds, roadway width, presence of parking, and other important factors. These important considerations ensure that each bikeway supports a balanced, safe, and efficient transportation network for all road users.



Map of On Street Facilities – Existing and Proposed

Bikeway Types



Shared Lane Markings



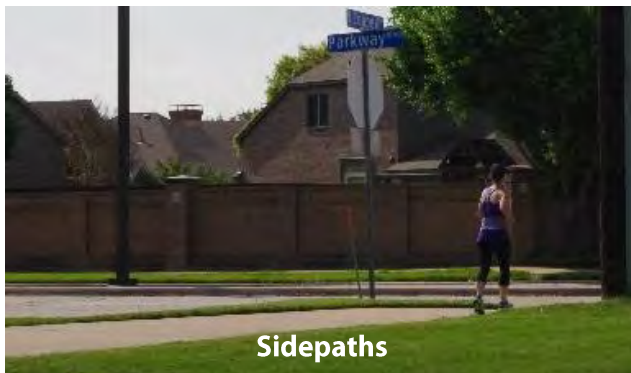
Bicycle Boulevards



Bike Lanes



Cycle Tracks / Protected Bike Lanes



Sidepaths



Shared Use Paths / Trails

Supporting Programs

Education, encouragement, and enforcement programs support walking and bicycling activity and can be cost effective complements to infrastructure investments. When combined with physical improvements like sidewalks, greenways, and on-street bikeways, these types of programs foster a social environment that values and supports active transportation. The Plan recommends a variety of supporting programs designed to increase active transportation and encourage walkers, bicyclists, and even motor vehicle drivers to be safe, responsible, and respectful when traveling in Coppell. These recommended programs include bicycle skills courses for children and adults, bicycling and walking route maps, organized bike rides, National Bike Month and National Bike to Work Day activities and events, and targeted traffic enforcement in school zones and busy areas.





Table of Contents

Chapter 1. Introduction	1
Purpose.....	1
Background.....	2
The Planning Process	3
Plan Components	4
Chapter 2. Existing Conditions	5
Introduction	5
Existing Conditions	5
Bicycle and Pedestrian Crashes	13
Community Initiatives and Programs	14
Guidance and Regulations	16
Opportunities and Constraints.....	20
Chapter 3. Public Engagement.....	21
Introduction	21
Steering Committee.....	21
Public Workshop	21
Online Survey.....	23
Eco Coppel Earthfest	35
Conclusion.....	36
Chapter 4. Vision, Goals & Objectives	39
Introduction	39
Vision Statement	39
Goals and Objectives	39
Chapter 5. Recommendations.....	43
Introduction	43
The Bicycle Network.....	44
The Pedestrian Network.....	52
Community-Wide Programs	57
Internal Practices and Policies	62
Chapter 6. Implementation	65



Introduction	65
Early Action Steps	65
Funding Sources	67
Performance Measures	70
Appendix A: Design Guidelines	73

List of Maps

Map 1: Existing Trail Facilities in Coppell	12
Map 2: Bicycle and Pedestrian Crash Locations, 2009 – 2013.....	14
Map 3: Proposed Bicycle Network.....	47
Map 4: Recommended Pedestrian Network.....	54

List of Tables

Table 1: Existing Shared Use Path Inventory	11
Table 2: Top 10 Corridors for Pedestrian Improvements.....	28
Table 3: Top 10 Intersections for Pedestrian Improvements	29
Table 4: Top 10 Corridors for Bicycle Improvements	32
Table 5: Top 10 Intersections for Bicycle Improvements	33
Table 6: Recommended Bikeways by Facility Type.....	48
Table 7: Recommended Signed/Marked Shared Roadway Projects	48
Table 8: Recommended Bicycle Boulevard Projects	49
Table 9: Recommended Bike Lane Projects	49
Table 10: Recommended Protected Bike Lane / Cycle Track Projects	49
Table 11: Recommended Sidepath Projects.....	50
Table 12: Recommended Shared Use Path Projects	51
Table 13: Recommended Intersection Improvements	55
Table 14: Design Guidelines and Reference Manuals	63
Table 15: Performance Measurement Data and Sources	70

Chapter 1. Introduction

Purpose

Bicycling, walking and trail use are on the rise in Coppel. Residents and community members have expressed a growing interest in trail expansion. The City currently boasts a strong, interconnected sidewalk network, more than a dozen miles of sidepaths and bike lanes, and nearly ten miles of multi-use trails. Coppel's existing trails are heavily used for recreation, fitness and exercise, but their lack of connectivity afford little value for transportation-oriented trips. As the City continues to grow, it is important that future capital investments and development projects incorporate trails, on-street bikeways, and pedestrian paths as vital to the community.

The purpose of the Coppel Bicycle and Pedestrian Master Plan is to provide a framework for future investments and studies in bicycle and pedestrian infrastructure and programs, with a focus on improving connectivity to local destinations, tying into the regional trail network, improving safety and accessibility for all bicyclists and pedestrians, supporting economic development, and improving quality of life for Coppel residents.

Through a series of recommended physical improvements and supporting policies, programs, and activities, the Plan sets forth a comprehensive strategy that can strengthen and expand the trail and on-street bikeway network and encourage trail usage, walking and bicycling for transportation and recreation.



Figure 1: Healthy and active living are essential to the character and quality of life in Coppel.

Background

The Coppell Bicycle and Pedestrian Master Plan (The Plan) is an outward expression of the community's desire and commitment to supporting bicycling and walking as safe, healthy, and convenient forms of transportation and recreation in Coppell. The Plan builds on local planning efforts, including the Coppell 2030 Comprehensive Master Plan and Trails Master Plan, both of which laid the foundation for trail development and active transportation in Coppell. The Plan expands on the shared use path network established in these plans and recommends the study and feasibility of a complete network for off-street paths supported by on-street bikeways to connect residents and visitors to the people and places that make Coppell a strong, unique and attractive community.

Local initiatives like Safe Cycling Coppell and Living Well in Coppell have been instrumental in building the need for a long-range strategy to address bicycling and walking. These citizen-driven initiatives stress the importance of a safe and comfortable infrastructure for walking and bicycling as integral the community's economic vitality, quality of life, and long-term health.

Regional initiatives like BikeDFW and the North Central Texas Council of Governments' Veloweb network of interconnected trails and bikeways have also helped to expand interest in, and support for, bicycling and bicycle facilities. The popularity and success of the Champion Trail, just a short distance from Coppell, is a testament to the growing desire for trails and bikeways as community assets. By developing this long-range planning document, the City can integrate local efforts into the region-wide Veloweb and create seamless connections to surrounding municipalities.

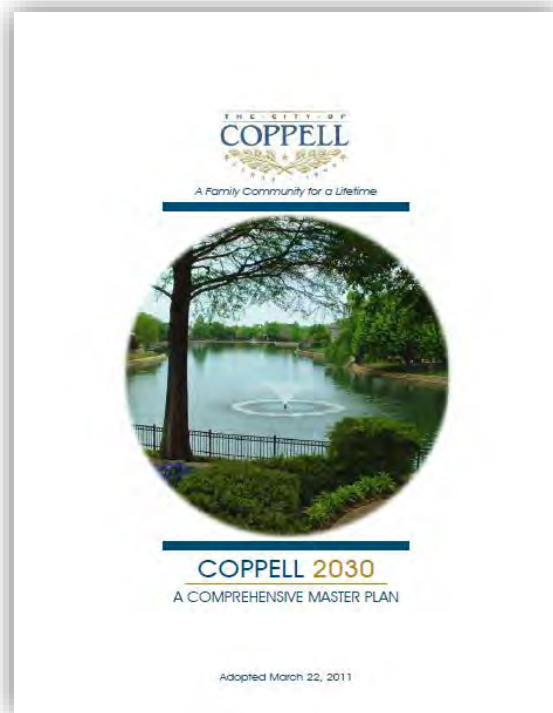


Figure 2: Coppell 2030 is the blueprint for the City's long-term growth and development.



Figure 3: Local support for bicycling and walking continue to rise in Coppell.

The Planning Process

The development of the Plan relied on an interactive, engaging, and thorough planning process in order to identify opportunities and recommend projects, programs and policies that reflect the values, needs and aspirations of the community. Extensive field work, research, and data analysis documented and scrutinized the context for plan development in order to identify opportunities and constraints that will impact bicycle and pedestrian facility development. An online survey, a public open house, and other engagement activities offered residents an opportunity to shape the Plan's vision, goals and recommendations. A steering committee consisting of Coppel staff and important community stakeholders guided the planning process from start to finish, ensuring both the process and resulting products addressed critical issues and reflected the will and desire of the community. Figure 5 displays the various inputs that influenced the development of the plan.



Figure 4: High attendance at the open house reflected the communities interest in bicycling and walking.



Figure 5: Key inputs for plan development.

Plan Components

The Plan document is composed of the following chapters, as well as an appendix that includes valuable resources for plan implementation and additional documentation of the planning process.

Introduction

The introduction provides a brief overview of the purpose and background of the Plan, the benefits of a Bike and Walk Friendly Community, and the planning framework that guide the recommendations and implementation strategies in the Plan.

Existing Conditions

The existing conditions chapter describes the physical, social, and policy contexts surrounding the development of this Plan. Included in this chapter are thorough analyses of bicycling and walking facilities, roadway characteristics, bicycle and pedestrian crash data, local and regional plans and policies, and current programs that support and encourage active transportation. Understanding, acknowledging and addressing these existing conditions creates a foundation for the programs, policies, and projects recommended in this Plan.

Public Involvement

The public involvement chapter summarizes the outreach and participation efforts to engage Coppel residents, planning partners, and key stakeholders. From public workshops and pop-up meetings to online surveys and mapping tools, the planning process utilized a diversity of media platforms to build consensus for walking and bicycling and solicit ideas to shape the walking and bicycling environment. The community's input is a driving force behind the Plan's vision, goals and recommendations.

Vision, Goals & Objectives

This chapter establishes a bold and progressive vision for the future of bicycling and walking in Coppel. A series of diverse and holistic goals and objectives are designed to achieve this vision.

Recommendations

This chapter describes the capital projects and supporting programs recommended to transform Coppel into a Bike and Walk Friendly Community. Recommendations are categorized using the Five E's framework of a Bike and Walk Friendly Community – engineering, education, encouragement, enforcement, and evaluation. Together, these Five E's create a holistic approach to fostering a social and physical environment that support and encourage walking and bicycling as safe, comfortable, and convenient transportation modes.

Implementation

This chapter provides a comprehensive strategy to implement the Plan, including early action steps, project prioritization criteria, cut sheets for high priority projects, cost estimates, funding sources, and maintenance activities. These implementation strategies are critical to the initial and long-term success of the Plan.

Appendix

The appendix of the plan includes supplemental materials and documentation to enhance and assist the City with plan implementation.

Chapter 2. Existing Conditions

Introduction

As the City of Coppel continues on its path to make bicycling and walking valued recreation activities and viable modes of transportation, a thorough assessment of the current environment for non-motorized transportation and recreation can guide future investments in bicycle and pedestrian infrastructure and supporting programs. This chapter describes existing conditions for walking and bicycling in Coppel, including land use and development patterns, the transportation network, and bicycle and pedestrian facilities, as well as community input related to current activity and desired improvements. The opportunities and constraints identified at the end of this chapter are grounded in an inventory of these existing conditions and can provide a foundation for the development of a city-wide network of bicycle and pedestrian facilities.

Existing Conditions

Study Area

The City of Coppel is a community of approximately 39,880 citizens located in northwest Dallas County, featuring a diversity of residential neighborhoods, a network of beautiful parks and open spaces, unique cultural and civic assets, thriving retail and commercial corridors and nodes, and a growing light industrial base. The City's attractive amenities and location within the Dallas-Fort Worth Metropolitan Area make it a desirable community to live, work, learn and play in. Coppel is surrounded by residential communities, including Irving to the south, Lewisville to the north, Grapevine and Farmers Branch to the west, and Carrollton to the east.

Land Use and Development

Development patterns in the City of Coppel have a significant impact on walking and bicycling activity. The subdivision and platting of residential neighborhoods, commercial and retail centers, and larger employment centers can affect walking and bicycling distances, route choice and directness, and connectivity between residential neighborhoods and important community destinations such as parks, schools, and retail centers.

The distinct separation of land uses evident in Coppel is common among suburban communities in the United States, many of which employ single-use zoning practices that date back to the 1920s. While the grouping of land uses into different areas of the city was originally intended to promote the health and general welfare of city residents, it has increased travel distances and contributed to the reliance on personal motor vehicles to access employment, shopping, and other key destinations.

Residential

Residential neighborhoods and subdivisions dominate the landscape and character of Coppel, comprising almost 50% of all land uses (by current zoning designation). The winding residential streets and low degree of connectivity between adjacent neighborhoods are common characteristics of residential development patterns of the latter half of the 20th Century. While these characteristics add to the ambiance of the neighborhoods and reduce cut-through traffic, they also increase walking and bicycling distances, making it more difficult to access nearby destinations.

While bicycle and pedestrian connectivity may be challenging, there are many positive attributes to Coppell's residential neighborhoods. The majority of neighborhoods possess sidewalks, tree lawns, and mature trees, creating a comfortable and inviting environment for walking and bicycling. Newer developments like Old Town Coppell are incorporating wider sidewalks, narrow residential lots, shorter block lengths, a mixture of land uses, and other New Urbanist principles that support a walkable and bikeable environment.

Commercial

Commercial and retail activities are located throughout the City of Coppell, with the great majority concentrated along Denton Tap Road between Highland Road just north of State Highway 121 and Belt Line Road. Additional commercial nodes can be found at MacArthur Boulevard and Belt Line Road, MacArthur Boulevard and Sandy Lake Road, and MacArthur Boulevard and State Highway 121. Many of these commercial destinations are difficult to access for bicyclists and pedestrians due to high volumes of motor vehicle traffic, particularly along Denton Tap Road.

Light Industrial

Light industrial, manufacturing and warehousing, and other corporate offices are concentrated in the west and southwest of Coppell. This area of Coppell is well situated between State Highway 121 and Interstate 635 and in close proximity to Dallas-Fort Worth International Airport (DFW), making it an ideal location for distribution centers. When coupled with Coppell's favorable climate for business and proactive approach to economic development, numerous national and international companies, including Amazon, the Container Store, Mohawk Industries, Panasonic Avionics Corporation, and Samsung have chosen to locate their headquarters, logistics and distribution centers, and operations in Coppell.

Recreation, Parks and Open Space

Coppell's park system provides residents and visitors of all ages with a diverse array of active and passive recreational opportunities, including walking and bicycling trails, ball fields, lakes, a biodiversity education center, an aquatic center, a senior and community center, a dog park and even a tennis center. While the City's 17 parks are dispersed throughout the City, major parks like Andrew Brown Park, Wagon Wheel Park, and Grapevine Springs Park and Preserve draw the most significant number of visitors and are major destinations in the community. Creating connections between residential



Figure 6: New Urbanist design of Old Town Coppell creates a pedestrian-friendly environment for residents and visitors.



Figure 7: Retail and professional services developments like Eleanor Square line Denton Tap Road.

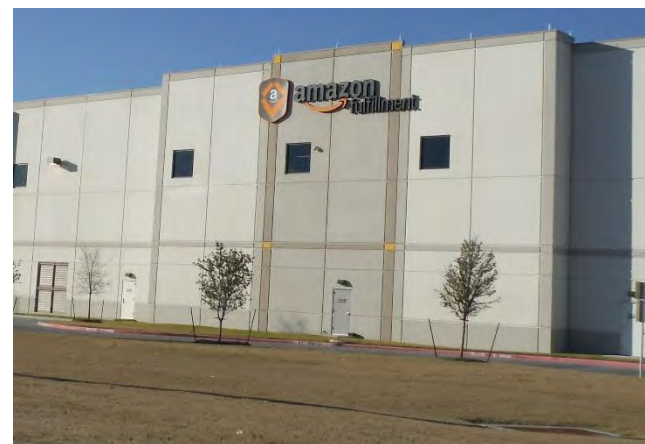


Figure 8: Amazon and other major corporations are drawn to Coppell's business-friendly environment and ideal location within the region.

neighborhoods and these important community destinations will extend bicycle and pedestrian mobility and expand recreational facilities to include sidewalks, trails and on-street bikeways as extensions to the park system.

Transportation Network

Because of its regional context within the fourth largest metropolitan area in the United States, the City of Coppell must balance regional mobility with local connectivity, accessibility and convenience. Larger roadways like interstates, toll ways and state highways provide the greatest mobility and the least degree of accessibility. At the other end of the spectrum, local streets provide minimal mobility, but the greatest level of access to adjacent properties. The functional classification concept of mobility versus access is displayed in the figure to the right.

These same roadways that serve motor vehicles are also integral to pedestrian and bicycle mobility, access, and connectivity.

While off-street trails are an important component of a bicycle and pedestrian network, facilities along roadways, including sidewalks, sidepaths, on-street bicycle lanes, and cycle tracks, would provide greater and more direct mobility throughout the community while also providing greater access to community destinations.

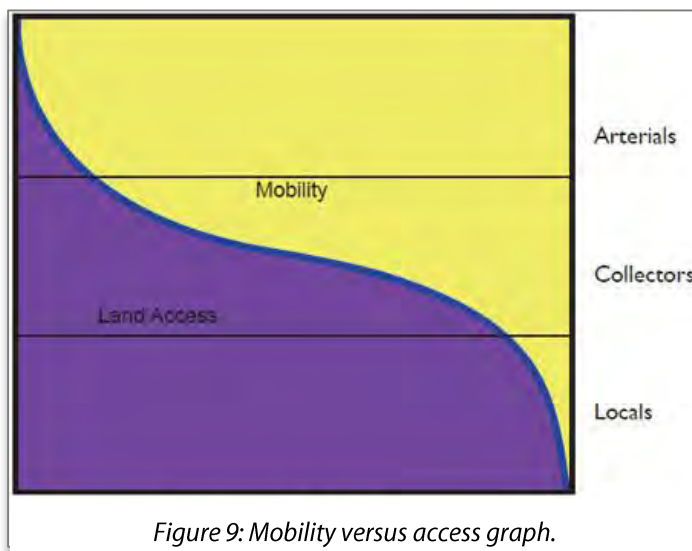


Figure 9: Mobility versus access graph.

Roadways

The largest roadways in and around Coppell are limited access principal arterials. The City is surrounded on all sides by major highways: State Highway 121 and the Sam Rayburn Tollway to the north and west, Interstate 35E to the east, and Interstate 635 to the south. While these major highways provide easy access from Coppell to destinations throughout the region, they also serve as barriers to regional bicycle and pedestrian travel.

Principal arterial roadways in Coppell provide a high level of mobility. S Belt Line and E Belt Line both facilitate the through movement of motor vehicle traffic while minimizing access to adjacent properties. Denton Tap Road, while also classified as a principal arterial roadway, provides direct access for many adjacent commercial properties and adjacent roadways. As such, through traffic flow suffers, particularly during peak travel hours (rush hours), causing significant delay.

Minor arterial roadways also focus on mobility over accessibility. Minor arterials in Coppell include Sandy Lake Road, MacArthur Blvd, Royal Lane, and Freeport Parkway.

Collector roadways, which provide greater access than arterials but still less than local roadways, can be ideal corridors for bicycling and walking. These roadways often carry less motor vehicles than arterials roadways while still providing a high level of connectivity to destinations throughout the community. Collector



Figure 10: High volumes during peak a.m. and p.m. hours cause motorist delay and create uncomfortable and intimidating conditions for bicyclists and pedestrians.

roadways in Coppell include S Coppell Road, Bethel Road (east of Freeport), Hartz Road, Bethel School Road, Parkway Blvd, and Mockingbird Lane.

The City of Coppell has also identified other important roads that, while not established as functionally classified roadways (arterials or collectors), are integral to the transportation network. These roads, which have been identified in the City of Coppell Major Thoroughfare Plan, include Moore Road, Riverchase Drive, Creekview Drive, Ruby Road, Plantation Road, Samuel Boulevard, Gateway Boulevard, Airline Drive, and Wrangler Drive.

Most arterial and collector roadways in Coppell offer minimal comfort for bicycle and pedestrian travel, which is problematic for encouraging active transportation. By incorporating sidewalks, bicycle lanes, and other facilities for bicycle and pedestrian travel, these roadways can be modified to increase safety, comfort and user experience for all road users. As motor vehicle volumes and speeds increase, greater separation between motor vehicles and non-motorized users is necessary in order to support a variety of bicyclist and pedestrian types.

Local roads throughout the City provide access from arterials and collectors to individual lots and parcels. These local roads are often shorter and narrower than arterial and collector roadways, with parking permitted on one or both sides of the road, lower posted speed limits, lower volumes of traffic. Given these characteristics, local roads often provide the most comfortable and enjoyable walking and bicycling experience without significant modifications or improvements.

Existing Pedestrian Facilities

Sidewalks, marked crosswalks, and other pedestrian facilities are an integral component of the non-motorized transportation network in Coppell. These facilities support safe and comfortable travel for walkers, joggers, families pushing strollers, and persons with wheelchairs or other mobility assistive devices.

Sidewalk Design

Sidewalks line most roadways in the City of Coppell and range in width from 4 feet to 8 feet and are buffered from motor vehicle traffic by a planter strip. These planter strips are often wider along busier roadways, which helps to provide additional separation from motor vehicles and a perception of safety and comfort for pedestrians. Notable exceptions of sidewalks immediately adjacent to the roadway include segments of MacArthur Blvd, Sandy Lake Road, West Parkway Blvd, Moore Road, Denton Tap Road, and Deforest Road.

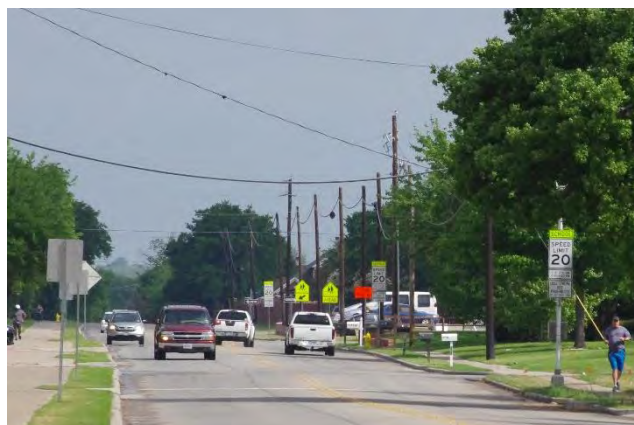


Figure 11: Collector roads like Coppel Road balance mobility and accessibility.



Figure 12: Sidewalks on Moore road make it possible for families and children to access destinations like Austin Elementary and the Coppell Center for the Arts.



Figure 13: Narrow segments of sidewalks immediately adjacent to motor vehicle traffic create uncomfortable and undesirable situations for pedestrians.

Sidewalk Connectivity

Requirements in the City's zoning code and subdivision regulations have helped to create a well-connected network of sidewalks throughout Coppell. The vast majority of residential neighborhoods, collectors, and arterial roadways have sidewalks on both sides of the road. While there are some minor sidewalk gaps located on important corridors like Town Center, Parkway, and Bethel Road, most gaps in the sidewalk network occur in the light industrial areas along the south and west periphery of the City. These gaps do not greatly affect connectivity between neighborhoods and most common pedestrian trip generators like parks, schools, and retail. They do, however, limit pedestrian connectivity to and from many of the larger employment centers in the light industrial areas in the west and southwest of Coppell.

Crosswalks and Intersections

Crosswalk markings provide guidance for pedestrians who are crossing roadways by defining paths across intersections or other crossing points. While marked pedestrian crosswalks do not in and of themselves slow traffic or reduce pedestrian crashes, there are several reasons to install marked crosswalks, including:

- To indicate a preferred pedestrian crossing location
- To alert drivers to an often-used pedestrian crossing
- To indicate school walking routes

A Federal Highway Administration (FHWA) study "Safety Effects of Marked versus Unmarked Crosswalks at Uncontrolled Location: Final Report and Recommended Guidelines" noted that in some locations, crosswalks should be installed with other pedestrian facility enhancements to decrease possible pedestrian crash risks.

The City of Coppell commonly uses stamped and dyed concrete that is patterned to look like red bricks in order to identify pedestrian crossing locations. In school zones and other intersections with higher volumes of pedestrian traffic, the City often supplements or replaces these brick pattern crosswalks with "transverse" striping (two parallel lines, one on each side of the crosswalk) and other high visibility pavement markings to increase pedestrian awareness.

The majority of signalized intersections in Coppell include push button activated pedestrian signal heads, which alert pedestrians of the appropriate signal phase during which to cross the street. More than half of all signalized intersections include pedestrian signal heads at each crossing leg. While nearly all signalized intersections are equipped with these pedestrian enhancements, pedestrian crossing distances can be very long.

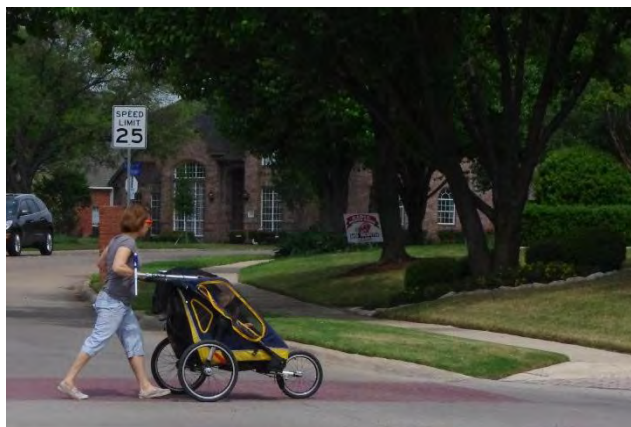


Figure 14: Crosswalks are an integral component of the pedestrian transportation network.



Figure 15: Parkway Blvd and Denton Tap Rd, the City's busiest intersection for pedestrians, includes designated crosswalks across each leg of the intersection.

Existing On-Street Bikeways

On-street bikeways are important components of a bicycle network. There are currently no on-street bicycle facilities in the City of Coppell. However, the lack of on-street bikeways does not signify a lack of bicycle activity on roadways in Coppell. Considerable bicycle activity has been documented on multiple field visits, particularly for school-related and recreational trips. Utilizing GPS data from the popular activity-tracking service Strava, the map below identifies frequently-used roads and trails for bicycling. The brightest lines on the map are the most heavily used, while the darker lines are less frequently used.



Figure 17: Many people bicycle on Coppell streets without dedicated bicycle facilities.

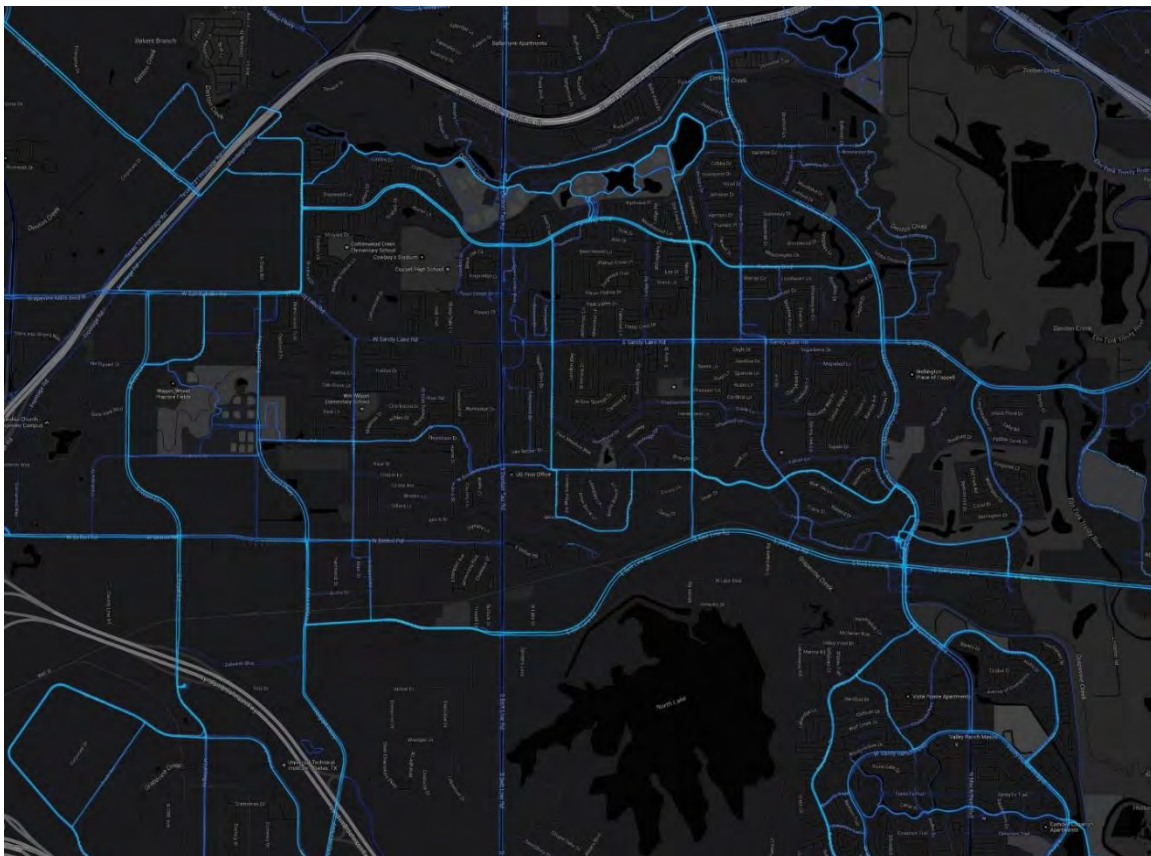


Figure 16: Strava Bicycle Activity Heat Map

While the information that can be gleaned from these Strava maps is useful for identifying commonly used routes and developing recommendations for bicycle facilities and improvements, there are some limitations that must be acknowledged. First, and perhaps most important, the majority of Strava users are experienced recreational road cyclists, generally comfortable on most roadways. Other bicyclist types like casual adult bicyclists and children bicycle riders are not adequately accounted for in these observations. As a result, many of the roadways commonly used by experienced bicyclists and identified on the map above may not be suitable for travel by these other bicyclist types. With these limitations in mind, the Strava data still highlights opportunities for local and regional routes and connections to important community destinations. Many of the bicycle rides on this map originate from Bicycles Plus at E Belt Line Rd and S MacArthur Blvd, as well as

Andrew Brown Park Central parking lot. Commonly used roadways include Parkway Blvd, Heartz Rd, Moore Rd, N Coppel Rd, Freeport Parkway, Southwestern Blvd, and E Bethel School Rd.

Existing Shared Use Paths

Shared use paths allow for two-way, off-street travel by bicyclists, pedestrians, skaters, wheelchair users, runners, persons with limited mobility, and other non-motorized users. The term “shared use path” and “trail” are often used interchangeably; however, the term “trail” can be more encompassing than “shared use path” and include natural surface trails and even sidewalks. Shared use paths are wider, paved trails frequently found in parks, along rivers, and in greenbelts or utility corridors where there are few conflicts with motorized vehicles. They can also be located adjacent to the roadway, providing children and casual bicycle riders with a more comfortable experience. When located within a roadway right-of-way, these shared use paths, or “sidepaths”, must be designed to enhance safety and minimize conflict with motor vehicles, particularly at unsignalized intersections and other motor vehicle crossings.



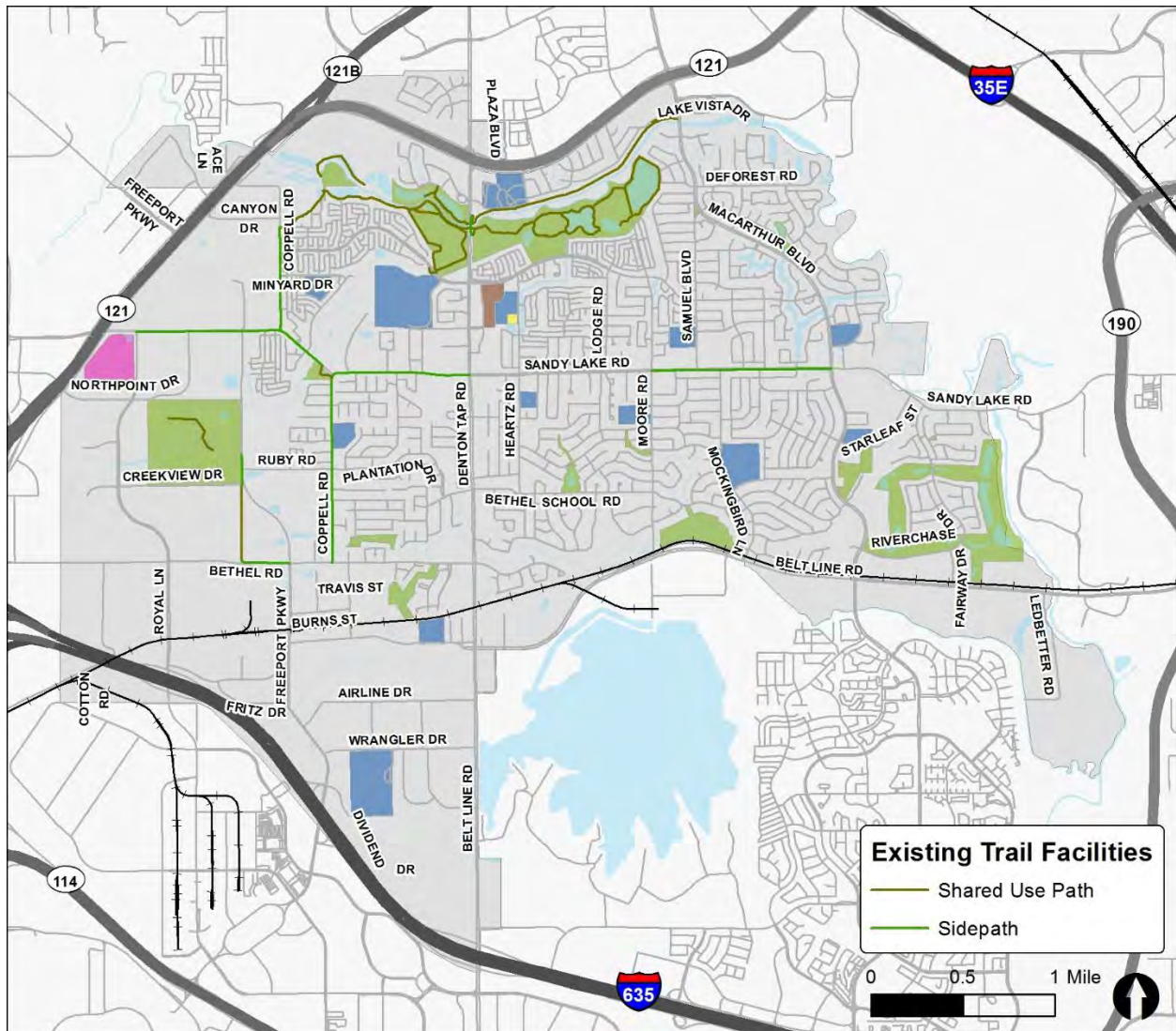
Figure 18: Andrew Brown Park Trail is the Coppel's longest and most popular shared use path.

The 12.5 miles of shared use paths in the City of Coppel are located within municipal parks and along major roadways. The majority of shared use paths in the City of Coppel are linear in nature (rather than loop trails) and offer both transportation and recreation benefits. The following table provides an inventory of all existing shared use paths in the City.

Table 1: Existing Shared Use Path Inventory

Shared Use Path/Roadway Name	Type	Miles
Andrew Brown/Magnolia Park Trail System	Internal	4.43
Duck Pond Park Trail	Internal	0.14
Hunterwood Park Trail System	Internal	0.63
Wagon Wheel Park	Internal	0.34
Thweatt Park Trail	Linear	0.11
Denton Creek Trail	Linear	1.79
Creekview – Bethel Connector	Linear	0.42
Denton Creek Park – Westminster Way Connector	Linear	0.28
Denton Creek Park – Andrew Brown Park Connector	Linear	0.30
Freeport Parkway (Wagon Wheel Park to Creekview Drive)	Sidepath	0.13
North Coppel Road (Westminster Way to Sandy Lake Road)	Sidepath	0.50
South Coppel Road (West Sandy Lake Road to Cooper Lane)	Sidepath	0.63
W Sandy Lake Road (Royal Lane to Thweatt Park)	Sidepath	1.08
W Sandy Lake Road (Coppel Road to Denton Tap Road)	Sidepath	0.75
W Sandy Lake Road (MacArthur Blvd to Moore Road)	Sidepath	0.97
Total		12.5

These shared use paths serve as the foundation of Coppel's bicycle and pedestrian network. Although there is still a low degree of connectivity between many of these sidepaths and park trails, they are beginning to support bicycling and walking trips throughout the community, especially when coupled with the City's expansive network of sidewalks. These existing trails, along with previously planned trail alignments and trail segments currently under design and/or construction, are shown in the map below.

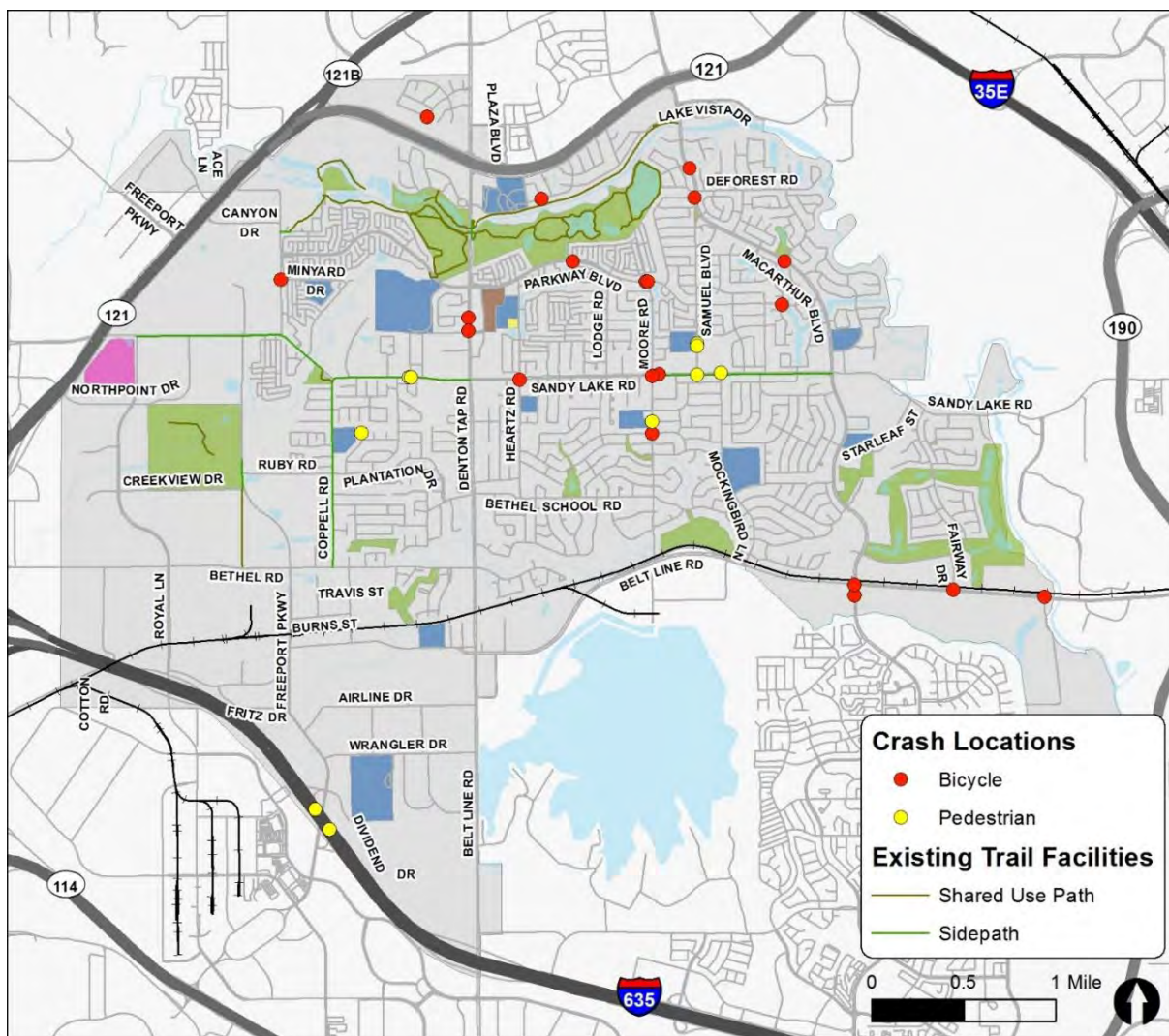


Map 1: Existing Trail Facilities in Coppel

Bicycle and Pedestrian Crashes

Crashes with motor vehicles represent a significant threat, both real and perceived, to the safety of bicyclists and pedestrians. National and local surveys show that safety concerns are the most common reason people do not bicycle more often. Many bicyclists feel that motorists do not see them or are openly hostile to them on roadways, particularly at intersections. An examination of the debilitating impacts of crashes on bicyclists and pedestrians emphasizes the vulnerability of these road users. For example in 2009, bicyclists and pedestrians constituted a combined total of just 2% of commuters nationwide, yet represented 13% of all traffic fatalities nationwide.

Local traffic collision data can be a valuable source of information for identifying trends in bicycle and pedestrian crashes, understanding specific crash characteristics, and developing countermeasures to create a safer environment for non-motorized roadway users. Utilizing data supplied by the Coppell Police Department and obtained from the North Central Texas Council of Governments website, the following map identifies all bicycle and pedestrian crash locations in Coppell during a five year period from 2009 to 2013. Because of the lack of information associated with these crash locations, little is known about the circumstances contributing to each crash. However, general trends such as type of roadway and location along the roadway (road segment v. intersection) can be formulated to develop plan recommendations.



Map 2: Bicycle and Pedestrian Crash Locations, 2009–2013

A total of 31 crashes involving bicyclists and pedestrians occurred in Coppell between 2009 and 2013. Ten of these crashes involved pedestrians, and 21 involved bicyclists. None of these crashes were fatal. The majority of these crashes occurred on arterial and collector roadways, including MacArthur, Sandy Lake, Denton Tap, Belt Line, Moore Rd, and Parkway Blvd. Many were located at roadway intersections rather than mid-block, an indication of the potential for conflict between motorists and other road users given the high number of turning movements. There are also a number of crashes in close proximity to significant community destinations, including New Tech High, Austin Elementary, Denton Creek Elementary, and businesses along Denton Tap Road. Two of the 10 pedestrian crashes occurred on I-635 near the Freeport Parkway exit.

When compared to national crash statistics, there are noticeable differences in the data that point to Coppell's unique character. For example, there were 48% more bicycle crashes than pedestrian crashes in Coppell. In comparison, there were 45% more *pedestrian crashes* than bicycle crashes in the United States in 2013.¹ This may be an indication that pedestrians in Coppell benefit from a robust network of sidewalks and crosswalks, or that the lack of bicycle infrastructure in the City leads to less predictable bicyclist behavior. Without additional information regarding number of bicycle and pedestrian trips and/or miles traveled, it can be difficult to draw definitive conclusions.

Community Initiatives and Programs

Creating a bicycle and pedestrian-friendly community takes more than sidewalks, trails and bike lanes. Programs, activities, and events that build a social culture that supports and embraces active transportation are integral components of a holistic approach to transform the way people move about the community. In the City of Coppell, numerous efforts are already underway to build community support for walking and bicycling and encourage more people to choose active transportation when traveling in Coppell.

Living Well in Coppell

Living Well in Coppell (LWiC) has emerged as one of the community's leading organizations working to create a more healthy and active environment in Coppell. The volunteer-based initiative works in concert with the City of Coppell to "enable and encourage active, healthy lifestyles within the community, and to help Coppell become known in the D/FW area as a "healthy" community." Physical wellness is one of the three focus areas for LWiC, along with nutritional wellness and personal/social wellness. At part of its kick-off event in October of 2014, LWiC hosted a "Bike with the Mayor" and a "Walk with the City Manager" on the trail system in Andrew Brown Park.



Figure 19: Residents pledge to be Living Well in Coppell at the October 2014 kick-off event.

¹ National Highway Traffic Safety Administration. "Traffic Safety Facts 2013: A Compilation of Motor Vehicle Crash Data from the Fatality Analysis Reporting System and the General Estimates System" DOT HS 812 139 (2015).

Safe Cycling Coppel

Formed in 2013 by Coppel residents, Safe Cycling Coppel advocates for safer roads and trails through infrastructure improvements like signage, pavement markings, and dedicated bicycle facilities. The group has encouraged the Coppel City Council and other entities in Coppel to build support for investments in bicycle infrastructure that provides residents and visitors of all ages and abilities with the opportunity to safely and comfortable access destinations throughout the community by bicycle.

Walk to School Events

The Coppel Independent School District (CISD) is an ardent proponent of active transportation and supports and encourages walking and bicycling to school. While many children walk and bike to school on a daily basis, the CISD organizes a number of events to encourage more families and children to choose walking and bicycling. In addition to the annual Walk to School Day event every October, seven schools also participate monthly “Walk to School Wednesdays”. Some schools and their parent-teacher organizations are more active than others and support walking and bicycling on a daily basis.

The CISD School Health Advisory Council (SHAC) also works throughout the school district to communicate to administrators, parents, and community stakeholders the important connection between health and learning. As a leader in healthy and active living within the school district, SHAC plays an important role in building healthy habits in Coppel youth and their families.



Figure 20: Students and families participate in Wilson Elementary's Walk to School Wednesday events.

School Zone Enforcement

The City of Coppel Police Department also plays an important role in creating a culture that supports walking and bicycling, particularly for school children. By actively enforcing strict school speed limits in the 15 designated school zones located throughout the City, the Police Department builds respect for pedestrians and fosters an environment in which children (and their parents) feel safe walking to and from school, especially when crossing or traveling along busier roadways like MacArthur, Parkway, and Moore.

Life Safety Park

The Life Safety Park will provide educational opportunities to school children, families, and the general public regarding overall life safety programs such as fire procedures, severe weather response, and pedestrian caution.

Group Bike Rides and Runs

Many residents and area cyclists take part in organized recreational rides that travel through Coppel and neighboring municipalities. Some of these rides begin at destinations within Coppel, including Andrew Brown Park and Bicycles Plus. Bicycles Plus hosts four rides every week that begin at the store and travel from 20 to 55 miles in and around Coppel. Run On! Coppel hosts weekly social runs every Wednesday. These runs offer people of all skill levels the opportunity to run two to five miles in a fun, social setting with assistance and advice from staff and coaches. These runs often take advantage of Coppel's great trail and sidewalk network. Andrew Brown Park, Wagon Wheel Park, and Coppel Nature Park are common destinations for these weekly runs.



Figure 21: Run On! Coppel's weekly social runs attract large and diverse crowds of residents and visitors.

Guidance and Regulations

There are several elements of governance within cities that affect transportation infrastructure, fostering or hindering the bicycling and walking environment. **Ordinances** as set forth in the city's municipal code are regulations governing new development and redevelopment. **Plans** often articulate a community's bold, multi-year vision, and lay out steps through goals, objectives and strategies. While they are not generally regulatory, they can effectively guide city leaders and staff toward the vision. **Policies** are a stronger statement of intent and while not regulatory in the legal sense, they can sustain a community vision through changes in political leadership and organizational changes. **Practices** might be the most important element of change, as they encompass what city staff actually work on every day. Without programs, staff and funding dedicated to a practice area like 'Active Transportation' or 'Bicycle/Pedestrian Coordination', plans and policies can be crippled or made ineffective. For example, within the Coppel Master Plan are many stated policies to improve the city's infrastructure for bicycling and walking and if these two modes are fully integrated into routine daily operations of the Public Works and Planning departments, key bicycling infrastructure in particular might actually get on the ground.

Master Plans

Coppel 2030: A Comprehensive Master Plan

The Coppel 2030 Plan was adopted by the City in 2011 and provides a long-range blueprint for future growth and development. Bicycling and walking enjoy a robust presence in the Coppel 2030 Plan and are key elements in the Plan's vision, policy plan, planning framework, healthy neighborhoods initiatives, and transportation and mobility sections. Bicycling and walking are also incorporated in various sections of the implementation plan as well.

Vision 2030

Vision 2030 provides the community's overall framework for growth and development, and ensures that Coppel's high standard of living is maintained as the City evolves. The vision evolved from numerous public meetings and engagement opportunities and reflects the needs, desires and aspirations of the community. The Vision 2030 is built around a singular yet broad vision statement:

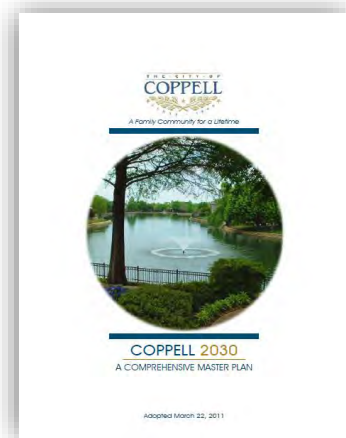


Figure 22: Coppel 2030 Plan

Coppell is A Family Community for a Lifetime

Coppell residents choose to make Coppell their hometown because of our **Small Town Feel**, our **Inviting Community Gathering Places**, our **Active, Healthy Lifestyle for All**, our **Top Quality Schools**, and our **Diverse Faith-Based Values**.

Coppell is our Special Place to Live because of our **Beautiful Green City**, our **Great Livable Neighborhoods**, our **Viable Community Commercial Centers**, our **Prosperous Business Center**, and our **Convenient Access and Effective Mobility**.

This vision statement is general yet succinct, encapsulating the values and aspirations of the community in just a few short sentences. While not explicitly stated in the vision statement itself, bicycling, walking, and an active transportation network supporting health and human-scale mobility are integral to many of the elements of the Vision 2030.

Policy Plan

The Policy Plan section of Coppell 2030 provides the city charter provisions and state statutes justifying the planning exercise, which could potentially strengthen the bicycling and walking policies and recommendations and make them more likely to be implemented.

The Coppell 2030 Plan is built on the following five “core pillars”:

- Sustainable Community
- Placemaking
- Mixed Use Activity Centers
- Land Use and Mobility
- Healthy Neighborhoods

Since “mobility” is the primary area bicycling and walking pertain to, each of the other pillars can be strengthened if Coppell fully optimizes all of its opportunities to improve the multimodal environment.

Implementation

Chapter 5 of Coppell 2030 provides detailed implementation strategies for the areas of Sustainability, Land Use, Parks and Open Space, Transportation and Mobility, Healthy Neighborhoods, and Redevelopment. The following sample of Coppell 2030 Transportation and Mobility actions related to the bicycling and walking environment demonstrate the community’s desire and will foster a culture and environment that will support active transportation:

- TM-1 Provide a balanced transportation system, less dependent on the private automobile, supported by both the use of emerging technology and the location of jobs, housing, commercial activity, parks and open space.
- TM-2 Improve mobility options and accessibility for the non-driving elderly, children, disabled, low-income and other members of the population.
- TM-3 Provide a safe and interconnected network of pedestrian and bicycle routes throughout the city, with connections to regional transit services, that provides linkages among employment sites, housing, and mixed-use centers.
- TM-4 Provide walking and biking corridors linking neighborhoods and other destinations in Coppell to the future DART station in the Belt Line corridor.
- TM-5 Provide short-term and/or long-term bicycle parking in commercial and mixed use districts, in employment centers and multifamily developments, at educational facilities, in parks and recreational areas, at special events, and at transit facilities.
- TM-7 Implement traffic calming measures to minimize the impact of regional trips through Coppell, while supporting the travel needs of the community.
- TM-9 Work with the Coppell Independent School District to increase walking and biking to school by improving routes from neighborhoods to schools.

Transportation Plan

As defined in the City of Coppel municipal code, the Transportation Plan is the official plan for the orderly physical development of highways, roads, and streets in the City of Coppel. The Transportation plan included in Coppel 2030 is an update of the prior plan approved in 1996, and designates roadways within a context-sensitive framework as follows:

- Freeway
- Boulevard
- Boulevard with on-street parking in mixed-use centers
- Avenue
- Avenue with on-street parking in mixed-use centers
- Local Street
- Alley/Rear Lane

The Transportation Plan further classifies roads within these designations by the functional classification of principal/minor arterial, Collector, and Local. Bicycle and pedestrian provisions in the design parameters are included for boulevards, avenues and local streets. None of these designations or functional classifications utilizes annual average daily traffic volumes (AADT) to assign descriptions or levels. While quite common, it is a key missing element when considering certain corridors for on-street bicycle facilities, as allotting roadway space for such facilities has to take motor vehicle capacity and flow into account. At the time the Transportation Plan was updated for Coppel 2030, best practices in developing bicycling networks were not a priority.

Much progress in bicycle network and facility design has occurred in the last 5 years, and many cities all across the U.S. have implemented effective, safe and relatively low-cost bicycle facilities through the method of “right-sizing” roadways, commonly known as road diets. While Coppel 2030 does not specifically mention this tried-and-true strategy, language in the plan provides for considering changes to roadways in the Thoroughfare plan, as follows:

The Comprehensive Plan will need to build consensus about any needed revisions to the street standards such as aesthetic enhancements, multi-modal accommodations, and the potential addition of on-street parking in future mixed-use and redevelopment districts such as Old Coppel.

The Coppel 2030 Plan transportation system balances the regional, community, and neighborhood functions to achieve the desired community form and character. These functions include roadways, trails, pedestrian systems, and transit. Since it will be necessary to transition the design and function of existing streets over time, the 2030 Transportation Plan outlines a framework for context sensitive street types which should be used as a guide to update the City’s existing street design manuals with integrated standards for Context Sensitive Solutions.

The form and character of each street type is recommended with the understanding that the final design may vary based on further study and determinations of the city, transportation planners and engineers, key stakeholders, and citizens-at-large.

Streetscape Plan

The City of Coppel is revisiting the Streetscape Plan to identify opportunities to incorporate additional design elements to support bicycle, pedestrian and motorist safety, both at intersections and along corridors as supported by the Manual for Uniform Traffic Control Devices and the engineering judgement of city staff.

Trails Master Plan

The trails master plan provides a framework for critical off-street linkages between community parks and other local destinations. The Plan includes projects of the Regional Veloweb that provide connectivity to surrounding communities and regional trails and is primarily focused on off-street multiuse recreational trails and sidepaths alongside roadways. The plan includes short-and long-term projects, many of which have been implemented. Section 2.6 above describes current trails, or shared-use paths.

Municipal Code

Codes and ordinances are a critical element in fostering bicycling and walking safety and connectivity, typically included in sections pertaining to traffic operations and laws, zoning, subdivision regulations, land use, and others. Some of the best cities for bicycling in the U.S. have given “teeth” to plans and visions by including a wide variety of bicycle and pedestrian design elements in the municipal code. Following are summaries of the code sections of City of Coppel regulations pertaining to bicycling and walking from Code 911 (all verbiage is comment, not code language):

Sec 8-6-2. Requires bicycle helmet for persons over the age of 14

Sec 8-8-2. Imposes penalties for drivers who block intersections. The owner of a motor vehicle is liable for a civil penalty if the vehicle proceeds into an intersection at a system location when the traffic control signal for that vehicle's direction of travel is emitting a steady red signal.

Sec 9-11-12. Allows bicycles on sidewalks, often a safety and connectivity necessity.

Sec 12-31-6. Off street parking requirements. One strategy for encouraging bicycling and walking is to require fewer car parking spaces in commercial zones than has traditionally been the norm in suburban environments. This allows total lot size to be smaller, resulting in a more human-scale, walkable urban form.

Sec 12-31-8. Location of Parking Spaces. This section of the code acknowledges opportunities for shared parking among adjacent businesses, particularly those with that have different hours of operation. Businesses are encouraged to share parking, or work with adjacent or nearby properties to “trade” parking, e.g., on busy weekend nights a restaurant or pub might utilize parking of a nearby municipal building, church, or business that operates during the day only.

Chapter 13 - Subdivision Regulations include roadway design requirements in Appendix C – Design Criteria and Standards. There is currently no mention of bicycle facilities in the standards.

City Roadway Project Development Practices

The City of Coppel has made substantial progress toward its vision of a multimodal community, implementing many trail and sidepath projects from the Trail Master Plan, and continuous improvements to the sidewalk network.

The city’s subdivision regulations that pertain to streets and roads do not include reference or design requirements for on-street bicycle facilities.

TxDOT Coordination and Support

As Coppel is surrounded on three sides by major freeway corridors and roadways under the jurisdiction of TxDOT, close collaboration with this statewide agency is critical for any infrastructure projects. Multi-lane freeway corridors often create substantial barriers to bicycle and pedestrian connectivity within communities.

Opportunities and Constraints

As Coppel continues to evolve, an interconnected system of pedestrian and bicycle facilities can play an integral role in attracting and retaining new residents and businesses that value the City's diverse recreational offerings and the opportunities to live a healthy and active lifestyle. Based on an analysis of the existing conditions in the City, the following opportunities and constraints must be considered in order to develop a safe, connected, and accessible active transportation network.

Opportunities

- The Andrew Brown Park Trail is the most popular corridor for walking, bicycling, and jogging in Coppel. As the City's active transportation system continues to grow, the Andrew Brown Park Trail can serve as the backbone of Coppel's bicycle and pedestrian network. Providing a safe, comfortable and family-friendly path that crosses Denton Tap Road, increases connectivity to numerous destinations, and links to additional bikeways and walkways is critical to capitalize on this asset.
- Partnerships with neighboring municipalities and regional agencies offer opportunities to connect to the growing Veloweb Regional Trail System and adjacent trail systems like the Campion Trail in Irving.
- Branded and coordinated wayfinding signs along shared use paths and on-street bikeways can lead bicyclists to community destinations and inform residents and visitors about recommended corridors for bicycle travel.
- The incorporation of pedestrian-scale lighting, shade trees, bicycle parking, benches, water fountains, and trash and recycling containers, and other amenities along shared use paths and sidewalks can provide an attractive, comfortable, and inviting space for residents and visitors.
- Wide collector and local roadways in the industrial areas of Coppel, such as Ruby Road and Creekview Drive, provide unique opportunities for on-street bikeways that connect Coppel residents and visitors to these areas' businesses and places of employment.
- With ample curb-to-curb width, additional vehicle capacity, and numerous community destinations along its length, Parkway Blvd presents an excellent opportunity to develop a signature and iconic on-street bikeway project.
- Home to the City's Farmers Market and an eclectic blend of residences, shops and restaurants, Old Town Coppel is quickly growing into one of the area's most unique, pedestrian-friendly destinations in the community.
- Local and regional planning efforts have identified the DART-owned Cotton Belt Rail Corridor that runs through southern Coppel as a corridor for future trail development, which will enhance east-west connectivity and provide residents and visitors with direct access to Old Town Coppel.
- Ample park land and undeveloped park properties like Grapevine Creek Park provide ideal locations for the installation of single-track hiking and mountain biking trails to expand opportunities for walking and bicycling and diversify the City's recreational offerings.

Constraints

- With heavy volumes of motor vehicle traffic, wide pedestrian crossings, and auto-oriented retail and commercial development, Denton Tap Road divides Coppel into two distinct halves and presents significant barriers to bicycle and pedestrian travel. Whether crossing the corridor or traveling along it, Denton Tap Road is the single biggest constraint to walking and bicycling in Coppel.
- The Interstate Highways and Tollways surrounding Coppel limit regional connectivity to adjacent communities.
- A lack of on-street bikeways limits residents' ability to bicycle to destinations not accessible by shared use paths and trails.
- Deep residential lots and a lack of public lands along Grapevine Creek limit the riparian corridor's potential for trail or greenway development.
- There is a lack of soft surface and natural surface trails for mountain biking, running, and other recreational activities.

Chapter 3. Public Engagement

Introduction

Meaningful and productive public outreach and engagement is vital to the success of the Coppel Bicycle and Pedestrian Master Plan. The City of Coppel is implementing a thorough, interactive outreach and engagement process to involve Coppel residents and community members in planning. Through their input, residents, business owners, visitors, and other people interested in walking and bicycling in Coppel will help shape the vision, goals, objectives, and recommended projects and programs. As a result, the Master Plan will directly reflect the needs and desires of the community and put forth a community-driven blueprint for the future of walking and bicycling in Coppel.

This chapter summarizes the activities held by the City of Coppel in order to create a transparent, participatory, and informative public engagement element throughout the course of the planning process.

Steering Committee

The City convened a Steering Committee, consisting of city staff, elected officials, coordinating agency and stakeholder representatives, local advocates, and community residents, to oversee the planning process, provide input and direction at key decision points, and encourage public participation. The Steering Committee met four times during the course of the planning process and supplied invaluable insight, ideas, and feedback to develop the Plan goals, objectives, and recommendations. Given the responsibilities of the Steering Committee members with regard to implementing the Plan, their wide range of varied support and endorsements are vital to the enduring success of the Plan for years to come.

Public Workshop

Overview

On Wednesday, February 11, 2015, the City of Coppel held a public workshop at Town Center from 6:00 – 8:00 pm to provide information about the Bicycle and Pedestrian Plan to community members and solicit input to guide the plan direction and recommendations. The workshop consisted of a brief presentation providing an overview of the planning process and timeline, a question and answer session to address general questions from attendees, and an interactive mapping and input session to generate feedback on specific issues and opportunities. While 78 individuals signed in at the information table, roughly 90 attendees were counted during the opening presentation.



Figure 23: Public workshop attendees gather in the atrium at Town Center.

Input and Ideas

The mapping and input session was designed to provide multiple opportunities for attendees to share their ideas for making Coppel a better place to walk and bike. Whether highlighting a dangerous or uncomfortable street crossing, pointing out a commonly-used street that lacks sidewalks, or suggesting motorist education and awareness programs to support safer streets for bicyclists and pedestrians, public workshop attendees communicated their ideas on large maps, on multiple input boards, and comment forms.

Community Mapping Stations

Two maps were stationed in the Town Center atrium for attendees to identify walking and bicycling destinations, commonly used streets and trails, and barriers and obstructions that make walking and bicycling difficult, dangerous, or uncomfortable. Popular destinations included Old Town Coppel, Wagon Wheel Park, Andrew Brown Park, Grapevine Springs Park, MacArthur Park, Coppel High School, commercial destinations along Denton Tap Road, and destinations in nearby by adjacent communities, particularly DART stations in Lewisville and Carrollton, and the Campi3n Trail in Irving. Barriers to bicycling and walking received equal attention (if not more) at the mapping stations. The most common type of barrier for both walking and bicycling was signalized intersections along arterial and collector roadways, particularly those along Denton Tap Road, MacArthur Blvd, State Highway 121, and Beltline Road. Other important barriers for bicycling and walking included crossing Parkway Blvd by Coppel High School, narrow sections of sidewalk along Denton Tap Rd over Denton Creek, a missing sidewalk segment on Parkway Blvd east of Moore Road, and the recently closed State Highway 121 underpass at Denton Creek, part of a popular regional bicycling route leading to Grapevine and Flower Mound.



Figure 24: Attendees gather at one of the mapping stations.

Bicycle and Pedestrian Facility Toolbox Station

There are a variety of infrastructure improvements and facility types designed to provide for safe and comfortable bicycling and walking. While the selection of an appropriate bicycle or pedestrian facility depends greatly on the context of the roadway, surrounding land uses, and intended user type, it is important nonetheless to understand the types of facilities that residents and potential users in the community desire. At the Bicycle and Pedestrian Toolbox Station, public workshop attendees selected the bicycle and pedestrian improvements that they would most like to see in Coppel. Those in attendance expressed their desire for facilities that provide a high level of separation from motor vehicle traffic. The most desired facilities types were:

- cycle tracks (12 votes)
- bicycle lanes and buffered bicycle lanes (6 votes)
- shared lane markings (6 votes)
- sidewalks (5 votes)
- multi-use sidepaths (4 votes)



Figure 25: Attendees identify their preferences for new bicycle and pedestrian facilities.

- multi-use paths (2 votes)
- pedestrian-activated signals and crossings (1 vote)

Cyclist Types Station

In order to understand the types of bicyclists that currently bicycle in Coppell and/or would like to do so in the future, the City asked attendees to identify themselves as one of four types of bicyclists: *fast and highly experienced*, *enthused and confident*, *interested but concerned*, and *no way, no how*. While the *fast and highly experienced* category commonly represents just a small percentage of the general population in most cities in the U.S., this group represented more than two thirds of individuals (12 of 17) that visited the Cyclist Types Station. The project team has noted similarly high engagement levels of experienced bicyclists through additional stakeholder meetings and contact. Coppell appears to have a significant community of recreation and “sport” bicyclists that are very interested in roadway and trail projects that may impact bicycling.

Comment Form Station

Unlike the other input stations at the public workshop, the Comment Form Station allowed attendees an opportunity to provide whatever type of input or feedback they desired to share. Twenty comment forms were completed, addressing everything from specific streets that are dangerous for walking and bicycling to educating non-residents that drive through the community every day. The following comments have been selected by the project team because they express common sentiments echoed throughout the public workshop and paint a picture of walking and bicycling in Coppell:



Figure 26: Public workshop attendees stop by the Comment Form Station to share their ideas.

“I lived in Waco 25 years ago and rode bicycles with my young child – to breakfast, to the park, etc. I’ve never felt safe doing this in Coppell.”

“I fall into the category of enthused bicyclists who are afraid to ride their bikes due to safety concerns. A dedicated bike lane on our major streets would be a HUGE improvement over what we have now and would encourage citizens like me to ditch our cars and ride a bike instead. Thank you!”

“We live by Andrew Brown (Park) and love the trails but would really like to go to Old Town, Wagon Wheel, Irving Trails, DART, and Denton Tap businesses.”

“Please give equal priority to making our city very walkable while also addressing biking needs and concerns.”

“[I would like to see] safe biking access on sidewalks or protected bike lanes for my children.”

“[Parkway Blvd] is a priority for bicycles and walkers!! Getting this road bicycle and walker friendly will do loads to move people east-west... on bikes & on foot. #1 Priority! Fix this and Coppell is well on its way to leaving the car keys at home.”

Online Survey

While the high attendance at the public meeting was a strong indicator for community interest in the Bicycle and Pedestrian Master Plan, it represented just a small fraction of the total population of Coppell. To reach a broader audience, the City of Coppell created an online survey and distributed it through the city’s website and social media outlets, including Facebook and Twitter. In just one month, 574 individuals completed the survey. The input gathered through this online survey will help identify issues and opportunities for walking and bicycling and will help to create a blueprint for the City of Coppell to become a great place to walk and bike.

Respondent Characteristics

Questions about the survey respondents themselves can help the City better understand who is and who wants to be walking and bicycling in Coppell.

Connection to Coppell

As shown in the figure below on the following page, over 95% of all respondents live in the City of Coppell, and more than two thirds of respondents use the City's parks and trails for recreation. More than 60% of respondents also shop at businesses in Coppell as well, indicating that many daily trips by those in the Coppell community are to destinations located within the Coppell city limits.

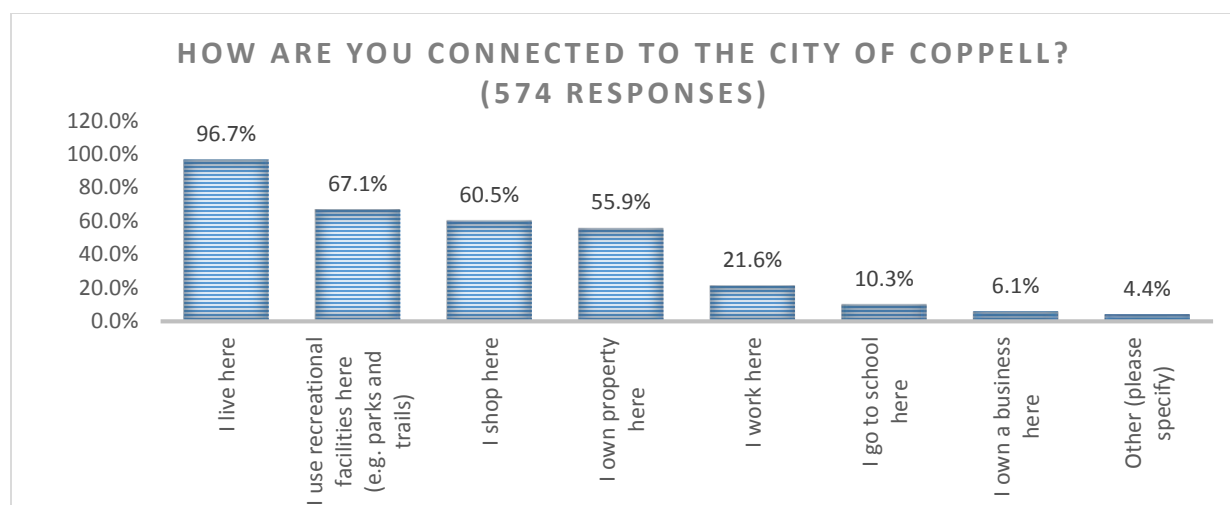


Figure 27: Connection to Coppell

Respondent Age

The vast majority of respondents were between the ages of 30 and 59, representing almost one in ten individuals that completed the survey. The largest single age group represented in the survey results was the 40-49 category, constituting 38% of all respondents. The smallest single age group represented in the survey responses was the 10-19 category, with only three individual survey responses.

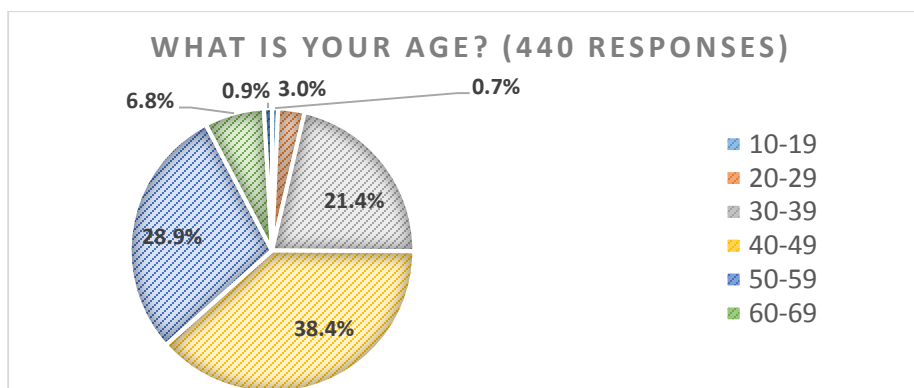


Figure 28: Respondent Age

Respondent Gender

Females represented a significantly larger portion of survey respondents, constituting nearly two thirds of the 440 individuals that responded to this question. Males, in comparison, represented only 34%, while 2% of respondents selected “Other”.

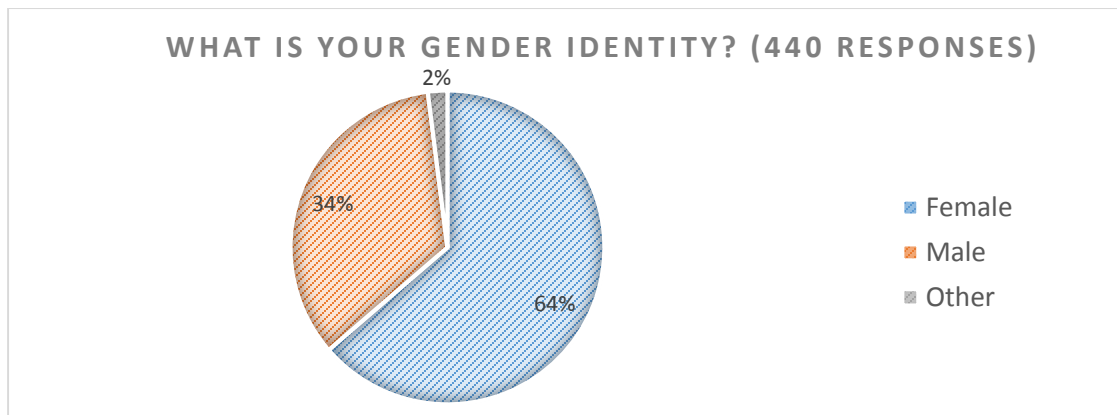


Figure 29: Respondent Gender

Bicyclist Types

Bicyclists are often grouped into categories that correspond with their level of experience and perceptions of comfort and safety bicycling in traffic. By learning more about the types of bicyclists in Coppell, the City can plan for improvements that will have the greatest impact for different user groups. For example, the fast and highly experienced group of bicyclists are comfortable and confident riding in the traffic lane with motor vehicles. The types of improvements that will help this group are relatively minor, like bicycle loop detectors that will actuate a traffic signal when a bicyclist arrives at a signalized intersection, or addressing potholes along popular corridors for road cycling. In comparison, the interested but concerned category often desire the bicycle facilities that provide greater separation from motor vehicle traffic, like dedicated bicycle lanes and cycle tracks. As shown in the chart below, the interested but concerned category represents more than half of all respondents. In comparison, the fast and highly experienced category represents only 10% of survey respondents. It is important to note that these groups are not static; as bicyclists gain more confidence and feel comfortable riding in a variety of situations, they often move from the interested but concerned to the enthused and confident category.

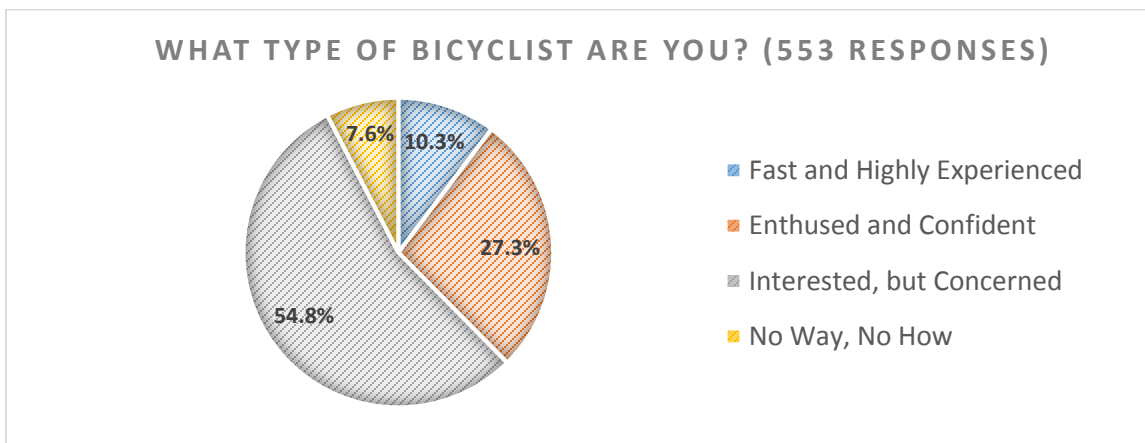


Figure 30: Bicyclist Type

Pedestrian Activity, Concerns and Desires

Barriers to Walking in Coppell

When asked to select the three most significant obstacles to walking in Coppell, survey respondents focused on the long distances between destinations (35%), the lack of safety and perception thereof along roads and sidewalks (27%), and the lack of safe street crossings (24%). Other common responses include poorly maintained sidewalks, a lack of shade, and a lack of sidewalks or paths. It should be noted that more than one in every four respondents walks frequently and has no concerns with the pedestrian environment.

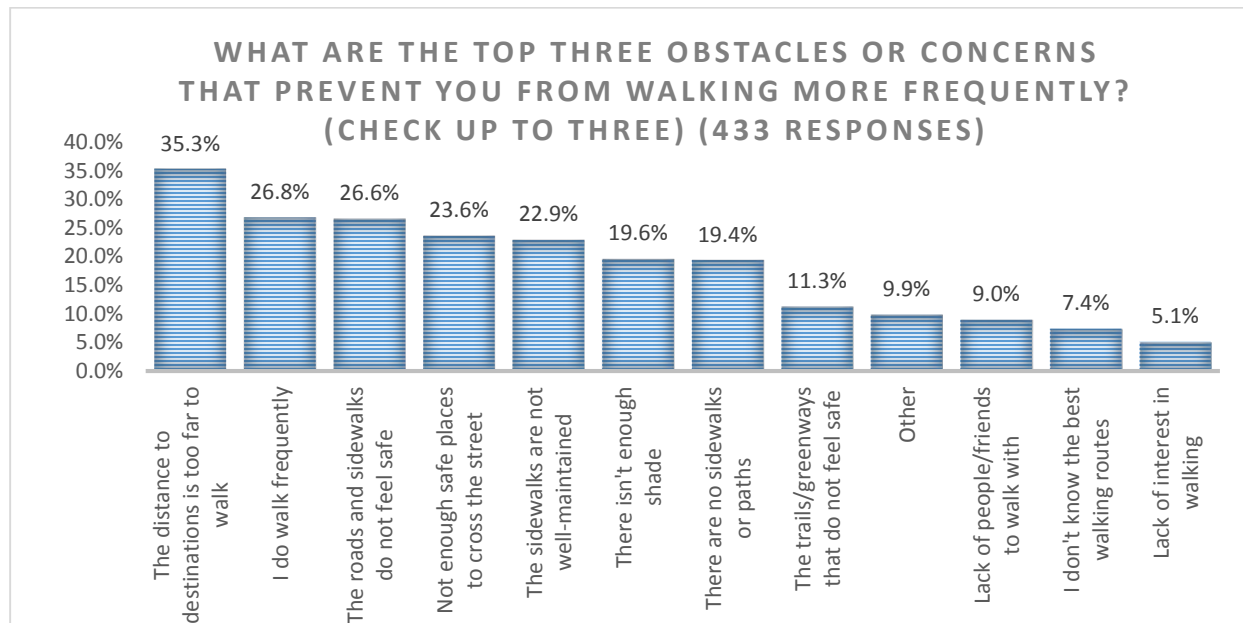


Figure 31: Barriers to Walking

Reasons for Walking

When asked about the reasons they choose to walk instead of drive, survey respondents pointed to a number of different factors that influence their decision. As shown in the chart on the following page, the most important reason was health. Ninety-nine percent of all respondents acknowledged the health benefits of walking. The second most influential reason is to be outdoors and socialize with friends (95%), and the third most influential reason was that walking is better for the environment than driving (69%). Only 2% of survey respondents have no choice but to walk, as it is their primary means of transportation.

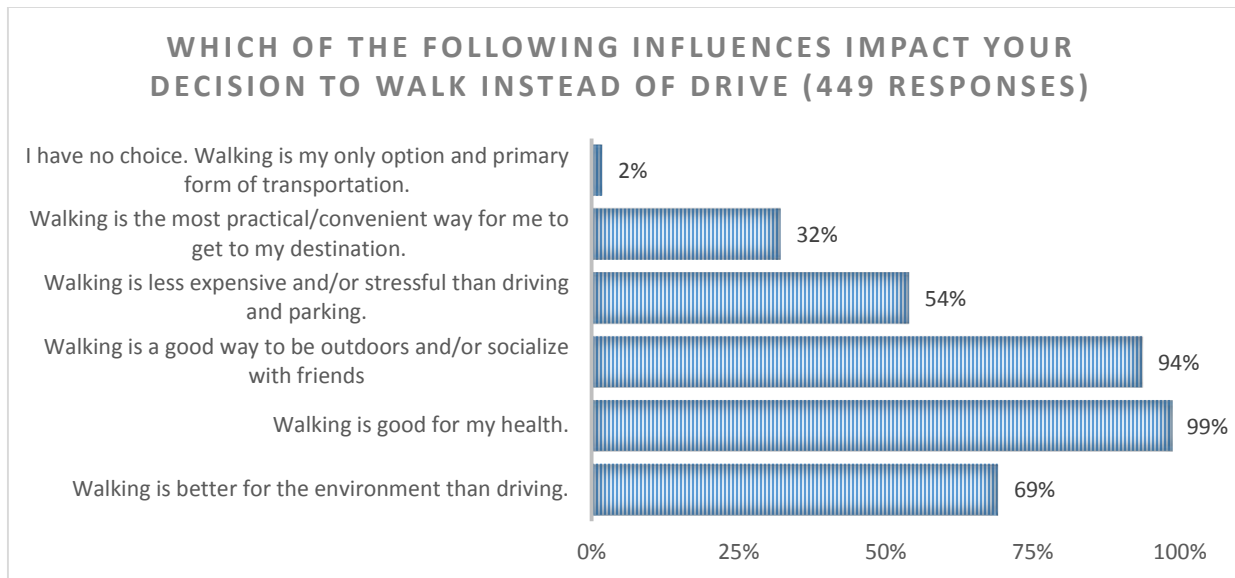


Figure 32: Reasons for Walking

Walking Destinations

Many residents and visitors are interested in walking to destinations throughout Coppell, especially parks and trails (84% of all respondents), friends' and family members' houses (60%), and recreation centers and gyms (58%). Many individuals also want to access restaurants, shops, and school.

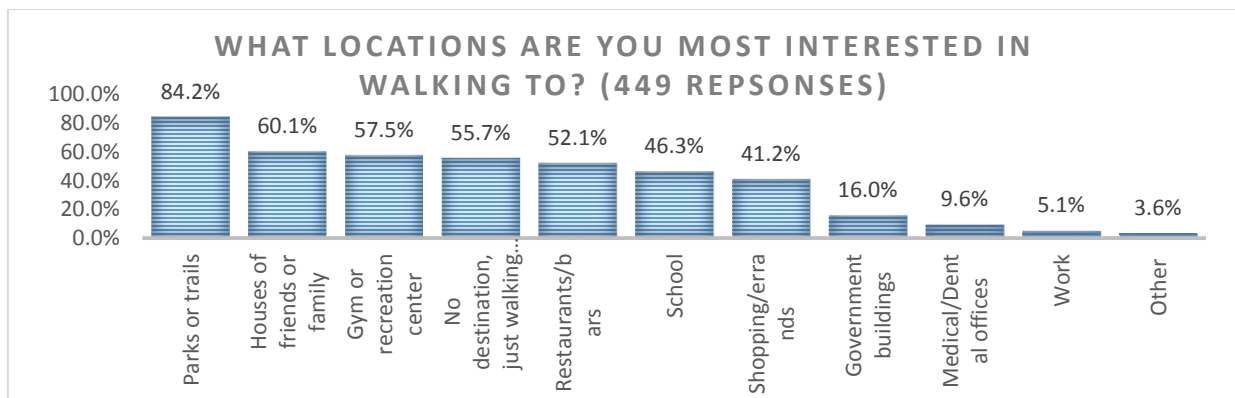


Figure 33: Walking Destinations

Children's Walking Activity

More than half of all children (51%) walk for transportation purposes, according to parents who completed the survey. When it comes to their children walking in Coppell, parents are most concerned with too much traffic (62%), a lack of safe street crossings (53%), and high motor vehicle speeds (52%).

Desired Improvements

Enhancements to the pedestrian network can have a significant impact of pedestrian activity. When asked which types of improvements would influence survey respondents to walk more often, individuals

highlighted the importance of an interconnected sidewalk network that links to important destinations and off-street paths as the two most important factors that will encourage them to walk more frequently. Other desired improvements included security features and lighting (selected by 89% of respondents), roadway crossing improvements (84%), and more sidewalks (79%).

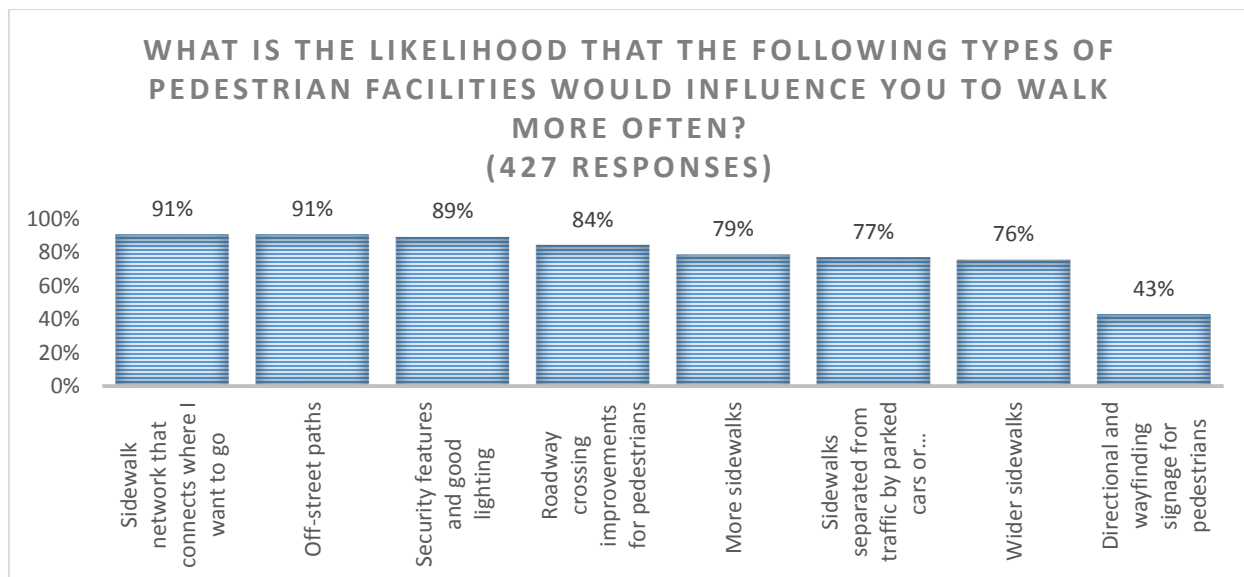


Figure 34: Desired Pedestrian Improvements

Locations for Improvements

Survey respondents identified multiple corridors and intersections in need of improvements to create a safer, more comfortable pedestrian experience. Table 4 on the following page displays the corridors most in need of pedestrian improvements, as identified by survey respondents. Many of the corridors listed below exhibit common characteristics that contribute to a less comfortable pedestrian experience, including heavier traffic volumes, multiple travel lanes, higher motor vehicle speeds, and longer crossing distances. As arterial and collector roadways, most of these corridors are primary routes by which residents and visitors access the City's most popular destinations. As such, it is important that these corridors provide safe, convenient and comfortable pedestrian infrastructure.

Table 2: Top 10 Corridors for Pedestrian Improvements

Street	Percent of All Responses
Denton Tap	41%
Sandy Lake	32%
Parkway	25%
MacArthur	24%
Bethel	17%
Coppell	15%
S Belt Line and E/W Belt Line	12%
Bethel School	7%
Freeport	5%
Samuel	3%

Many of the same corridors listed above were also prevalent in survey responses identifying intersections in need of improvement. Many Coppell residents find it just as challenging, if not more so, to cross some of these busy roads as they do traveling along them. Table 3 lists the intersections most in need of pedestrian improvements, as identified by survey respondents. The table highlights the perceived lack of safety and comfort at some of the City's largest, most heavily traveled intersections (for cars, bicycles, and motor vehicles). These intersections also represent some of the most common intersections identified as barriers for pedestrian travel by attendees at the first public workshop.

Table 3: Top 10 Intersections for Pedestrian Improvements

Intersection	Percent of All Responses
Denton Tap and Sandy Lake	36%
Denton Tap and Parkway	27%
MacArthur and Sandy Lake	18%
Sandy Lake and Moore	7%
Bethel and Coppell	7%
Denton Tap and 121	7%
Beltline and MacArthur	6%
Denton Tap and Bethel	6%
MacArthur and Parkway	5%
Denton Tap and Beltline	5%

Bicycling Activity, Concerns and Desires

Barriers to Bicycling in Coppell

When asked about the obstacles they face when bicycling in Coppell, survey respondents do not feel safe on area roads and trails (66% of all respondents), they do not feel safe crossing streets (45%), and they are concerned that drivers are too aggressive (42%). All three of these top barriers to bicycling relate to roads and/or motor vehicles.

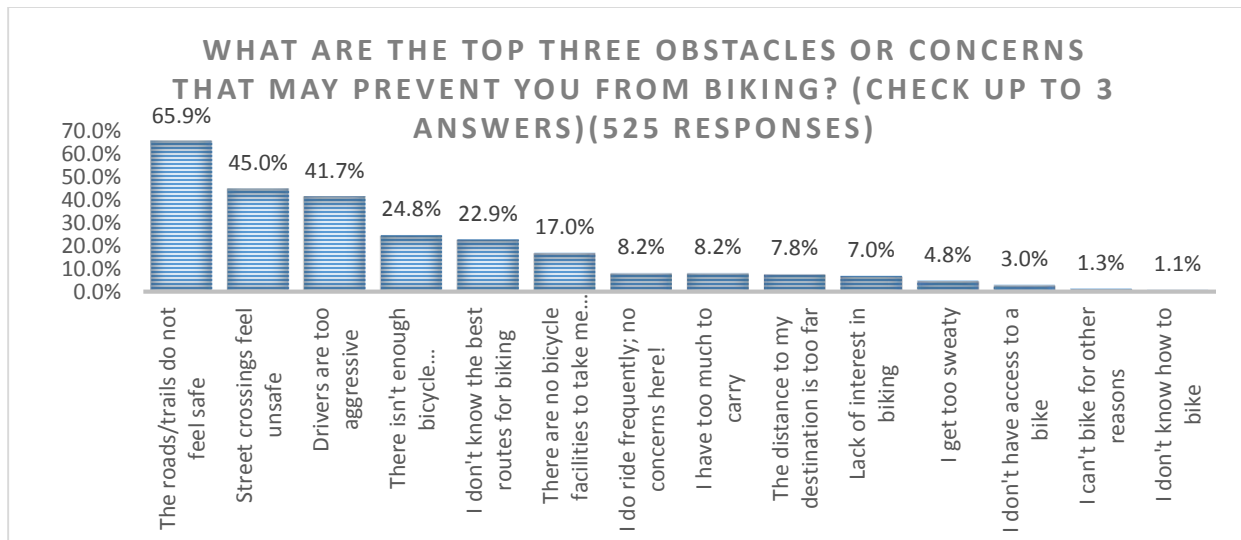


Figure 35: Barriers to Bicycling

Reasons for Bicycling

Similar to walking, survey respondents find health and fitness as the most appealing reason for riding a bicycle (over 90%). Other popular answers included spending more time outdoors (80%), fun and socializing (73%), beautiful scenery (53%), quality time spent with children or grandchildren (45%), and environmental impact (41%).

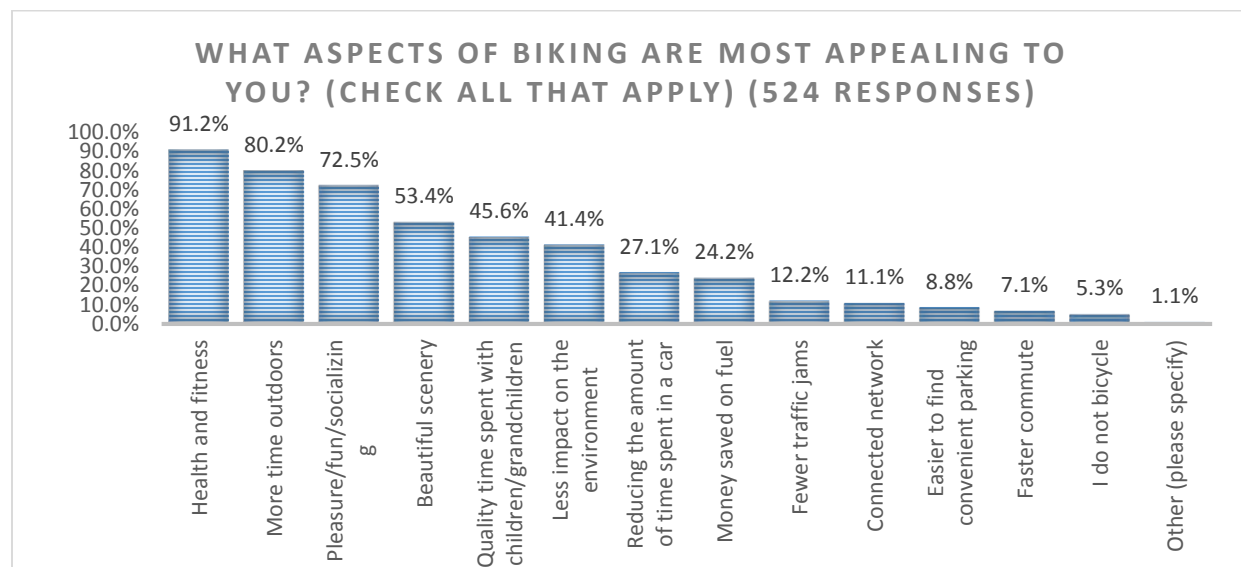


Figure 36: Reasons for Bicycling

Bicycling Destinations

Survey respondents expressed their desire to access popular recreation destinations by bicycle. More than four in every five survey respondents chose parks or trails (84%) as a destination they'd like to access by

bicycle. Other popular destinations included recreation centers and gyms (58%), friends' and family members' houses (53%), shopping and retail destinations (44%), and schools (43%). Over half of respondents that answered this question also acknowledged that they often like to bike for fitness and leisure and have no particular destination at all.

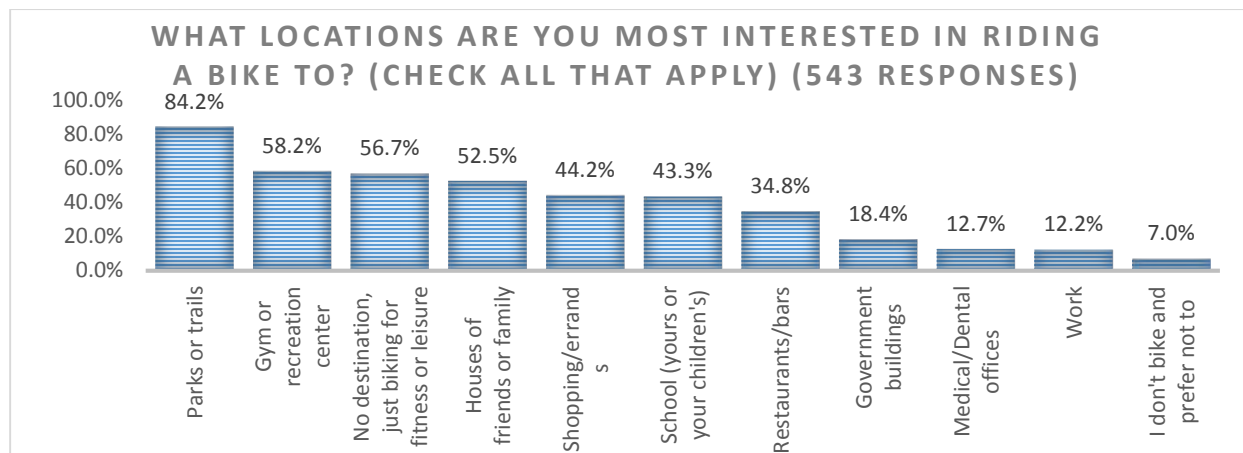


Figure 37: Bicycling Destinations

Children's Bicycling Activity

When asked about their children's bicycling activity, survey respondents with children indicated that 37% of children bike for transportation purposes. Parents are most concerned with too much traffic (69%), a lack of safe street crossings (67%), and a lack of on-street bicycle facilities like bike lanes (57%).

Desired Improvements

Bicycle facilities can have a significant impact on bicycle activity. With an interconnected network of bicycle facilities like off-street paths, cycle tracks and bike lanes, many community residents will choose to bike to destinations throughout the Coppel. When asked which improvements will encourage them to bicycle more frequently, respondents identified off-street paths, cycle tracks, buffered bike lanes, and intersection enhancements as the most significant potential improvements.

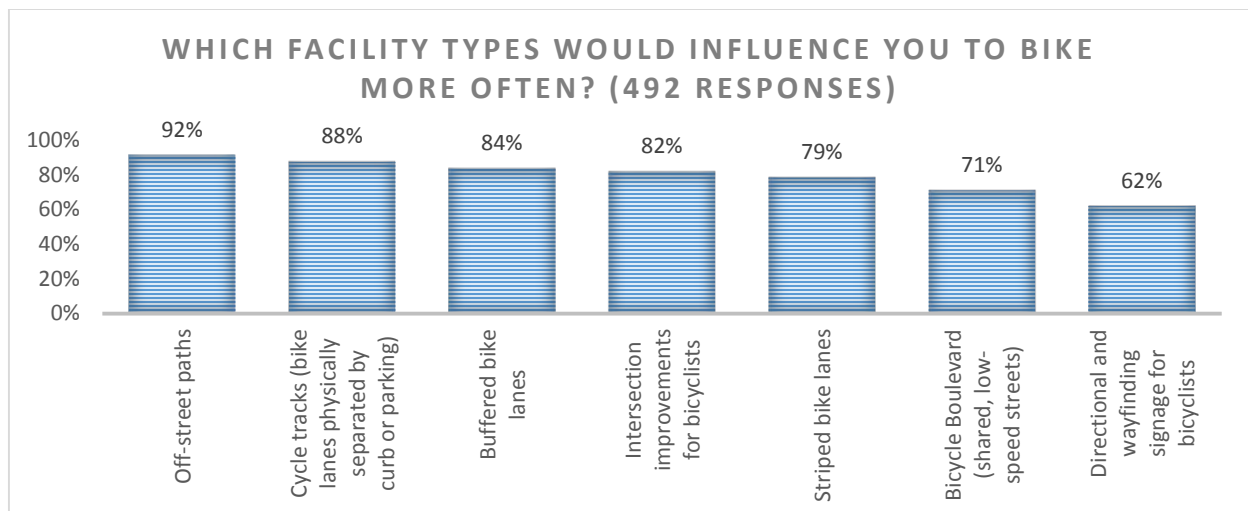


Figure 38: Desired Bicycle Improvements

Locations for Improvements

Survey respondents identified multiple corridors and intersections in need of improvements for bicycle safety and mobility. Table 4 displays the corridors most in need of bicycle improvements, as identified by survey respondents. The same four roadways - Denton Tap, Sandy Lake, Parkway and MacArthur –listed as the top four corridors in need of bicycle improvements were the same four listed as the top corridors for pedestrian improvements, an indication that there is a desire to walk and bike along these arterial corridors *and* that residents find these corridors lacking in terms of safety and/or comfort.

Table 4: Top 10 Corridors for Bicycle Improvements

Street	Percent of All Responses
Denton Tap	57%
Sandy Lake	56%
Parkway	42%
MacArthur	34%
S Belt Line and E/W Belt Line	17%
Bethel	12%
N Coppell and S Coppell	9%
Bethel School	6%
Freeport	6%
Heartz	5%

Many of the same corridors listed above were also prevalent in survey responses identifying intersections in need of improvement. Many Coppell residents find it just as challenging, if not more so, to cross some of these busy roads as they do traveling along them. Table 5 shows the intersections most in need of bicycle improvements, as identified by survey respondents. Six of the ten intersections are along Denton Tap Road, three along Sandy Lake Road, and three along MacArthur Blvd. While many of these intersections were also identified as barriers to pedestrian travel, the notable inclusion of MacArthur Blvd and Beltline Road reflects

many cyclists' desire for a safer regional connection to the Campion Trail just south of Coppell in neighboring Irving.

Table 5: Top 10 Intersections for Bicycle Improvements

Intersection	Percent of All Responses
Denton Tap and Sandy Lake	50%
Denton Tap and Parkway	35%
MacArthur and Sandy Lake	27%
MacArthur and Beltline	15%
MacArthur and Parkway	7%
Denton Tap and Beltline	6%
Sandy Lake and Coppell	6%
Denton Tap and Hwy 121	5%
Denton Tap and Bethel	4%
Denton Tap and Bethel School	3%

Bicycle Parking

Survey respondents also pointed to the need for bicycle parking at destinations throughout the City. The greatest need for bicycle parking is at the Tom Thumb Shopping Center, the CVS at Denton Tap Rd and Parkway Blvd, the Kroger at Sandy Lake Rd and MacArthur Blvd, and other commercial destinations throughout Coppell.

Open Comments

At the end of the survey, an open field was provided for respondents to share any additional thoughts, ideas, or concerns with the City. The comments ranged from general support for the project to specific concerns about texting and driving. Despite the diversity of opinions and ideas expressed, there are a number of common themes that emerged from these open comments:

Aspirations

"Let's build this plan and have a healthy life."

"I love riding my bike to run errands, get to schools, the library, YMCA, dentist and doctor appts, etc. It's how I grew up and why I chose the location of our house. I would love for Coppell to become a more biker friendly town and encourage people to get out on their bikes and help the environment!"

"Let's make Coppell known for great parks and a great biking system. That's something to be proud of."

"I appreciate the small town walking feel especially closer into the heart of Coppell. Fortunately/unfortunately my particular neighborhood is locked in by several creeks and is on the outskirts of town making it difficult to enjoy walkability to the fullest."

"I would like to see the city focus on safe pedestrian/bike paths to all of the schools so that we can instill the idea of walking to get places in our young population and encourage a healthy lifestyle early on."

"I would love to be able to walk or ride my bike to any destination within the City of Coppell as a daily practice, not just recreational."

"Other cities around us are really ahead of the game in cycling/biking. The activity is growing more and more. Cycling/biking events are also a way to generate \$\$\$ for the city by having more visitors to Coppell spending money within our city limits. It also promotes health."

Regional Connectivity

"I love the paths we have in place so far, we just need more of them and I would love it if we could connect with surrounding cities"

"I would like to have a safe way to bike over 635 into and out of the Irving / Las Colinas area"

"This is a great town, we'd love to see more bike/jogging trails, especially connecting to a metroplex-wide system (e.g. Valley Ranch and Champion Trail). Thanks!"

"Coppell is isolated and we need the ability to get out of town by other ways besides cars."

Safety and Security

"Security is always a concern in more remote areas, particularly at night. Will there be police bicycle patrols in the areas?"

"I have to ride my bike daily for exercise on a trainer in my house because I am so afraid I will be hit on the road. An improvement needs to be made to give bicyclists the opportunity to ride all through the city in safety."

"Limit car traffic!!!!"

"Reduce the nonresident drive through traffic on all roads. At least reduce speed limits and enforce!"

"Many sidewalks in my neighborhood are unsafe and need maintenance."

Appreciation and Support

"The fact that you are reaching out to get the public's opinion gives me great confidence that Coppell leadership will hit a home run with this project and makes me want to stay here. Thanks!"

"Thank you for putting this survey together and implementing an awesome plan."

"I'm excited to see this survey and the thought of better bike paths in Coppell."

"Thanks for consulting us to get our opinion on this very important subject for the Coppell community."

"Thank you for looking into this. We really could benefit from being a bike and pedestrian friendly city."

"Keep it up. It's been a very long time coming."

"I am excited at the work being done, and support the Parks department in this effort."

Eco Coppel Earthfest

On Saturday, April 11, the City of Coppell hosted a booth at the Annual EcoCoppel Earthfest to share information about the Plan and gather additional input and ideas from Coppell residents and visitors. More than 150 individuals stopped by the booth to learn about the plan, and 15 individuals and families shared their ideas for walking and bicycling in Coppell on large speech boxes (shown below), which were posted for all attendees to see. Residents expressed their desires for dedicated bicycle lanes, encouraging more children to walk and bike to school, improving connections to popular destinations like Old Town Coppell, fixing broken and uneven sidewalks throughout the City, and creating safer crossings along Denton Tap Road.



Figure 39: A Coppell family shares their ideas for walking and bicycling at Earthfest.



Figure 40: These four comments are representative of the feedback provided by Coppell residents at EcoCoppel Earthfest.

Conclusion

Whether it's at the corner of Parkway Boulevard and Denton Tap Road during the middle of rush hour, or the Andrew Brown Park Trail on a Saturday afternoon, people in Coppell are already walking and bicycling a great deal. Through on-line survey responses and input provided at the Public Workshop, residents shed light on how, where, and why they walk and bike in Coppell, as well as their desires for improving walking and bicycling throughout the City. While the survey respondents and public workshop attendees represented a diverse cross section of the Coppell community, there was a consensus that the highest priorities for improving bicycling and walking conditions were to expand and improve the pathway and trail network, develop an on-street network of protected bikeways that provide a high level of safety, comfort, and separation from motor vehicle traffic, and improve the pedestrian network, particularly at major intersections and along major corridors.

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Chapter 4. Vision, Goals & Objectives

Introduction

Visioning and goal setting is an important part of any planning effort. A strong vision and supporting goals and objectives provide the foundation for all physical and programmatic recommendations in the Plan. Based on public input from community residents, steering committee members, and key stakeholders, the Plan's vision statement encapsulates the values and desires of the community, painting a picture for the future of bicycling and walking in Coppell:

Vision Statement

Visioning and goal setting is an important part of any planning effort. A strong vision and supporting goals and objectives provide the foundation for all physical and programmatic recommendations in the Plan. Based on public input from community residents, steering committee members, and key stakeholders, the Plan's vision statement encapsulates the values and desires of the community, painting a picture for the future of bicycling and walking in Coppell:

The City of Coppell will be a community in which people of all ages and abilities can safely, comfortably, and conveniently travel by bicycle or on foot.

Goals and Objectives

To help achieve this vision, the Bicycle and Pedestrian Master Plan defines a number of goals and objectives to target specific community needs. Goals are broad, value-based expression of the community's desires, describing the ideal situation that would result if all plan purposes were fully realized. Goals give direction to the plan as a whole and are concerned with the long-term. Objectives are action-oriented statements that should be undertaken to reach a particular goal. These goals and objectives are based on the input from community members, guidance from the steering committee, and a detailed analysis of existing conditions.

Goal 1: Improve and prioritize bicycle and pedestrian accommodations within the City of Coppell

Objectives:

- 1.1: Implement a continuous network of bike lanes, signed shared bikeways, and bike boulevards that serve all bicycle user groups, including both recreational and utilitarian riders.
- 1.2: Implement an accessible network of pedestrian supportive infrastructure, including sidewalks, curb ramps, and trails in high-priority pedestrian areas.
- 1.3: Provide a bicycle, pedestrian and trail network that is safe and attractive and meets the needs of all genders, ages and abilities.

- 1.4: Evaluate streets for bike facilities based on the recommended projects in this Plan when performing street resurfacing or restriping projects.
- 1.5: Include priority bikeway and trail projects within the City's Capital Improvement Program.
- 1.6: Eliminate gaps in the bicycle network to improve connectivity between destinations.
- 1.7: Require new private development projects to finance and install bicycle facilities, sidewalks, and multi-use trails where recommended in the Coppel Bicycle and Pedestrian Master Plan and Trails Master Plan, as part of on-site improvements and off-site mitigation measures as appropriate. Such requirements should be required through updates to the Subdivision Regulations and others sections of the municipal code.
- 1.8: Adopt and adhere to existing and future standards established by manuals including, but not limited to the AASHTO Guide for the Development of Bicycle Facilities, the Manual of Uniform Traffic Control Devices (MUTCD) and the NACTO Urban Bikeway Design Guide.
- 1.9: Adopt revised roadway design standards to ensure compliance with context sensitive design principles.

Goal 2: Adopt local government policies, processes and standards that encourage and enhance walking, bicycling and other trail related activities in Coppel

Objectives:

- 2.1: Adopt and implement the Coppel Bicycle and Pedestrian Master Plan.
- 2.2: Designate City of Coppel staff member(s) to be responsible for the coordination of non-motorized transportation.
- 2.3: Expand sources for funding construction and maintenance of trails and bikeways beyond the Transportation Alternatives Program through NCTCOG.
- 2.4: Create a sustainable, dedicated source of bikeway funding within the annual city budget.
- 2.5: Encourage bikeway and trail advocates and other interested citizens to serve on government boards and committees.
- 2.6: Pursue public-private partnerships in the planning and implementation of bikeway and trail projects.
- 2.7: Preserve potential corridors for future use including rail corridors, canals/ditches, utility rights-of-way and natural corridors.

Goal 3: Monitor the implementation of the Coppel Bicycle and Pedestrian Master Plan

Objectives:

- 3.1: Establish 'annual bike/ped/trails census' counts.
- 3.2: Begin monitoring on-street bicycle use as before/after data collection on future on-street bikeways.
- 3.3: Monitor bicycle and pedestrian collision data to seek continuous reduction in bicycle and pedestrian collision rates
- 3.4: Track public opinion about walking and bicycling through citizen surveys

Goal 4: Implement comprehensive education and encouragement programs targeted at all populations

Objectives:

- 4.1: Educate and inform the general public on bicycle and walking safety issues and encourage non-motorized transportation with programs that target pedestrians, bicyclists and motorists.
- 4.2: Install signage along all on-street bikeways and trails to assist with way-finding and to increase awareness of bicyclists and other trail users.
- 4.3: Support Safe Routes to School and other efforts, including educational and incentive programs to encourage more students to bicycle or walk to school, through a partnership with school district and other interested parties.
- 4.4: Encourage employers to provide incentives and support facilities for employees that commute by bicycle.
- 4.5: Partner with trail and bicycling advocacy groups, the medical and health community, bike shops, businesses, and outlying communities on education and encouragement programs.
- 4.6: Promote bicycling and walking through City-sponsored events.
- 4.7: Educate professional drivers (transit drivers, delivery drivers, etc) on bicyclist rights and safe motoring behavior around bicyclists.
- 4.8: Encourage large employers, colleges, activity centers and major transit stops to provide secure bicycle storage facilities and racks and promote their efforts.
- 4.9: Require bicycle parking and other end-of-trip facilities within new commercial development and retrofit public facilities with bicycle parking where it is absent.

Goal 5: Increase enforcement on City streets, trails and bikeways

Objectives:

- 5.1: Increase attention by law enforcement officers to bicycle-related violations by both motorists and bicyclists, and emphasize positive enforcement for safe bicycling behavior by children. Law enforcement officers should be recruited to participate in educational programs in schools.
- 5.2: Increase enforcement efforts to prevent the obstruction of dedicated bikeways and walkways.
- 5.3: Reduce aggressive and/or negligent behavior among drivers, bicyclists and pedestrians.
- 5.4: Ensure that all bicycle or pedestrian collisions are accurately recorded into a collision database for future analysis and monitoring.
- 5.5: Establish volunteer bike patrol on trails.

Goal 6: Promote healthy lifestyles and safe trail/bikeway facilities

Objectives:

- 6.1: Work with the medical community to develop programs that promote the health and wellness benefits associated with walking and cycling.
- 6.2: Work with Safe Routes to Schools efforts to encourage healthy walking and bicycling habits from an early age.
- 6.3: Increase activity among Coppel's residents through the provision of a comprehensive bikeway and trail network.
- 6.4: Reduce the numbers of crashes involving bicyclists and trail users by at least 30 percent.
- 6.5: Increase helmet use among bicyclists, particularly those required by City ordinance who are 14 years of age and under.

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Chapter 5. Recommendations

Introduction

This chapter presents a comprehensive set of infrastructure and programming recommendations specifically tailored to reach the Plan vision in which Coppel's trail and roadway system will comfortably, safely and efficiently facilitate bicycle and pedestrian transportation for users of all ages and abilities. These recommendations are built on a solid foundation of input from the public, City staff, and technical analysis. The chapter is divided into four sections: bicycle network recommendations, pedestrian network recommendations, community-wide program recommendations, and internal program and policy recommendations. **Bicycle network recommendations** consist of bicycle facilities, wayfinding signage and markings, end-of-trip (bicycle parking) facilities, and other improvements that enhance the bicycling experience. **Pedestrian recommendations** include sidewalks, shared use paths, and crossing improvements at high-priority locations throughout Coppel. **Community-wide programs** consist of education, encouragement, and enforcement, recommendations that foster a culture in which bicycling and walking are a part of daily life for Coppel residents. **Internal program and policy recommendations** address engineering, planning, and evaluation opportunities to integrate bicycling and walking into the City policies and operations. Together, these elements constitute a comprehensive, Five E's approach to transforming Coppel into a bicycle and pedestrian friendly community.



Figure 41: People of all ages and abilities rely on the City's system of sidewalks, trails and bikeways to travel throughout the community.

The Bicycle Network

People who bicycle vary in their physical abilities, experience levels, and the types of bicycles they ride. Creating a comprehensive bicycle network requires the provision of comfortable, convenient, and safe facilities that accommodate the different types of expected users. Many streets in Coppel, such as low-speed, low-volume neighborhood streets, may not need any special facilities to accommodate bicyclists, while others with larger volumes and higher speeds may require significant bikeway infrastructure investments. These infrastructure investments come in the form of signed and bicycle boulevards, dedicated bicycle lanes, cycle tracks, shared use paths, wayfinding signage, intersection improvements, and other elements that support bicycle transportation and enhance bicycling's visibility as a valued, respected, and viable mode of travel in Coppel.

Bicycle Facility Types

Each bicycle facility type recommended in this plan is described below. The facility types are presented by degree of separation from motor vehicle traffic, from least separation to most separation. More detailed descriptions of each facility type are included in the design guidelines in the appendix of the Plan.

Signed/Marked Shared Roadways

On shared roadways, bicyclists and motor vehicles use the same roadway space. These facilities are typically used on roads with low speeds and traffic volumes, however they can be used on higher volume roads with wide outside lanes or shoulders. A motor vehicle driver will usually have to cross over into the adjacent travel lane to pass a bicyclist, unless a wide outside lane or shoulder is provided.

While bicyclists are permitted on nearly all roadways except for interstate highways, signed and marked shared roadways indicate preferred bicycle routes through the use of wayfinding signage and shared lane markings. These design elements increase motorist awareness of bicyclists and support safe and responsible road use.



Figure 42: Shared lane markings on a two-lane, one-way street.

Bicycle Boulevards

Bicycle Boulevards are low-volume, low-speed streets modified to enhance bicyclist by using treatments such as signage, pavement markings, traffic calming and/or traffic reduction, and intersection modifications. These treatments, also referred to as neighborhood greenways or quiet streets, allow through movements of bicyclists while discouraging similar through-trips by non-local motorized traffic through traffic calming and traffic diversion design elements.



Figure 43: Bicycle boulevards offer a comfortable bicycling experience for riders of all abilities.

Conventional Bike Lanes

Bike lanes designate an exclusive space for bicyclists through the use of pavement markings and signage. The bike lane is located adjacent to motor vehicle travel lanes and is used in the same direction as motor vehicle traffic. Bike lanes are typically on the right side of the street, between the adjacent travel lane and curb, road edge or parking lane.

Bike lanes adjacent to on-street parallel parking require special treatment in order to avoid crashes caused by an open vehicle door. The bike lane should have sufficient width to allow bicyclists to stay out of the door zone while not encroaching into the adjacent vehicular lane. Parking stall markings, such as parking “Ts” and double white lines create a parking side buffer that encourages bicyclists to ride farther away from the door zone.



Figure 44: Conventional bike lane in an urban setting.

Buffered Bike Lanes

Buffered bike lanes are conventional bicycle lanes paired with a designated buffer space that provides additional separation between the bicycle lane and the adjacent motor vehicle travel lane and/or parking lane.

This treatment is appropriate for bike lanes on roadways with high motor vehicle traffic volumes and speed, adjacent to parking lanes, or a high volume of truck or oversized vehicle traffic.

Where space permits, buffers are sometimes placed on both sides of the bike lane. Buffered bike lanes differ from protected bike lanes because the buffer space uses only paint and no physical barrier.



Figure 45: Buffered bike lanes provide additional separation from motor vehicle traffic.

Protected Bike Lanes / Cycle Tracks

Protected bike lanes, also referred to as cycle tracks, provide a space on or next to the roadway for exclusive use by bicyclists, separated from traffic by a physical barrier of some kind. These facilities are different from sidewalks and sidepaths in that pedestrians are not permitted to use them. Barriers may be in the form of planters, raised curbs, parking, bollards, or other streetscape elements. Protected bike lanes can be configured for either one-way or two-way travel.



Figure 46: Two-way cycle track in Seattle, WA.

Sidepaths

Shared use paved trails along roadways, also called Sidepaths, are a type of trail that runs adjacent to a street. Because of operational concerns like numerous conflict points in the form of driveways and street crossings, as well as the bi-directional nature of sidepaths, these facilities must be designed with additional care and consideration. However, as a low-stress bikeway, sidepaths are an attractive facility type for children and casual adult bicycle riders, and therefore can have a significant impact on ridership. Sidepaths in the City of Coppell can be found on N Coppell Rd, Sandy Lake Rd, and Freeport Pkwy.



Figure 47: A jogger running on the N Coppell Rd sidepath near Parkway Blvd.

Shared Use Paths

A shared use path (also known as a greenway or multi-purpose trail) allows for two-way, off-street bicycle use and also may be used by pedestrians, skaters, wheelchair users, joggers and other non-motorized users. These facilities are frequently found in parks, along rivers, beaches, and in greenbelts or utility corridors where there are few conflicts with motorized vehicles. Trail facilities can also include amenities such as lighting, signage, and fencing (where appropriate).

Key features of shared use paved trails include:

- Frequent access points from the local road network.
- Directional signs to direct users to and from the trail.
- A limited number of at-grade crossings with streets or driveways.
- Terminating the trail where it is easily accessible to and from the street system.
- Separate treads for pedestrians and bicyclists when heavy use is expected.

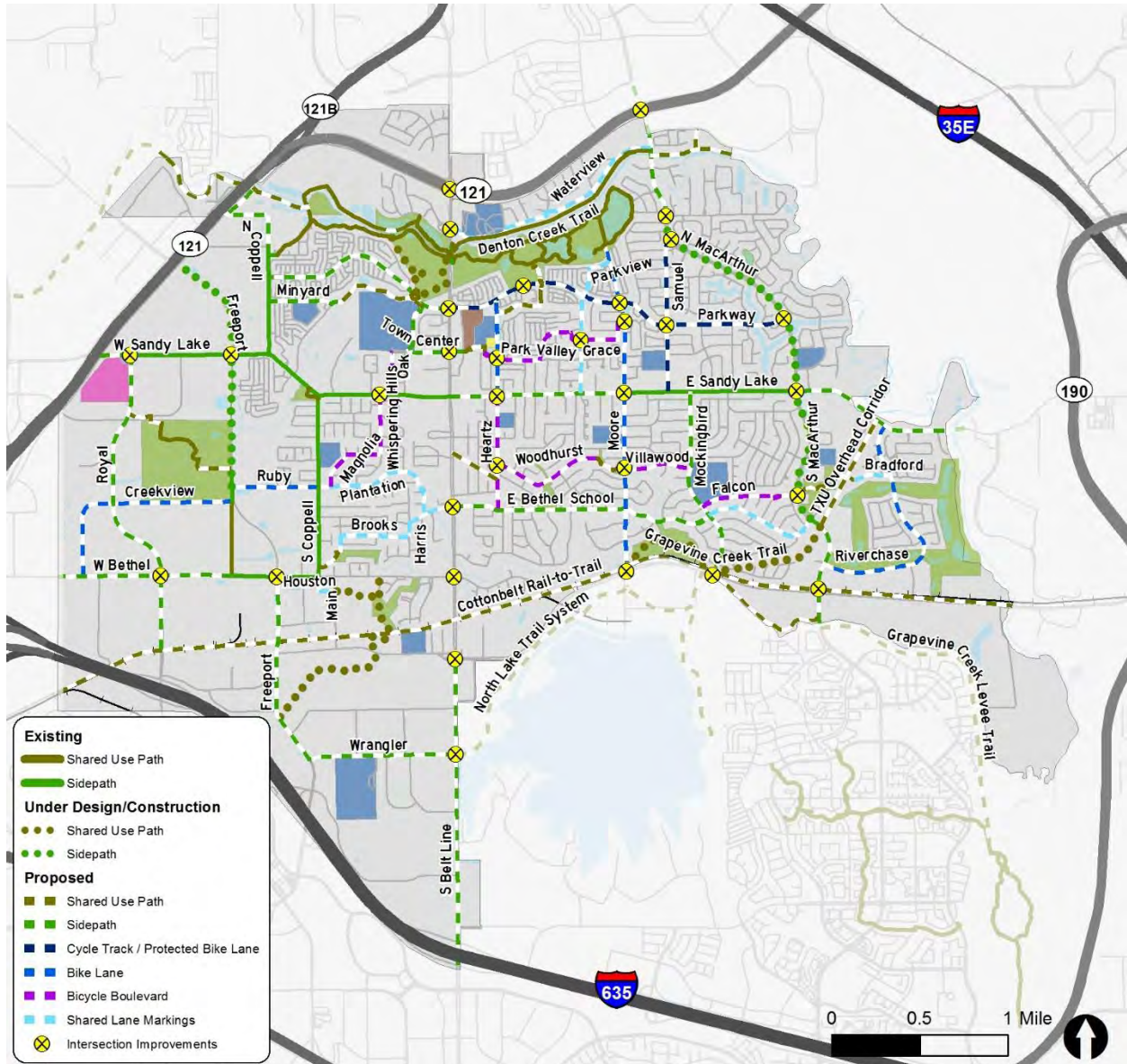


Figure 48: The Denton Creek Trail is one of many shared use paths in Coppell.

Recommended Bicycle Facilities

The Coppel Bicycle and Pedestrian Master Plan recommends more than 50 miles of new on-street bikeways and shared use paths. Once installed, this comprehensive bicycling network will offer residents and visitors of all ages and abilities safe, convenient, and comfortable facilities that connect people to parks, schools, employment centers, commercial districts, and other popular destinations. The bicycling recommendations provided in this chapter represent a master planning level of detail and may change as individual projects are studied, designed and implemented. Individual segments may be enhanced or upgraded to a higher facility type as opportunities present themselves.

The recommended bicycle facilities are displayed below in Map 2. Each facility is listed in the Recommended Bicycle Facilities table on the following page.



Map 3: Proposed Bicycle Network

The following table summarizes all bikeways recommended in this planning process by facility type. This table also includes previously planned bikeway facilities and projects under design and/or construction.

Table 6: Recommended Bikeways by Facility Type

Bicycle Facility Type	Length (Miles)
Shared Lane Markings	4.91
Bicycle Boulevard	4.33
Conventional Bike Lane	5.55
Cycle Track / Protected Bike Lane	2.88
Sidepath	18.88
Shared Use Path	15.42
Grand Total	51.97

Tables 7 through 12 group Plan recommendations by facility type and display each recommended bikeway project, including project limits, proposed length, and recommendation status (proposed, previously proposed, and under design/construction). Like the facility descriptions above, these tables are listed in order by degree of separation from motor vehicle traffic, from least separated to most separated.

Table 7: Recommended Signed/Marked Shared Roadway Projects

Name	From	To	Status	Length (Miles)
Anderson	Hunterwood Park	Brooks	Proposed	0.10
Bradford	Riverchase	MacArthur Park Trail	Proposed	0.21
Brooks	Anderson	Harris	Proposed	0.39
E Bethel School	Moore	S MacArthur	Proposed	0.67
Forest Hill	Waterview	N MacArthur	Proposed	0.23
Harris	Brooks	W Bethel School	Proposed	0.08
Houston	Cameron	Main	Proposed	0.09
Lodge	E Sandy Lake	Parkview	Proposed	0.72
Lyndsie	Natchez Trace	Waterview	Proposed	0.27
Main	W Bethel	Houston	Proposed	0.09
Natches Trace	N Denton Tap Rd	Lyndsie	Proposed	0.36
Parkview	Moore	Lodge	Proposed	0.12
Plantation	W Bethel School	S Coppell	Proposed	0.81
W Bethel School	Harris	S Denton Tap	Proposed	0.27
Waterview	Lyndsie	Forest Hill	Proposed	0.50
Total				4.91

Table 8: Recommended Bicycle Boulevard Projects

Name	From	To	Status	Length (Miles)
Charleston	Magnolia	Whispering Hills	Proposed	0.20
Condor	Falcon	S MacArthur	Proposed	0.14
Dogwood Trail	Park Valley	Grace	Proposed	0.29
Falcon	Mockingbird	Condor	Proposed	0.42
Grace	Dogwood Trail	Stringfellow	Proposed	0.41
Heartz	E Sandy Lake	E Bethel School	Proposed	0.65
Magnolia	W Bethel School	Charleston	Proposed	0.22
Oak	W Sandy Lake	Coppell High School	Proposed	0.24
Park Valley	Dogwood Trail	Town Center Trail	Proposed	0.33
Stringfellow	Moore	Grace	Proposed	0.04
Villawood	Trail Connector	Mockingbird	Proposed	0.43
Whispering Hills	Charleston	W Sandy Lake	Proposed	0.34
Woodhurst	Heartz	Trail Connector	Proposed	0.63
Total				4.33

Table 9: Recommended Bike Lane Projects

Name	From	To	Status	Length (Miles)
Creekview	Freeport	W Bethel	Proposed	1.24
Heartz	Parkway	E Sandy Lake	Proposed	0.55
Moore	Moore Road Park	E Belt Line	Proposed	1.86
Riverchase	E Sandy Lake	S MacArthur	Proposed	1.41
Ruby	S Coppell	Freeport	Proposed	0.49
Total				5.55

Table 10: Recommended Protected Bike Lane / Cycle Track Projects

Name	From	To	Status	Length (Miles)
Parkway	MacArthur	Denton Tap	Proposed	2.01
Samuel	Sandy Lake	MacArthur	Proposed	0.87
Total				2.88

Table 11: Recommended Sidepath Projects

Name	From	To	Status	Length (Miles)
Cowboy	Parkway	Town Center	Proposed	0.28
E Bethel School	S Denton Tap	Moore	Proposed	1.50
E Sandy Lake	City Limit - Carrollton	N MacArthur	Previously Proposed	1.03
E Sandy Lake	Moore	N Denton Tap	Previously Proposed	0.99
Freeport	Highway 121	Wagon Wheel Park	Design / Construction	1.40
Freeport	W Bethel	Wrangler	Previously Proposed	1.10
Minyard	N Coppell	Cottonwood Branch Trail	Previously Proposed	0.40
Mockingbird	E Sandy Lake	E Belt Line	Proposed	1.11
N Coppell	Westminster	Denton Creek Trail West	Proposed	0.66
N MacArthur	City Limit - Lewisville	Deforest	Previously Proposed	0.47
N MacArthur	Deforest	E Sandy Lake	Design / Construction	1.36
Parkway	N Denton Tap	N Coppell	Proposed	1.17
Royal	W Sandy Lake	Cottonbelt Rail-to-Trail	Previously Proposed	1.82
S Belt Line	E Belt Line	City Limit - Irving	Previously Proposed	1.74
S MacArthur	E Bethel School	Grapevine Creek Levee Trail	Proposed	0.68
S MacArthur	E Sandy Lake	E Bethel School	Design / Construction	0.78
Town Center	Cowboy	Town Center Plaza	Proposed	0.32
W Bethel	Creek View - Bethel Connector Trail	City Limit - Grapevine	Previously Proposed	0.99
W Sandy Lake	Royal	City Limit - Grapevine	Previously Proposed	0.25
Wrangler	S Belt Line	Freeport	Previously Proposed	0.83
Total				18.88

Table 12: Recommended Shared Use Path Projects

Name	From	To	Status	Length (Miles)
Andrew Brown West Loop Trail	Andrew Brown Trail West	Andrew Brown Trail West	Design/Construction	0.81
Cottonbelt Rail-to-Trail	City Limit - Carrollton	City Limit - Grapevine	Previously Proposed	5.57
Cottonwood Branch Trail	Parkway	Freeport	Previously Proposed	0.56
Denton Creek East - Lake Vista Connector	Lake Vista	Denton Creek East Trail	Previously Proposed	0.12
Denton Creek East Trail	N MacArthur	City Limit - Carrollton	Previously Proposed	0.47
Denton Creek West Trail	Denton Creek Park Trail Connector	City Limit - Grapevine	Previously Proposed	1.12
Denton Tap - Hertz Connector	S Denton Tap	Hertz	Proposed	0.30
Grapevine Creek Trail	Mockingbird / E Beltline	S MacArthur / Grapevine Creek Levee Trail	Proposed	0.75
Grapevine Creek Trail	S MacArthur	Moore	Design/Construction	1.36
Grapevine Springs Trail	W Bethel	Freeport	Design/Construction	1.30
Hertz-Andy Brown Park Connector Trail	Andrew Brown Park	Hertz	Proposed	0.57
Hunterwood Park Trail Connector	S Coppell	Anderson	Proposed	0.16
MacArthur Park Trail	Bradford	S MacArthur / Condor	Proposed	0.38
Magnolia Park Trail	Magnolia Park Trail	East Haven Development	Previously Proposed	0.18
Old Town - Grapevine Springs Connector	Grapevine Springs Trail	S Coppell / Houston	Design/Construction	0.25
Town Center Trail	Town Center	Park Valley	Proposed	0.17
TXU Overhead Corridor	S MacArthur	E Sandy Lake	Previously Proposed	0.68
Villawood-Woodhurst Trail Connector	Villawood	Woodhurst	Proposed	0.14
Wagon Wheel Park Trail - East	Existing Trail	Freeport	Previously Proposed	0.25
Wagon Wheel Park Trail - West	Wagon Wheel Park Trail	Royal	Proposed	0.28
Total				15.42

The Pedestrian Network

Most trips begin and end as walking trips, even when a car, bicycle, bus, or train is also involved. The City of Coppell has a comprehensive network of pedestrian facilities, but there are some gaps in the network, either in the form of missing sidewalks or challenging intersections and street crossings. There are also some aging sidewalks in poor condition, which can present significant impediments to pedestrians, particularly pedestrians with limited mobility, physical impairments, or mobility-assistance devices such as walkers, wheelchairs, and mobility scooters. The City addresses these deficiencies by improving existing sidewalks, adding ADA-compliant crossings, and adding new sidewalks as part of redevelopment, street reconstruction, new or upgraded traffic signals, and targeted spot improvements. This section of the Plan identifies specific pedestrian infrastructure recommendations to enhance connectivity, accessibility, and safety for pedestrians of all ages and abilities.

Pedestrian Facility Types

Most trips begin and end as walking trips even when a car, bicycle, bus, or train is also involved. Generally, Coppell has a very complete walking network and there are few places where walking facilities are not available. Pedestrians use several different types of facilities to travel in Coppell, primarily multi-use paths, sidepaths, and sidewalks. Each of these facility types is described briefly below.

Multi-Use Paths

These facilities, which were described above in greater detail, are shared by many active transportation and recreation users including pedestrians, bicyclists, and in-line skaters. The Denton Creek Trail, Andrew Brown Park Trail, and Freeport Connector Trail between Freeport Pkwy and Bethel Rd are all examples of shared use paths in Coppell. This plan recommends 15 miles of new multi-use paths.



Figure 49: Shared use paths, like this boardwalk connecting the Vista subdivision to Riverchase Elementary and MacArthur Park, provide vital links for bicyclists and pedestrians..

Sidepaths

Sidepaths, which were described earlier in this chapter above in greater detail, are an increasingly prevalent asset to the City's pedestrian network. These wide shared use facilities can be found on Sandy Lake Rd, Freeport Pkwy, Coppell Rd. Heavy use by walkers, runners, and bicyclists is a testament to the popularity of sidepaths among Coppell residents and visitors alike.

Sidewalks

Sidewalks are the most common walking facility in Coppell. There are more than 240 miles of sidewalks throughout the City of Coppell, providing essential connections between residential neighborhoods and nearby destinations. Some are directly adjacent to travel lanes without any buffer or barrier, while others are buffered by landscaping, parking, or other physical means.



Figure 50: A family walks home from Wilson Elementary on Coppell Rd.

Crossings and Intersections

Intersections in Coppell should be designed for pedestrian safety and comfort, with pedestrian enhancements appropriate to traffic speed, traffic volume, pedestrian crossing distance, and other similar factors. Marked crosswalks provide a delineated space for pedestrians and other sidewalk users to cross. Differences in striping patterns (e.g. double ladder or piano key crosswalks) and paving surfaces (e.g. raised and/or brick crosswalks) offer varying levels of visibility and delineation between pedestrians and automobiles, bicyclists, and other roadway users. The selection of crosswalk location and type of striping pattern used is through careful engineering judgement of city staff referencing documents such as the Manual of Uniform Traffic Control Devices.

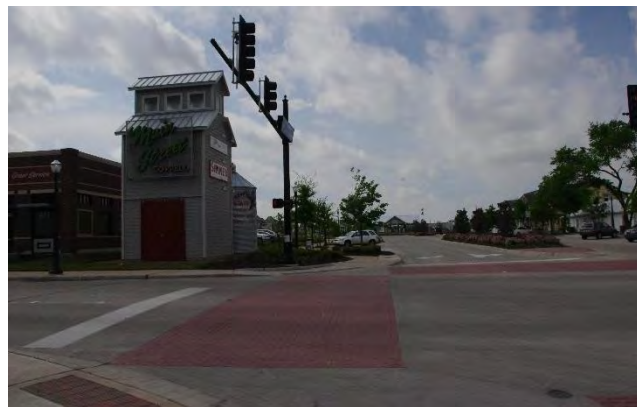


Figure 51: Push button-activated countdown timers, textured crosswalks, and ADA-accessible curb ramps enhance pedestrian safety at Bethel Rd and Coppell Rd.

In addition to crosswalk markings, a host of other crosswalk elements can be utilized to create a safe and comfortable pedestrian experience, including bulb-outs, median refuge islands, push button-activated pedestrian signal heads, countdown timers, ADA-accessible curb ramps, leading pedestrian intervals, and flashing beacons. While each intersection identified for improvements will require individual analysis to determine appropriate design elements, the City of Coppell should provide a consistent and uniform experience for pedestrians throughout the entire community.

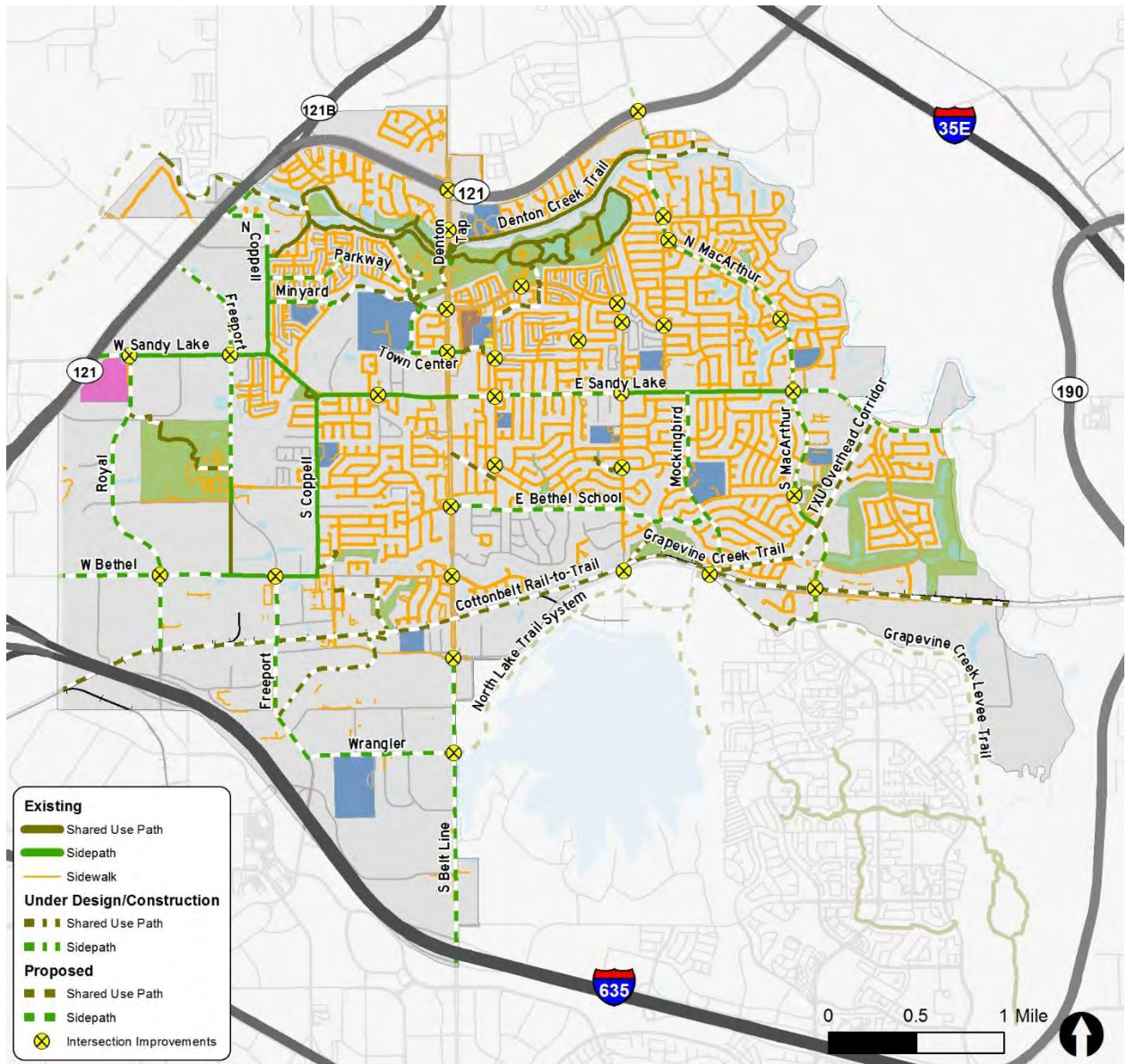
Recommended Pedestrian Facilities

The Coppell Bicycle and Pedestrian Master Plan recommends nearly fifty miles of pedestrian facilities to accompany the existing 250 miles of sidewalks, shared use paths, and sidepaths located throughout the City. These new shared use paths and sidepaths will expand the pedestrian network, address critical gaps and barriers, increase accessibility and safety, and support a positive and comfortable experience for people of all ages and abilities. While there are no specific recommendations for new sidewalk segments, the Plan does provide policy recommendations, including a sidewalk prioritization strategy and a Complete Streets Ordinance, both of which are described later in this chapter. These recommendations will help to ensure that all roadway projects address pedestrian mobility.

In addition to the linear facilities mentioned above, the Plan also identifies a number of intersections for which pedestrian improvements are recommended. The recommendations for intersection improvements are conceptual in nature and will require additional analysis beyond the scope of this Plan to determine the character and design of each intersection improvement. A number of potential design elements for safe and accessible pedestrian crossings are included in the design guidelines section of the appendix for reference.

It is important to note that the recommended pedestrian facilities do not constitute an exclusive schedule of pedestrian projects. The City of Coppell should pursue and implement additional pedestrian projects as part of a Complete Streets approach to transportation investments and maintenance, in conjunction with programmed capital improvements and private development, and as other opportunities arise.

The map on the following page identifies recommended shared use paths, sidepaths, and intersection improvements.



Map 4: Recommended Pedestrian Network

Table 11 and Table 12 in the previous section of this chapter identify each recommended sidepath and shared use path, respectively. Table 13 below lists each intersection recommended for pedestrian improvements.

Table 13: Recommended Intersection Improvements

Intersection
Belt Line and MacArthur
Belt Line and Mockingbird
Belt Line and Moore
Belt Line and Wrangler
Bethel and Royal
Denton Tap and Belt Line
Denton Tap and Bethel
Denton Tap and Bethel School
Denton Tap and Highway 121
Denton Tap and Natchez Trace
Denton Tap and Parkway
Denton Tap and Town Center
Freeport and Bethel
Heartz and Park Valley
Heartz and Woodhurst
Lodge and Grace
MacArthur and Condor
MacArthur and Deforest
MacArthur and Highway 121
MacArthur and Parkway
MacArthur and Samuel
Moore and Stringfellow
Moore and Villawood
Parkway and Andrew Brown Park
Parkway and Moore
Parkway and Samuel
Sandy Lake and Freeport
Sandy Lake and Heartz
Sandy Lake and MacArthur
Sandy Lake and Moore
Sandy Lake and Royal

Other Pedestrian Improvements

While a continuous pedestrian network supports opportunities for walking, additional streetscape enhancements and traffic calming elements transform the public realm by prioritizing walking as the primary mode of transportation, slowing and even reducing motor vehicle traffic, creating an attractive and comfortable environment that invites pedestrian activity, and adding character and quality to the streetscape and adjacent land uses. Both of these roadway design elements - streetscape enhancements and traffic calming - are discussed in greater detail in the design guidelines in the appendix of the Plan.

Streetscape Enhancements

Landscaping, street trees, pedestrian-scale lighting, benches, street furniture, and even public art can have a profound effect on improving the pedestrian experience along a corridor. Many of the streets in Old Town Coppell demonstrate the impact of pedestrian-focused streetscape enhancements on the character of a street. Design elements like street trees, multi-textured and multi-colored sidewalk and pavement surfaces, benches, pedestrian-scale lighting, bulb-outs, and mid-block pedestrian crossings enhance the public realm and create a warm and inviting space for social interaction. For the City of Coppell, capital investments in public spaces like these can be a significant catalyst for private investment.



Figure 52: Benches, street trees, bicycle parking, and pedestrian-scale lighting in Old Town Coppell.

Traffic Calming

Traffic calming is a design principle that seeks to lower vehicular traffic speeds using physical and visual cues. These tools are typically self-enforcing: the roadway's physical conditions influence drivers' speed and behavior rather than regulatory devices and enforcement measures. Traffic calming works best on local streets with residential areas and highly trafficked commercial corridors. Extensive research shows that slower motorist speeds reduce overall crash severity and frequency, and improve cyclist and pedestrian comfort within and adjacent to traffic. Slower traffic also tends to reduce roadway noise, which contributes to overall neighborhood livability and walking comfort.

Traffic calming countermeasures are divided into two general types: vertical and horizontal. Vertical speed control measures are composed of slight rises in the pavement, on which motorists and bicyclists must reduce speed to cross. Speed humps, speed tables, and raised crosswalks are examples of vertical traffic calming. Horizontal traffic calming devices, on the other hand, cause drivers to slow down by constricting the roadway space or by requiring careful maneuvering. Curb extensions, chicanes, chokers (neckdowns), and traffic circles are the most common applications of horizontal traffic calming.



Figure 53: The traffic circle on Waterview Dr slows motor vehicle traffic, creating a safe and calm environment for pedestrians.

Community-Wide Programs

Education, encouragement, and enforcement programs support walking and bicycling activity and can be cost effective complements to infrastructure investments. When combined with physical improvements like sidewalks, greenways, and on-street bikeways, these types of programs foster a social environment that values and supports active transportation.

Building on the Five E's approach outlined in the introduction of the Plan, the following education, encouragement and enforcement programs and accompanying actions offer a layered approach to increasing walking and bicycling activity, supporting safe, responsible, and respectful use of roads and trails, and creating a community where people of all ages and abilities feel comfortable walking or riding a bicycle for any trip.

Creative partnerships with local agencies, organizations, institutions and community groups are critical to the success of these programs. The City should consider opportunities for local partners to take lead or supporting roles in as many of these programs as possible, as dictated by their strengths, capacities, resources and alignment with their missions and goals.

Education

Adult Bicycle Education

Increasing citizens' access to bicycle skills classes can increase residents' understanding of basic bicycle operations, sharing the road with motor vehicles, hazard avoidance and maneuvering, and even bicycle maintenance. These skills and resources equip residents with the confidence and knowledge to safely and responsibly ride their bicycles to destinations in and around Coppell.

The City of Coppell should deliver at least two adult bicycling skills classes per year. These classes could be stand-alone program offerings through the Parks and Recreation Department, or integrated into a larger community event like the annual EcoCoppell Earthfest. The Life Safety Park will be a perfect venue for these classes.

Partnering with local bike shops and/or advocacy organizations can increase program delivery efficiency and utilize existing resources. BikeDFW, for example, offers a variety of bicycle skills courses taught by League of American Bicyclists certified instructors. Courses available through BikeDFW include Learning to Ride a Bicycle, Traffic Skills 101, Group Riding, and Commuting.

Youth Bicycle Education Classes

Bicycle rodeos and other education courses designed to build bicycling skills for children are an effective way to instill safe and responsible bicycling practices and support bicycling as a means of transportation for Coppell's next generation.

The City of Coppell should incorporate at least two youth-oriented bicycle education classes into the Parks and Recreation Department's program offerings each year. BikeDFW already offers two classes specifically targeting youth audiences:



Figure 54: BikeDFW and Bike Friendly Fort Worth provide a Traffic Skills 101 course for area cyclists (Source: <https://www.facebook.com/bikedfw>).



Figure 55: A BikeDFW Bicycling 123 course held in Allen, TX (Source: <https://www.facebook.com/bikedfw>).

Learning to Ride a Bicycle and Bicycling Skills 123 Youth. By partnering with BikeDFW, Coppell can utilize this advocacy organization's expertise and experience in delivering a refined and effective bicycle education curriculum. Again, the Life Safety Park will be a great resource for holding these classes.

Bicycle and Pedestrian Information Clearinghouse

As the City of Coppell's network of trails and on-street bikeways expands, residents and visitors alike will turn to the City's website for trail information, bicycle network maps, and other information. This presents the City with the ideal opportunity to provide a variety of information and resources to equip citizens with all they need to know about walking and bicycling in Coppell. Through a single page dedicated to bicycling and walking, the City can share educational materials, information about bicycle facility types and their intended users, descriptions of upcoming capital projects, bicycling and walking maps, upcoming events and activities, links to community partners' websites, plans and studies, and capital projects.

Project-Related Community Outreach

Community outreach and engagement is an ongoing process. While many Coppell residents and stakeholders participated in the planning process, the majority of the community may not feel the impact of the plan until individual projects are implemented near their homes, places of employment, or on their daily travel routes. As individual projects are implemented, particularly those that involve substantial modifications like road diets, cycle tracks, and shared use paths, the City must engage and inform community residents and adjacent property owners about the coming improvements, how they relate to the City's overall vision and approach to creating a walk- and bike-friendly community, and the benefits that these projects will provide for people of all ages and abilities.

The City should hold community meetings for significant bicycling and walking capital improvement projects to inform residents and adjacent property owners of project details, address community concerns, and build support for non-motorized transportation facilities. In addition to public meetings, the City should also use door hangers, mailers, or other forms of communications to provide project updates, explain infrastructure improvements and proper operations of a vehicle or bicycle

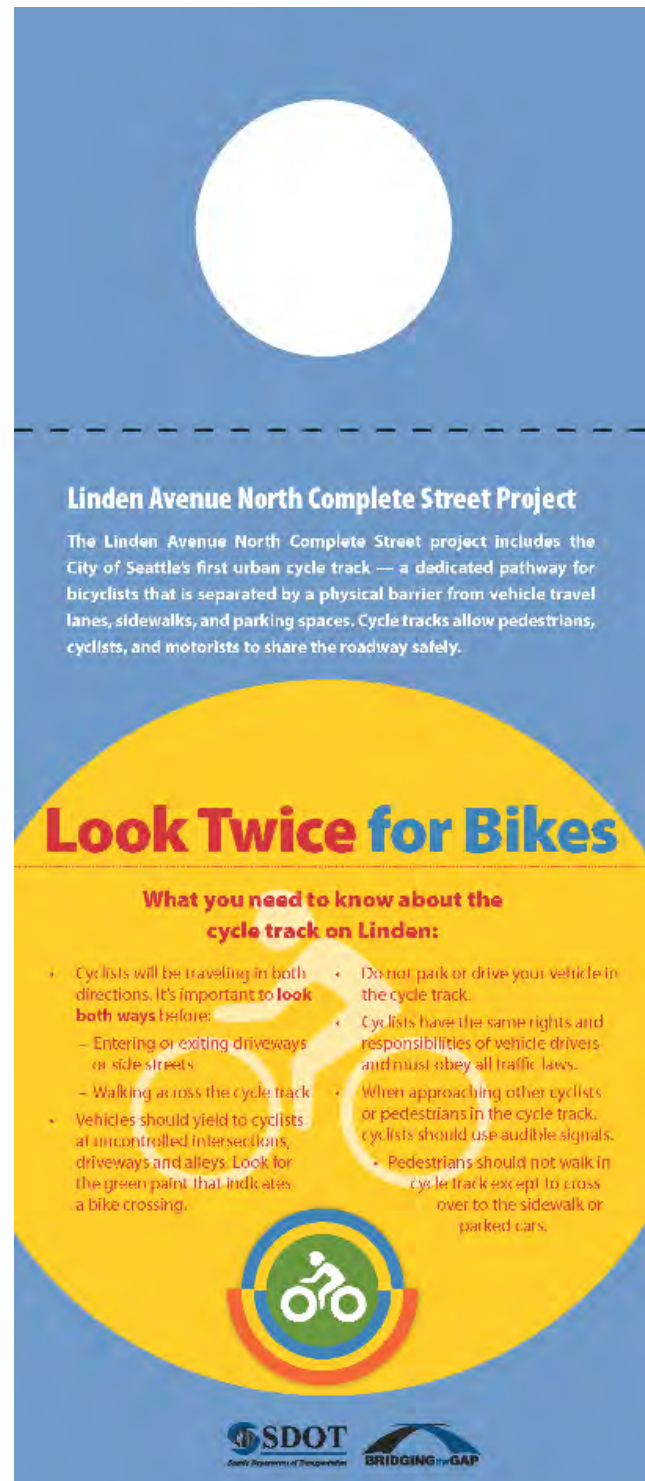


Figure 56: Seattle Department of Transportation uses door hangers to keep community residents and stakeholders informed of current and future bicycle and pedestrian projects (source: Seattle DOT).

with regard to the specific project, and, more generally, garner support for walking and bicycling by extolling their health, social, economic, transportation, and quality of life benefits.

Encouragement

Safe Routes to School

Many schools in the City of Coppell already participate the Coppell Independent School District's Walk to School Wednesdays. Living Well in Coppell, the City of Coppell and the Coppell Independent School District have even produced a short Youtube video to promote the program and encourage families to participate. In addition to the twice a month Walk to School Wednesdays, some schools have more active groups as well. Schools like Cottonwood Creek Elementary, Wilson Elementary, and Town Center Elementary have high rates of walking and bicycling on a daily basis. The City of Coppell should continue to support Walk to School Wednesdays and other efforts and initiatives to encourage walking and bicycling to school.

Community-Wide Bicycle Network and Trails Map

Raising awareness for the City's growing network of shared use paths and bicycle facilities is a simple and effective method to encourage walking and bicycling. The City should develop a community-wide bicycle network and trails map to familiarize residents and visitors with safe and convenient facilities for walking, bicycling, and jogging. These maps can be provided in print and online and can be supplemented with additional information, including trail mileage, nearby destinations, and etiquette and safety tips for trail usage and on-street bicycling.



Figure 57: The City's Trail System Map shows existing trails and the expanding sidepath network. This map should be updated as new facilities are added.

Walking and Bicycling Route Maps

Route-specific maps and guides offer residents and visitors unique bicycling and walking routes to access local destinations or tour the community. The City of Coppell should develop a series of walking and bicycling maps that showcase the growing network of shared use paths, on-street bikeways, and sidewalks. These routes can start and end at common destinations like the CORE, the Senior and Community Center, or Wagon

Wheel Park. Both bicycling and walking routes should vary in terms of length in order to provide choices for people of various physical abilities and bicyclists of different skill levels.

National Bike to Work Day/Week/Month

In partnership with the League of American Bicyclists, cities across the country host events and activities to promote National Bike Month, Week, and Day. These events can increase visibility for bicycling, encourage community members to bicycle for trips of all purposes, and build riders' comfort and confidence to bicycle on streets and in traffic.

The City of Coppell should develop a month-long National Bike Month program, complete with Bike to Work Day events, organized bicycle rides, a Bike to Work Challenge, bicycle education courses, and other events to increase ridership. The League of American Bicyclists has a number of valuable online resources to help plan, organize and execute successful events and activities, including an event organizing handbook, a calendar linking to local events and activities, and tips for people interested in commuting to work.

Individualized Marketing Campaign

Individualized marketing campaigns are a unique approach to Transportation Demand Management (TDM) that focus on increasing bicycling, walking and transit trips through concentrated outreach, promotional materials, and personalized support. Programs like Go Bronzeville in Chicago, IL and SmartTrips in Portland, OR are shining examples of community transformation through these individualized marketing campaigns. The City of Coppell should explore partnerships, funding sources, potential neighborhoods, and other feasibility factors for the creation of an individualized marketing campaign.

Monthly Social Bicycle Rides

Ongoing group bike rides can target many groups of people and cover countless topics or themes. In most cases, however, the purpose is the same: to provide a safe, comfortable, and social setting for bicycling. New riders experience riding safely in a group while learning bicycling skills and rules of the road, and all riders have the opportunity to meet neighbors, share in a feeling of camaraderie, and build community.

Bicycle Parking Program

End-of-trip facilities are an integral component of a successful, functional bicycle network. Without safe, secure and convenient bicycle parking, many residents and visitors will choose other means of transportation, viewing the lack of bicycle parking as a significant deterrent. The City of Coppell, the Coppell Independent School District, and numerous businesses have installed bicycle parking at locations throughout the community. The City of Coppell and its community partners should continue to increase the bicycle parking supply with secure, attractive, and highly visible bicycle parking



Figure 58: San Rafael's Way to Go! program provides households with all the information they need to walk, bike and use transit.

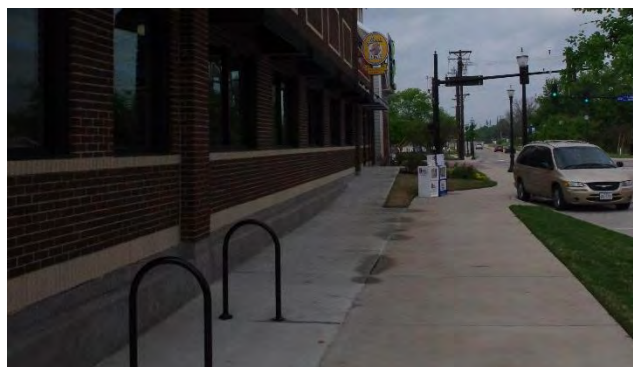


Figure 59: Safe and convenient bicycle parking at the Local Diner in Old Town Coppell.

facilities, including short-term bicycle parking solutions like racks and corrals, and long-term solutions like lockers and secure parking areas.

Enforcement

Targeted Enforcement

Schools, commercial districts and other areas with high volumes of bicycle and pedestrian activity, as well as locations with significant incidences of bicycle and pedestrian crashes, can benefit from an increased police presence. Motorists who routinely fail to yield the right-of-way to pedestrians, as required by law, or drive in excess of the speed limit are unlikely to change their behavior if they perceive that there are no consequences to their actions. Targeted enforcement of traffic safety laws and “sting” operations can reduce dangerous and illegal behaviors such as texting while driving or failing to yield for pedestrians in a crosswalk.

Hundreds of communities around the U.S. implement targeted crosswalk enforcement. In Las Vegas, for example, crossing decoys often wear seasonal costumes (such as a turkey at Thanksgiving, or a leprechaun in March) to earn greater media attention. While targeted crosswalk enforcement often results in citations, the greater impact comes through media publicity of the event to reinforce the importance of obeying pedestrian crossing laws.

Law Enforcement Training

Law enforcement officers play a daily role in helping to foster a culture of respect and responsibility among all road users. Regular trainings create a uniform understanding of their responsibilities with regard to traffic law enforcement for bicyclists, pedestrians, and motorists. Trainings can also create a dialogue between officers and other City staff, giving officers a chance to discuss ideas for new or revised legislation to further improve traffic safety. The City of Coppel should provide regular training sessions for law enforcement officers relating to bicyclist, pedestrian, and motorist traffic law and interactions among various modes of transportation.

Bicycle Patrol Unit

Bicycle patrol units are often used to increase social interaction between police departments and the people they serve. These units patrol neighborhoods, parks, special events and festivals, and other community-oriented events

The City of Coppel should utilize a Bicycle Patrol Unit to demonstrate the Department’s commitment to and investment in bicycling as an important transportation mode, both for the department and for the community at large.

Driver Citation Diversion

Other than one-time drivers education courses, there are few formal opportunities for motorists and/or bicyclists to learn the legal rights and



Figure 60: Coppel Police have created an atmosphere of respect and responsibility in school zones by actively enforcing school zone speed limits.



Figure 61: Officers in the Flower Mound Police Department Bicycle Patrol Unit occasionally ride with children to school and encourage safe riding and helmet use.

responsibilities specific to bicycling and walking. The Engineering, Parks and Recreation, and Planning Departments can work with the Police Department to develop traffic citation diversion classes so that road users (pedestrians, bicyclists, and/or motorists) who commit offenses known to endanger pedestrians and bicyclists can, at the discretion of the officer, be invited to take a safety and diversion class in lieu of paying fines.

Internal Practices and Policies

While the recommended facilities and programs described above provide direct and tangible benefits for Coppell residents and visitors, the City can also adopt internal practices and policies that integrate bicycling and walking into the very way the City does business. Adopting nationally-recognized standards and guidelines for facility design, prioritizing sidewalk infill and repair, and evaluating the effectiveness of new facilities and programs are all examples of internal practices and policies that support non-motorized transportation. The following recommendations provide engineering and evaluation opportunities.

Engineering

Sidewalk Prioritization Strategy

As indicated above, the Plan does not specifically recommend individual sidewalk segments or spot improvements. The sidewalk system in Coppell is very comprehensive and is in relatively good condition; however, cracked and heaving sidewalk slabs create tripping hazards and accessibility issues for pedestrians with limited mobility or mobility assistance devices, and minor gaps in the network reduce connectivity. Potential prioritization criteria may include the following:

- Feedback from the community;
- Proximity to schools;
- Proximity to parks and community centers;
- Proximity to commercial destinations; and
- Sidewalk condition (good, hazardous, missing, etc).

This prioritization process should be integrated into the ADA Transition Plan that the City will be developing in the near future.

Multi-Modal Streets Policy

Streets are planned, designed, constructed and maintained to accommodate all street users - pedestrians, bicyclists, transit users, and motor vehicle drivers. The Complete Streets movement in the United States has gained considerable traction over the last twenty years, with thousands of communities expressing their intent to create a truly multi-modal transportation system that supports safe travel for all roadway users.

The City of Coppell should consider drafting and adopting an ordinance or resolution to formalize and institutionalize the integration of all modes of transportation into roadway funding, design, construction, operations and maintenance. Establishing a municipal policy will delegate roles and responsibilities and create a system through which all transportation projects can be evaluated and will ensure the practice continues through changes in city staff and elected officials. Resources are available through the National Complete Streets Coalition, a program of Smart Growth America, a national non-profit dedicated to making communities work for everyone.

Bicycle and Pedestrian Wayfinding

Landmarks, destinations, neighborhood business districts, natural features and other visual cues help residents and visitors navigate through Coppell. However, many of the recommended bicycle routes utilize less familiar, lower-volume roadways that people may not typically use while traveling by bus or car. The placement of wayfinding signs throughout the City will indicate to bicyclists their direction of travel, location of destinations, and the distance (and travel time by bike) to those destinations, in turn increasing comfort, convenience and utility of the bicycle network. Wayfinding signs also provide a branding element to raise the

visibility of the City’s growing active transportation network. Wayfinding is critical to successful integration of on-street and off-street facilities into a seamless, interconnected network.

Bicycle & Pedestrian Design Guidelines

Design guidelines for sidewalks, trails, on-street bikeways, and other non-motorized transportation facilities can ensure consistent conditions for walking and bicycling throughout the community. Agencies and organizations like the Federal Highway Administration (FHWA), the National Association of City Transportation Officials (NACTO), and the American Association of State Highway Transportation Officials (AASHTO), and the Institute of Transportation Engineers (ITE) have developed numerous research and practice-based manuals to support local planners, engineers, and designers to create safe, effective and functional facilities for bicycle and pedestrian travel. As the City of Coppell continues to expand its network of non-motorized transportation facilities, the following manuals and design guidelines should be consulted to ensure project success.

Table 14: Design Guidelines and Reference Manuals

Manual	Agency	Year
Guide for the Planning, Design and Operation of Pedestrian Facilities	American Association of State Highway Transportation Officials (AASHTO)	2004
Manual on Uniform Traffic Control Devices	Federal Highway Administration (FHWA)	2009
Bicycle Parking Guidelines, 2nd Ed.	Association of Pedestrian and Bicycle Professionals	2010
Guide for the Development of Bicycle Facilities, 4th Ed.	American Association of State Highway Transportation Officials (AASHTO)	2012
Urban Street Design Guide	National Association of City Transportation Officials (NAACTO)	2013
Road Diet Informational Guide	Federal Highway Administration (FHWA)	2014
Urban Bikeway Design Guide, 2nd Ed.	National Association of City Transportation Officials (NAACTO)	2014
Separated Bikeway Planning and Design Guide	Federal Highway Administration (FHWA)	2015

Bicycle Parking Ordinance

While the expansion of the greenway and on-street bikeway network will draw additional bicyclists, the lack of convenient, accessible, and secure bicycle parking may deter residents and visitors from taking bicycle trips to local businesses, parks, schools, and other destinations in the community. The City of Coppell should develop and adopt a bicycle parking ordinance establishing minimum requirements for bicycle short- and long-term parking spaces in new developments and major renovations based on land use classification. A model bicycle parking ordinance has been included in the appendix for reference. The Association of Pedestrian and Bicycle Professionals’ Bicycle Parking Guide, 2nd Ed. (2010) should be consulted for additional guidance related to rack selection, installation, and maintenance.

Evaluation and Planning

Multi-Modal Crash Analysis and Reduction

A multi-modal approach to crash reduction is a comprehensive safety program that includes establishing measurable goals for reducing incidents and collisions for all modes of travel. By developing a system for routine analysis for pedestrian and bicycle-related crashes, other cities have been able to implement safety-driven, multi-modal enforcement programs along with strategic infrastructure changes. The City of Coppell should conduct a thorough analysis of reported bicycle and pedestrian crashes to identify high-crash locations, monitor the impact of capital improvements on crash rates, and develop specific recommendations

for countermeasures that reduce the likelihood of crashes and improve bicycle and pedestrian safety. Data can be obtained from TXDOT, NCTCOG, Coppell Police Department, and bicycle-driven crash inventories such as www.bikemaps.org. Such an analysis should be conducted every two years.

Bicycle and Pedestrian Count Program

Bicycle and pedestrian counts are a key metric that can determine the success of the City's efforts to increase bicycling and walking throughout the community. A successful count program will utilize a variety of techniques to measure Plan implementation and individual project impacts. The City should establish a count program to track levels of bicycling and walking at key locations throughout Coppell. Resources available through the National Bicycle and Pedestrian Documentation Project will assist the City in identifying count locations, training manual count volunteers, and extrapolating meaningful information from raw count data in order to make informed decisions and share successes with the community.

Bike and Walk Friendly Community Designation

The League of American Bicyclists' Bicycle Friendly Community program and the Federal Highway Administration and Pedestrian and Bicycle Information Center's Walk Friendly Community program acknowledge the efforts of local governments throughout the United States to support bicycling and walking as valued forms of transportation and recreation. Each organization utilizes the Five E's approach to creating bike and walk friendly communities, which groups activities into engineering, education, encouragement, enforcement and evaluation categories. Each of these five categories is integral to this comprehensive approach and must be embraced by the City in order to achieve either designation. Only five communities in Texas have achieved Bicycle Friendly Community status: Austin (Silver), Houston (Bronze), Richardson (Bronze), San Antonio (Bronze), and the Woodlands Township (Bronze). Only the City of Austin has achieved Walk Friendly Community status.

Chapter 6. Implementation

Introduction

The Coppel Bicycle and Pedestrian Master Plan provides a comprehensive set of recommendations and physical improvements that, once implemented, will increase safety, connectivity, accessibility, and comfort for bicycling and walking throughout the City. Implementing the Plan will require commitment, persistence, creativity, partnerships, funding, and continued community support. As the City of Coppel and its partners throughout the region continue to foster a bicycle- and pedestrian-friendly community for residents and visitors alike, a clear, action-oriented implementation strategy will be necessary to move the Plan forward.

This Plan is a vision and a guide to the future. It provides the blueprint for Coppel to develop a complete, connected, and safe non-motorized transportation network, increase opportunities for active transportation, and add to the quality of life that makes the City of Coppel a great place to live, work and play. With this charge firmly in mind, the following implementation actions and priorities provide a comprehensive strategy to realize the goals and objectives set forth in this Plan and establish Coppel as a premier community for walking and bicycling. They go beyond a list of infrastructure improvements and provide a framework to integrate active transportation into many aspects of the City processes.

Early Action Steps

The following early action steps are designed to initiate Plan implementation, sustain momentum from the planning process, and set the foundation for future progress. The following early action items, which represent a mix of policy, procedures, capital projects, and programs, provide early opportunities to engage community partners and establish strong and lasting relationships on which successful implementation efforts will depend. It should be understood that this list may not be feasible to execute these steps in order or immediately. Some items will need time to be included in City budgets or studied and reviewed by city staff or special committees.

Step 1: Adopt the Plan

Adopting the Plan is an important step, not just for its symbolic value representing the City's commitment to bicycling and walking, but also for its policy value as a guiding document for future capital investments and transportation decisions. The adoption process varies from community to community, depending on existing policies and procedures. The City of Coppel should undertake a formal adoption process and incorporate this Plan as a supplemental document supporting the Comprehensive Plan.

Step 2: Establish a Bicycle and Pedestrian Advisory Committee and Point Person for Bicycling in the City

Creating an active Bicycle and Pedestrian Advisory Committee will ensure that key stakeholders, agencies and organizations are involved in the implementation of the Plan and can report on its progress. Members of the Steering Committee for the planning process should be invited to serve on the Bicycle and Pedestrian Advisory Committee, along with other leaders throughout the community, including public safety representatives, Safe Cycling Coppel, and the Coppel Chamber of Commerce. This new committee should be a forum for active transportation leaders to convene periodically and discuss implementation progress, keep members up-to-date on bicycle- and pedestrian-related projects throughout the region, share resources and

tools, and maintain momentum for bicycling and walking in the community. Key duties of the committee should include the following:

- Champion for implementing the Bicycle and Pedestrian Master Plan;
- Advise the City on plan implementation;
- Facilitate cooperation among local agencies and jurisdictions;
- Identify and recommend sources of funding;
- Coordinate outreach and programming efforts;
- Apply for Bicycle Friendly Community and Walk Friendly Community Status; and
- Monitor plan implementation through various performance measures.

The committee can also function as a conduit to the community at-large, sharing information about implementation progress and achievements and directing residents and visitors to the appropriate resources and information.

Another element of this step will be to designate a point person, called the Bicycle Coordinator, from existing city staff, to serve in the role of liaison to this committee as well as point person for walking and bicycling issues. Ideally this representative will be from public works or city administration so that they can coordinate between departments in working with activities and initiatives of the advisory committee. Designating this staff person is key to a bicycling friendly community application.

Step 3: Complete Funded Projects

The City of Coppell has a number of projects in various stages of development that will enhance bicycle and pedestrian safety, connectivity and accessibility. Roadway projects on MacArthur Blvd, Freeport Pkwy, and Bethel Rd, as well as trail projects like the Grapevine Springs Trail near Pinkerton Elementary and the Grapevine Creek Trail from MacArthur Blvd to Grapevine Creek Park will have a significant impact on non-motorized transportation, improving safety along busy roadways and increasing connectivity to local destinations. The completion of these projects will be a significant accomplishment for the City of Coppell, expanding opportunities for non-motorized transportation and recreation and demonstrating the City's commitment to walking and bicycling.

Step 4: Establish Baseline Counts and Measurements

Continual monitoring of implementation progress is essential to the success of the Plan. Baseline measurements of key data like bicycling and walking activity, crash rates, miles of facilities, program participation numbers, and travel mode share provide a point of comparison to determine the impact of infrastructure projects and supporting education, encouragement, and enforcement programs. Bicycle and pedestrian counts and other performance measurements are discussed in further detail later in this chapter.

Step 5: Consider a Bicycle Parking Ordinance or Adopt Nationally Accepted Parking Guidelines

While the expansion of the trail and on-street bikeway network will draw additional bicyclists, the lack of convenient, accessible, and secure bicycle parking may deter residents and visitors from taking bicycle trips to local businesses, parks, schools, and other destinations in the community. The City of Coppell should consider developing and adopting a bicycle parking ordinance establishing minimum requirements for bicycle parking spaces in new developments and major renovations based on land use classification. A model bicycle parking ordinance has been included in the appendix for reference. The Association of Pedestrian and Bicycle Professionals' *Bicycle Parking Guide, 2nd Ed.* (2010) should be consulted for additional guidance related to rack selection, installation, and maintenance.

Step 6: Develop a Sidewalk Improvement Priority Strategy

While the sidewalk system in Coppell is in relatively good condition, cracked and heaving sidewalk slabs create accessibility issues for pedestrians with limited mobility or mobility assistance devices, and minor

gaps in the network reduce connectivity. The City of Coppell should develop a prioritization strategy to address these issues based on factors like community complaints, proximity to schools, parks, and other community destinations. This is likely to happen in the upcoming ADA Transition plan.

Step 7: Seek Funding for High Priority Projects

High priority projects have been identified based on their ability to meet plan goals and improve safety, accessibility, connectivity. These projects will have the most significant impact in creating a community in which bicycling and walking are safe, comfortable and convenient forms of transportation for people of all ages and abilities. Funding for bikeway projects can be very competitive, and the project development process can significantly increase the amount of time it takes to construct bicycle and pedestrian projects. With these considerations in mind, it is imperative that the City of Coppell begin to identify and pursue traditional and innovative funding sources to implement high priority projects.

Step 8: Create an Online Presence for Bicycling and Walking

By creating and adopting this Bicycle and Pedestrian Master Plan, the City has communicated to the community its commitment to walking and bicycling as safe, comfortable and convenient transportation choices for people of all ages and abilities throughout Coppell. The City should continue to communicate with residents and stakeholders by establishing an online presence to share information, provide updates on projects and events, and receive feedback and information from residents. By providing resources like this Plan, bicycling and walking maps, local ordinances, regional projects and resources like those found on NCTCOG's webpage, and links to community partners' initiatives, the City can equip residents and visitors with the information they need to incorporate walking and bicycling into their daily trips.

Funding Sources

Funding bicycle and pedestrian capital projects and supporting programs will require a diverse and creative approach. While the funding landscape at the federal level remains uncertain, the City of Coppell must still pursue federal transportation dollars through the current extension of the transportation bill, yet be flexible and spontaneous enough to capitalize on partnerships, in-kind matches, and other non-traditional opportunities to implement the Plan. The following section of this chapter provides an overview of funding sources that should be utilized.

Federal Funding Sources

The federal government has numerous programs and funding mechanisms to support bicycle and pedestrian projects, most of which are administered by the US Department of Transportation in cooperation with state and regional entities. The following federal programs are made available to local communities in Texas through state and regional entities, including Texas Department of Transportation, Texas Department of Parks and Wildlife, the North Central Texas Council of Governments, and Dallas County.

MAP-21

The Federal Highway Administration directs the current surface transportation funding and authorization bill, Moving Ahead for Progress in the 21st Century, commonly referred to as MAP-21. Many of the funding programs from the previous transportation bill, the Safe, Accountable, Flexible, Efficient Transportation Equity Act: A Legacy for Users (SAFETEA-LU), have been consolidated and reorganized in a manner that allows for greater discretion for state and local entities. The bill has been reauthorized several times. The TXDOT, with support from NCTCOG, is responsible for establishing application procedures, reviewing applications, and awarding and administering MAP-21 funding in the Dallas-Fort Worth Metroplex. The following MAP-21 programs consider bicycle and pedestrian projects an eligible activity for which funding may be allocated.

Transportation Alternatives Program (TAP)

The Transportation Alternatives Program (TAP) provides funding for a variety of non-motorized transportation facilities and activities previously funded under separate program categories in SAFETEA-LU, including the Recreational Trails Program, Transportation Enhancements, and Safe Routes to Schools. Eligible activities and projects include on- and off-road pedestrian and bicycle facilities, infrastructure projects improving access to public transportation, recreational trails projects, projects and systems that provide safe routes for non-drivers, safe routes to school projects, and boulevards and roadways in the right-of-way of former Interstate System routes.

Congestion Mitigation and Air Quality Improvement (CMAQ)

CMAQ funds transportation projects to reduce ozone and carbon monoxide pollution and meet national ambient area air quality standards (NAAQS) in Clean Air Act non-attainment areas. The construction of pedestrian and bicycle facilities using CMAQ funding must explicitly provide a transportation function. CMAQ can provide funds for projects that bring sidewalks into compliance with the Americans with Disabilities Act (ADA). Non-construction projects such as printed materials related to safe walking are eligible for CMAQ funds as well. These projects must be geared towards walking primarily for transportation rather than recreation and must be included in a plan developed by the State and each Metropolitan Planning Organization.

Highway Safety Improvement Program (HSIP)

The Highway Safety Improvement Program (HSIP) is intended to achieve significant reduction in traffic fatalities and serious injuries on all public roads by funding projects, strategies and activities consistent with a state's Strategic Highway Safety Plan (SHSP).

Surface Transportation Program (STP)

The Surface Transportation Program (STP) provides funding that may be used by States and localities for projects to preserve and improve the conditions on any Federal-aid highway, bridge and tunnel projects, public road projects, pedestrian and bicycle infrastructure, and transit capital projects. Bicycle and pedestrian infrastructure projects include ADA sidewalk modification, recreational trails, bicycle transportation, on- and off-road trail facilities for non-motorized transportation, and infrastructure projects and systems that will provide safe routes for non-drivers, including children, older adults and individuals with disabilities to access daily needs.

Section 402 State and Community Highway Safety Grant Program

Section 402 funds can be used to develop education, enforcement and research programs designed to reduce traffic crashes, deaths, severity of crashes, and property damage. Eligible program areas include reducing impaired driving, reducing speeding, encouraging the use of occupant protection, improving motorcycle safety, and improving bicycle and pedestrian safety. Examples of bicycle and pedestrian safety programs funded by Section 402 are comprehensive school-based pedestrian and bike safety education programs, helmet distribution programs, pedestrian safety programs for older adults, and general community information and awareness programs.

TIGER Discretionary Grants Program

The Department of Transportation's Transportation Investment Generating Economic Recovery (TIGER) Discretionary Grants Program was created as part of the American Recovery and Reinvestment Act of 2009 with the purpose of funding road, rail, transit and port projects that achieve critical national objectives, including livability, economic competitiveness, environmental sustainability, and safety. More than \$500M was made available in FY 2014. 72 applications were funded, many of which focused or incorporated active transportation elements. One grant recipient was the NCTCOG, whose Land Use-Transportation Connections to Sustainable Schools project was awarded \$210,000 to create a structured dialogue to improve transportation safety and multimodal transportation options to schools. Awards ranged from \$125,000 to \$25M.

Land and Water Conservation Fund (LWCF)

The goal of the Land and Water Conservation Fund is the creation and maintenance of high quality recreation resources through the acquisition and development of public outdoor recreation areas and facilities. The program operates on a reimbursing basis. The local sponsor matches 50% of the project cost prior to applying for the grant. After the project is approved, the sponsoring park and recreation board receives a reimbursement of 50% of the actual project costs. Applicants must submit a bill to the grant coordinator to request the federal share of the cost throughout the grant term.

Community Development Block Grant Program (CDBG)

While not traditionally viewed as a source of funding for bicycle and pedestrian projects, the Community Development Block Grant (CDBG) program provides money for streetscape revitalization and other improvements that can enhance walking and bicycling. Federal Community Development Block Grant grantees may “use Community Development Block Grants funds for activities that include, but are not limited to: acquiring real property; reconstructing or rehabilitating housing and other property; building public facilities and improvements, such as streets, sidewalks, community and senior citizen centers and recreational facilities; paying for planning and administrative expenses, such as costs related to developing a consolidated plan and managing Community Development Block Grants funds; provide public services for youths, seniors, or the disabled; and initiatives such as neighborhood watch programs.” The Dallas County Department of Planning and Development receives an allotted amount of funds through the US Department of Housing and Urban Development Community Development Block Grant Program (CDBG). Roughly 65% of the funds are allocated to 16 municipalities in Dallas County with populations of less than 50,000. Allocation is based on population and percentage of population classified as low and moderate income. In 2015, no funds were allocated to the City of Coppell.

State Funding Sources

Texas Parks & Wildlife’s Recreation Grants

The Texas Parks & Wildlife Department provides local agencies and organizations with a variety of funding sources to develop places and programs that support recreation activities and connect Texans to the state’s diverse and abundant natural resources. The Outdoor and Indoor Recreation Grants each provide a 50% funding match for local units of governments to acquire and develop parkland, renovate existing public recreation areas, and construct recreation centers, nature centers, and other park facilities.

Local Funding Sources

While external funding sources for bicycle and pedestrian projects and programs continue to be in short supply and high demand, local funds can often be the most reliable funding source to get a project done or develop an encouragement or education program. In addition, local funding is often required as match for external funding sources. With this in mind, it is imperative that the City of Coppell explore, identify, and pursue one or more of these local funding strategies as a means of implementing the plan.

Sales Tax Revenue

The City of Coppell has multiple sales tax revenue streams that allow the City to provide a high level of service to residents and visitors through high quality infrastructure, amenities, and services. These include:

- the 1-percent sales tax for general revenue;
- the ¼-percent Crime Prevention and Control District sales tax;
- the ¼-percent Street Maintenance sales tax, which is expected to generate over \$4M in FY 2014-2015; and
- the ½-percent CRDC sales tax, which was recently reauthorized and expanded to improve existing community facilities and amenities, including the Andrew Brown Jr Park system, green spaces, and trails projects throughout the City.

Capital Improvement Plan Set-Aside

As with most cities, Coppell has limited funds with which to implement bicycle and pedestrian projects and programs. By creating a dedicated set-aside in the Capital Improvement Plan, the City can focus, prioritize, and plan for capital expenditures for trails, on-street bikeways, and other projects that improve conditions for walking and bicycling. This set-aside may also be used as a local match for external funding sources, or as contributory towards bicycle and pedestrian elements of larger projects. Dedicated funding sources for supporting education and encouragement programs should also be established within the Parks and Recreation Department budget.

Impact Fees

Local governments in the State of Texas may adopt local ordinances imposing an impact fee on new development within their jurisdiction in order to fund infrastructure improvements that support development and the community at-large, including parks, recreational facilities, roads, bridges, water treatment and distribution facilities, and drainage control. Enabling legislation for impact fees was adopted by the Texas state legislature and signed into law in 1987. The City of Coppell currently assesses impact fees for water, sewer and roadway facilities as authorized in Chapter 17 of the City's Code of Ordinances.

Public Improvement Districts

In 1987, the State of Texas passed into law the Public Improvement District Assessment Act, which allows counties and municipalities to levy and collect special assessments in order to finance public infrastructure to promote economic growth and development. A Public Improvement District can be established for the construction of street and sidewalk improvements; park, recreation and cultural improvements; the creation of pedestrian malls; public safety and security; landscaping and aesthetic improvements; and a host of other capital projects.

Performance Measures

Data gathering and analysis is essential to communicating the success of implementation efforts to stakeholders, media, and the public at large. Data can be used to track community transformation through changes in infrastructure, activity and attitudes over time. The performance metrics listed in the table should be explored for their potential to monitor and communicate implementation progress.

Table 15: Performance Measurement Data and Sources

Data	Source
Journey to work (mode share)	American Community Survey (ACS), US Census Bureau
Bicycle and pedestrian crash data	Coppell Police Department, TXDOT
Miles of bicycle and pedestrian facilities	City of Coppell
Bicycle and pedestrian levels of service	City of Coppell
Bicycle and pedestrian activity/counts	Manual and automatic screen line counts
Residents' perceptions, attitudes and behaviors	Intercept surveys, online surveys
Economic impact	Property values, sales tax revenue
Number of education and encouragement programs and participation	Statistics from Parks and Recreation Department and partnering organizations
Network coverage (percent of population within ¼ mile of pedestrian facilities and ½ mile of bicycle facilities)	City of Coppell GIS database, US Census Bureau
Motor vehicle volumes on bikeway corridors	City of Coppell traffic counts

Number of bicycle parking racks/spaces	City of Coppell GIS database
Number of bicycle friendly businesses	League of American Bicyclists

The following evaluation actions and programs support an accountable and transparent implementation process and create feedback loops through which future needs, issues and opportunities can be identified.

Bicycle and Pedestrian Count Program

Establishing a citywide pedestrian and bicycle counts program helps collect quantitative data to track bicycling and walking trends and measure the success of walking and bicycling projects. The City of Coppell should develop a bicycle and pedestrian count program comprised of manual counts, automatic counts, and intercept surveys. Volunteer support from community groups like Living Well in Coppell or Coppell Senior High School for manual counts can actively engage community residents and increase awareness for bicycling and walking. Counts are usually schedule in early September on two days in the middle of the week. In addition, counts should be collected before projects are started and following completion to measure resulting usage.

Biennial Bicycling and Walking Report Card

The City of Coppell should publish a report every two years summarizing implementation progress. The report card can highlight completed greenways and bicycle facilities, share stories of successful programs and partnerships, and use data collected over time to quantify the impact of the plan on health, transportation, equity, and economic activity. The document can be posted on the City's website, distributed via social media, and printed for dissemination at public facilities and community events.

Bicycle and Pedestrian Crash Analysis

Crash reports from collisions involving bicyclists and pedestrians can be an invaluable resource for learning about the behavior of motorists, bicyclists, and walkers, as well as roadway conditions and characteristics that may lead to collisions. The City of Coppell should conduct a thorough analysis of reported bicycle and pedestrian crashes to identify high-crash locations, monitor the impact of capital improvements on crash rates, and develop specific recommendations for countermeasures that reduce the likelihood of crashes and improve bicycle and pedestrian safety. Data can be obtained from TXDOT, NCTCOG, Coppell Police Department, and bicycle-driven crash inventories such as www.bikemaps.org. Such an analysis should be conducted every two years.

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Appendix A: Design Guidelines

Introduction

Streets serve a multitude of functions: providing access to places, goods and services, serving as public space, capturing, channeling and sometimes filtering stormwater, and serving as corridors for key utility systems. Streets are such an integral part of everyday life, it is important that we maximize their value and their safety.

Coppell's streets take several forms and serve a variety of functions. They can provide a safe, peaceful route for children to walk or bicycle to school; a way for employees to get to work by bicycle, automobile or public transit; a place for residents and visitors to access shopping and dining; and for people to just sit and relax. It is critical that these corridors move people and goods safely and efficiently. When total preference is given to a particular use, this usually comes at the expense of other uses. Therefore, Coppell's streets should be designed to give sufficient consideration to all uses.

The purpose of this section of the Plan is to provide a framework of best practices in bicycle and pedestrian facility design as a guide for Coppell to use in its efforts towards developing a network of Complete Streets and trails throughout the City, for the benefit of all residents and visitors.



Figure 62: Complete streets take many different forms. In Indianapolis, Indiana, the Indianapolis Cultural Trail provides a cycle track to separate bicyclists from both pedestrians and motor vehicles.

Design for Pedestrians

The transportation network should accommodate pedestrians with a variety of needs, abilities, and possible impairments. Age is one major factor that affects pedestrians' physical characteristics, walking speed, and environmental perception. Children have low eye height and walk at slower speeds than adults. They also perceive the environment differently at various stages of their cognitive development. Older adults walk more slowly and may require assistive devices for walking stability, sight, and hearing.

The Manual of Uniform Traffic Control Devices (MUTCD) recommends a normal walking speed of three and a half feet per second when calculating the pedestrian clearance interval at traffic signals. Typical walking speeds can drop to two and a half to three feet per second in areas with older populations and persons with mobility impairments. While the type and degree of mobility impairment varies greatly across the population, the transportation system should accommodate these users to the greatest reasonable extent.

Sidewalks

Sidewalks are the most fundamental element of the walking network, as they provide an area for pedestrian travel that is separated from vehicle traffic. Sidewalks are typically constructed of concrete and are separated from the roadway by a curb and gutter and preferably a landscaped planting strip area. Sidewalks are a common application in both urban and suburban environments.

Sidewalks should be more than areas to travel; they should provide places for people to interact. There should be places for standing, visiting, and sitting. Sidewalks should contribute to the character of neighborhoods and business districts, strengthen their identity, and be an area where adults and children can safely participate in public life.

Attributes of well-designed sidewalks include the following:

Accessibility: A network of sidewalks should be accessible to all users. Roadway crossing distances and distances between crossings should be minimized to accommodate and encourage pedestrian travel.

Adequate width: Two people should be able to walk side-by-side. Different walking speeds should be



Figure 63: An inviting streetscape that supports pedestrian activity can bolster commercial activity.



Figure 64: Benches, planters, pedestrian-scale street lighting create a unique pedestrian environment.

possible. In areas of intense pedestrian use, sidewalks should accommodate the high volume of walkers.

Safety: Design features of the sidewalk should allow pedestrians to have a sense of security and predictability. Sidewalk users should not feel they are at risk due to the presence of adjacent traffic.

Continuity: Walking routes should be obvious and should not require pedestrians to travel out of their way unnecessarily.

Landscaping: Plantings and street trees should contribute to the overall psychological and visual comfort of sidewalk users, and be designed in a manner that contributes to the safety of people.

Drainage: Sidewalks and curb ramps should be designed so that standing water is minimized.

Social space: There should be places for standing, visiting, and sitting. The sidewalk area should be a place where adults and children can safely participate in public life.

Quality of place: Sidewalks should contribute to the character of neighborhoods and business districts.



Figure 65: Landscaping like street trees and planters can shade the sidewalk and provide a comfortable experience for pedestrians.



Figure 66: Wide sidewalks allow for socialization and a diversity of uses.

Sidewalk Zones

The sidewalk area can be broken down into four distinct zones:

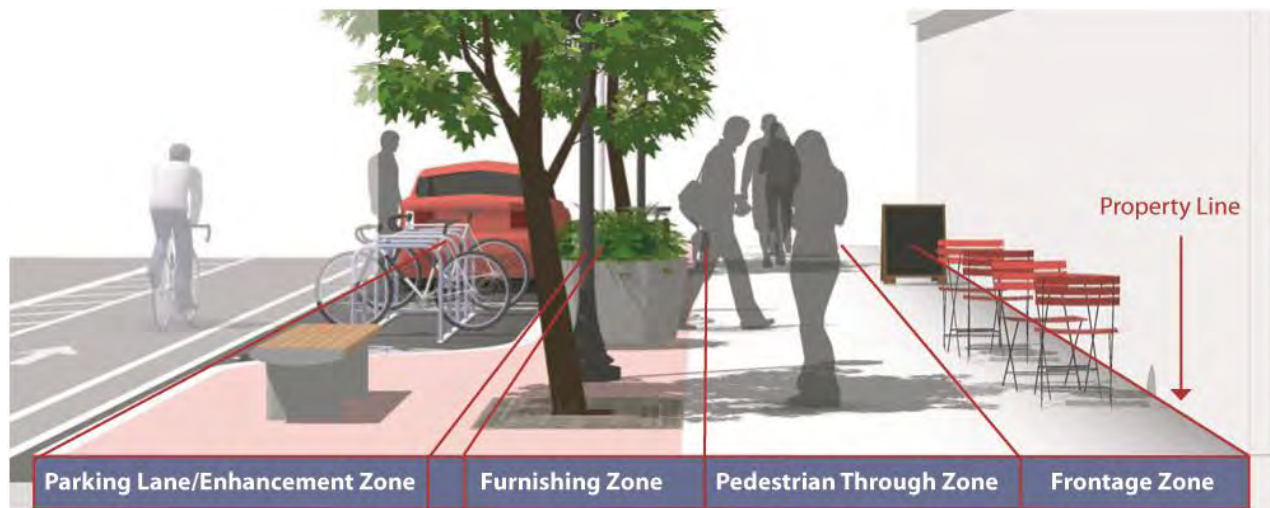


Figure 67: The four sidewalk zones.

The Frontage Zone allows pedestrians a comfortable “shy” distance from the building fronts. It provides opportunities for window shopping, to place signs, planters, or chairs. Not applicable if adjacent to a landscaped space.

The Pedestrian through Zone is the area intended for pedestrian travel. This zone should be entirely free of permanent and temporary objects. Wide through zones are needed in downtown areas or where pedestrian flows are high.

The Furnishing Zone buffers pedestrians from the adjacent roadway, and is also the area where elements such as street trees, signal poles, bicycle racks, signs, and other street furniture are properly located.

The Parking Lane/Enhancement Zone acts as a flexible space to further buffer the sidewalk from moving traffic. Curb extensions and bike corrals may occupy this space where appropriate.

The concept of sidewalk zones should be strictly followed, particularly in dense commercial areas, for a sidewalk to function properly and provide safe passage for all users. This is especially important for users with visual or physical impairments to be able to effectively navigate the corridor.

Other considerations such as sidewalk obstructions, driveways, width and access through construction areas are important to consider as well.

Intersections

Intersections are also an important piece of the pedestrian realm. Attributes of pedestrian-friendly intersection design include:

Clear Space: Corners should be clear of obstructions. They should also have enough room for curb ramps, for transit stops where appropriate, and for street conversations where pedestrians might congregate.

Visibility: It is critical that pedestrians on the corner have a good view of vehicle travel lanes and that motorists in the travel lanes can easily see waiting pedestrians.

Legibility: Symbols, markings, and signs used at corners should clearly indicate what actions the pedestrian should take.

Accessibility: All corner features, such as curb ramps, landings, call buttons, signs, symbols, markings, and textures, should meet accessibility standards and follow universal design principles.

Separation from Traffic: Corner design and construction should be effective in discouraging turning vehicles from driving over the pedestrian area. Crossing distances should be minimized.

Lighting: Good lighting is an important aspect of visibility, legibility, and accessibility.

These attributes will vary with context but should be considered in all design processes. For example, more remote intersections may have limited or no signing. However, legibility regarding appropriate pedestrian movements should still be taken into account during design.



Figure 68: Bulb-outs increase motorists' visibility of pedestrians while also reducing turning speeds.



Figure 69: Push button-activated crosswalks and pedestrian signal heads encourage pedestrian compliance at larger intersections.

Design for Bicyclists

Bicyclists, by nature, are much more affected by poor facility design, construction and maintenance practices than motor vehicle drivers. Bicyclists lack the protection from the elements and roadway hazards provided by an automobile's structure and safety features. By understanding the unique characteristics and needs of bicyclists, a facility designer can provide quality facilities and minimize user risk.

Similar to motor vehicles, bicyclists and their bicycles exist in a variety of sizes and configurations. These variations occur in the types of vehicle (such as a conventional bicycle, a recumbent bicycle or a tricycle), and behavioral characteristics (such as the comfort level of the bicyclist). The design of a bikeway should consider reasonably expected bicycle types on the facility and utilize the appropriate dimensions.

It is important to consider bicyclists of all skill levels when creating a non-motorized plan or project. Bicyclist skill level greatly influences expected speeds and behavior, both in separated bikeways and on shared roadways. Bicycle infrastructure should accommodate as many user types as possible, with decisions for separate or parallel facilities based on providing a comfortable experience for the greatest number of people.

The bicycle planning and engineering professions currently use several systems to classify the population, which can assist in understanding the characteristics and infrastructure preferences of different bicyclists. The most conventional framework classifies the "design cyclist" as Advanced, Basic, or Child. A more detailed understanding of the US population as a whole is illustrated in the adjacent figure. Developed by planners in Portland, OR and supported by data collected nationally since 2005, this classification provides the following alternative categories to address varying attitudes towards bicycling in the US:

Strong and Fearless (approximately 1% of population) – Characterized by bicyclists that will typically ride anywhere regardless of roadway conditions or weather. These bicyclists can ride faster than other user types, prefer direct routes and will typically choose roadway connections - even if shared with vehicles -- over separate bicycle facilities such as shared use paths.

Enthusied and Confident (5-10% of population) – This user group encompasses bicyclists who are fairly comfortable riding on all types of bikeways but usually choose low traffic streets or shared use paths when available. These bicyclists may deviate from a more direct route in favor of a preferred facility type. This group includes all kinds of bicyclists such as commuters, recreationalists, racers and utilitarian bicyclists.

Interested but Concerned (approximately 60% of population) – This user type comprises the bulk of the cycling population and represents bicyclists who typically only ride a bicycle on low traffic streets or multi-use trails under favorable weather conditions. These bicyclists perceive significant barriers to their increased use of cycling, specifically traffic and other safety issues. These people may become "Enthusied & Confident" with encouragement, education and experience and higher level facilities, such as buffered and protected bike lanes.

No Way, No How (approximately 30% of population) – Persons in this category are not bicyclists, and perceive severe safety issues with riding in traffic. Some people in this group may eventually become regular cyclists with time and education. A significant portion of these people will not ride a bicycle under any circumstances.

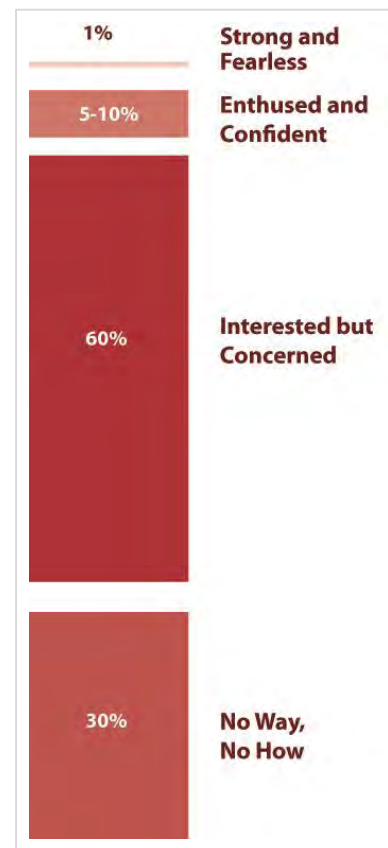


Figure 70: The four types of cyclists.

Shared Roadways

On shared roadways, bicyclists and motor vehicles use the same roadway space. These facilities are typically used on roads with low speeds and traffic volumes, however they can be used on higher volume roads with wide outside lanes or shoulders. A motor vehicle driver will usually have to cross over into the adjacent travel lane to pass a bicyclist, unless a wide outside lane or shoulder is provided.

Shared roadways employ a large variety of treatments from simple signage and shared lane markings to more complex treatments including directional signage, traffic diverters, chicanes, chokers, and/or other traffic calming devices to reduce vehicle speeds or volumes.

Signed Shared Roadway

Signed Shared Roadways are facilities shared with motor vehicles. They are typically used on roads with low speeds and traffic volumes, however can be used on higher volume roads with wide outside lanes or shoulders. A motor vehicle driver will usually have to cross over into the adjacent travel lane to pass a bicyclist, unless a wide outside lane or shoulder is provided.

Bicycle Route signage (Manual of Uniform Traffic Control Devices Sign D11-1) should be applied in the following circumstances:

- Beginning or end of Bicycle Route.
- At major changes in direction or at intersections with other bicycle routes.
- At intervals along bicycle routes not to exceed $\frac{1}{2}$ mile.

Marked Shared Roadway

A marked shared roadway is a general purpose travel lane marked with shared lane markings (SLM) used to encourage bicycle travel and proper positioning within the lane. In constrained conditions, the SLMs are placed in the middle of the lane to discourage unsafe passing by motor vehicles. On a wide outside lane, the SLMs can be used to promote bicycle travel to the right of motor vehicles. In all conditions, SLMs should be placed outside of the door zone of parked cars.



Figure 71: While not all roads have bicycle facilities, markings or signage, bicyclists may travel on any road except interstate highways.



Figure 72: Bicycle route signs like these help to direct bicyclists to local destinations.



Figure 73: Shared lane markings help cyclists position themselves within the travel lane.

Bicycle Boulevards

Bicycle Boulevards are low-volume, low-speed streets modified to enhance a bicyclist's experience by using treatments such as signage, pavement markings, traffic calming and/or traffic reduction, and intersection modifications. These treatments, also referred to as bicycle boulevards or quiet streets, allow through movements of bicyclists while discouraging similar through-trips by non-local motorized traffic.

Jurisdictions throughout the country use a wide variety of strategies to determine where specific treatments are applied. While no federal guidelines exist, several best practices have emerged for the development of bicycle boulevards. At a minimum, bicycle boulevards should include distinctive pavement markings and wayfinding signs. They can also use combinations of traffic calming, traffic diversion, and intersection treatments to improve the bicycling environment. The appropriate level of treatment to apply is dependent on roadway conditions, particularly motor vehicle speeds and volumes.



Figure 74: This Bicycle Boulevard in Portland, Oregon provides a comfortable experience for bicyclists of all types.

Route Selection. Bicycle boulevards should be developed on streets that improve connectivity to key destinations and provide a direct route for bicyclists. Bicycle boulevards parallel to commercial streets improve access for “interested but concerned” bicyclists and complement bike lanes on major roadways. Local streets with existing traffic calming, traffic diversions, or signalized crossings of major streets are good candidates, as they tend to be existing bicycle routes and have low motor vehicle speeds and volumes. Other streets where residents have expressed a desire for traffic calming are also good options.

Basic Treatments. Signs and pavement markings are the minimum treatments necessary to designate a street as a bicycle boulevard. Together, they visibly designate a roadway to both bicyclists and motorists. Signs, and in some cases pavement markings, provide wayfinding to help bicyclists remain on the designated route.



Figures 75 and 76: A combination of pavement markings and distinct signs distinguish bicycle boulevards from other shared travel lanes.

Additional Treatments. Vertical and horizontal traffic calming, intersection improvements, and even traffic diversion can be used to complement basic signage and pavement markings, improve safety, and reduce vehicle speeds and traffic volumes.

Common vertical traffic calming elements employed to reduce vehicle speed include speed humps, speed tables and raised crosswalks, which help to slow motor vehicles.

Horizontal traffic calming elements like curb extensions, chicanes, and traffic circles cause drivers to slow down by restricting the roadway space or by requiring careful maneuvering. Such measures may reduce the design speed of a street, and can be used in conjunction with reduced speed limits to reinforce the expectation of lowered speeds.

Intersection improvements are aimed at improving safety for all road users while giving priority to bicycle movements. These include stop signs at cross-streets, traffic circles, curb extensions, bike boxes, median islands, hybrid beacons, and rectangular rapid flashing beacons.

Traffic diversion measures are designed to reduce motor vehicle traffic volumes, which in turn increase bicyclists' comfort while also decreasing opportunities for conflict. Such traffic diversion measures include partial closures, diagonal diverters, median diverters, and even full closures.

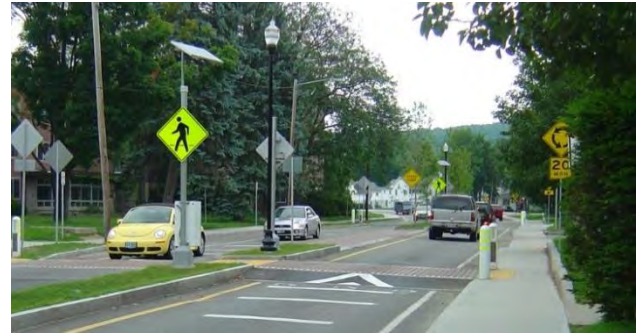


Figure 77: A raised crosswalk doubles as a speed table to reduce motor vehicle speeds.



Figure 80: Traffic diverters allow through bicycle movements while restricting motor vehicle traffic.



Figure 78: Traffic circles have proven to be effective intersection treatments for bicycle boulevards.

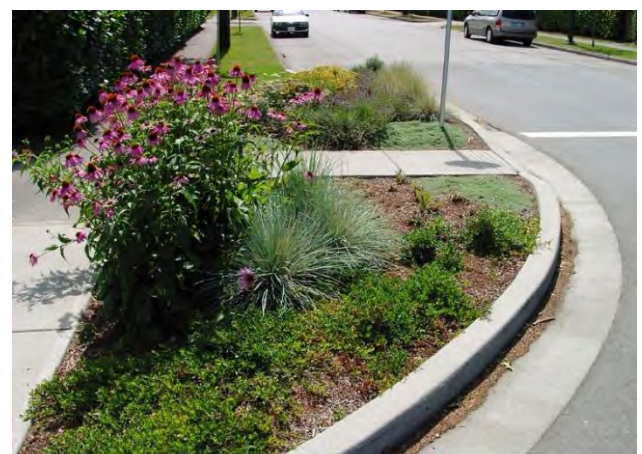


Figure 79: Curb extensions reduce turning radii and shorten pedestrian crossing distances.

Separated Bikeways

Shoulder Bikeway

Description. Typically found in less-dense areas, shoulder bikeways are paved roadways with striped shoulders (4'+) wide enough for bicycle travel. Shoulder bikeways often, but not always, include signage alerting motorists to expect bicycle travel along the roadway. Shoulder bikeways should be considered a temporary treatment, with full bike lanes planned for construction when the roadway is widened or completed with curb and gutter. This type of treatment is not typical in urban areas and should only be used where constraints exist.

Guidance. If 4 feet or more is available for bicycle travel, the full bike lane treatment of signs, legends, and an 8" bike lane line would be provided. If it is not possible to meet minimum bicycle lane dimensions, a reduced width paved shoulder can still improve conditions for bicyclists on constrained roadways. In these situations, a minimum of 3 feet of operating space should be provided.



Figure 81: Shoulder bikeways provide a functional facility in rural contexts.



Figure 82: Shoulder bikeways are similar to bike lanes, but lack curbs and gutters like their more urban counterparts.

Bike Lane

Description. Bike lanes designate an exclusive space for bicyclists through the use of pavement markings and signage. The bike lane is located adjacent to motor vehicle travel lanes and is used in the same direction as motor vehicle traffic. Bike lanes are typically on the right side of the street, between the adjacent travel lane and curb, road edge or parking lane.

Many bicyclists, particularly less experienced riders, are more comfortable riding on a busy street if it has a striped and signed bikeway than if they are expected to share a lane with vehicles.

Bike lanes adjacent to on-street parallel parking require special treatment in order to avoid crashes caused by an open vehicle door. The bike lane should have sufficient width to allow bicyclists to stay out of the door zone while not



Figure 83: Bicycle lanes provide dedicated space on the roadway for bicyclists.

encroaching into the adjacent vehicular lane. Parking stall markings, such as parking “Ts” and double white lines create a parking side buffer that encourages bicyclists to ride farther away from the door zone.

Guidance. Bike lanes should be a minimum of 4 feet when no curb and gutter is present. When curb and gutter are present, a 5 foot minimum is required, or 3 feet more than the gutter pan width if the gutter pan is wider than 2 feet.

On arterial roads with higher speeds, greater widths are recommended. However, in order to discourage motor vehicle use of the bike lane, a 7 foot maximum width is recommended.

For a bike lane adjacent to on-street parallel parking, 12-foot minimum from curb face to edge of bike lane is required, with a preferred width of 14.5 feet.

Conventional front-in diagonal parking is not compatible or recommended with the provision of bike lanes, as drivers backing out of conventional diagonal parking have limited visibility of approaching bicyclists. Under these conditions, shared lane markings should be used to guide bicyclists away from reversing automobiles.

Buffered Bike Lane

Description. Buffered bike lanes are conventional bicycle lanes paired with a designated buffer space, separating the bicycle lane from the adjacent motor vehicle travel lane and/or parking lane. Buffered bike lanes are allowed as per MUTCD guidelines for buffered preferential lanes in Section 3D-01.

Buffered bike lanes are designed to increase the space between the bike lane and the travel lane or parked cars. This treatment is appropriate for bike lanes on roadways with high motor vehicle traffic volumes and speed, adjacent to parking lanes, or a high volume of truck or oversized vehicle traffic.

Guidance. Where bicyclist volumes are high or where bicyclist speed differentials are significant, the desired bicycle travel area width is 7 feet.

Buffers between the bike lane and adjacent travel lane or parking lane should be at least 2 feet wide. If 3 feet or wider, buffers should be marked with diagonal or chevron hatching.



Figure 84: This bike lane example provides an extra two feet of buffer space to provide greater separation from parked vehicles.



Figure 85: Buffer zones can be provided on both sides of the bike lane, increasing separation from both parked and traveling motor vehicles.



Figure 86: Buffered bicycle lanes are becoming more common throughout the United States.

Cycle Track / Separated Bike Lane

Overview. A cycle track is an exclusive bike facility that combines the user experience of a separated path with the on-street infrastructure of a conventional bike lane. A cycle track is physically separated from motor traffic and distinct from the sidewalk. This separation offers a higher level of comfort than bike lanes and are attractive to a wider spectrum of the public. Cycle tracks have different forms but all share common elements—they provide space that is intended to be exclusively or primarily used by bicycles, and are separated from motor vehicle travel lanes, parking lanes, and sidewalks.

Cycle tracks may be one-way or two-way, and may be at street level, sidewalk level or at an intermediate level. If at sidewalk level, a curb or median separates them from motor traffic, while different pavement color/texture separates the cycle track from the sidewalk. If at street level, they can be separated from motor traffic by raised medians, on-street parking or bollards.



Figure 88: This two-way cycle track is separated from motor vehicle travel lanes by a raised concrete barrier.



Figure 87: A raised cycle track in Cambridge, Massachusetts.

A two-way cycle track is desirable when more destinations are on one side of a street (therefore preventing additional crossings), if the facility connects to a path or other bicycle facility on one side of the street, or if there is not enough room for a cycle track on both sides of the road.

Intersections and approaches must be carefully designed to promote safety and facilitate left-turns from the right side of the street.

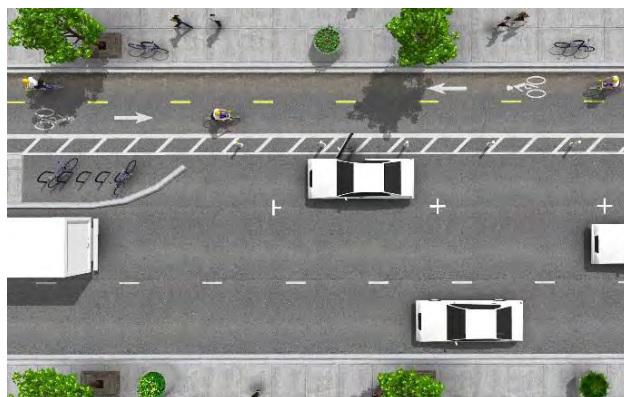


Figure 89: This cycle track diagram incorporates raised bollards to separate bicyclists from motor vehicles.



Figure 90: A raised concrete barrier and vehicle parking create adequate separation to provide cyclists with a comfortable facility.

Guidance. Cycle tracks should ideally be placed along streets with long blocks and few driveways or mid-block access points for motor vehicles. Cycle tracks located on one-way streets have fewer potential conflict areas than those on two-way streets. In situations where on-street parking is allowed, cycle tracks shall be located between the parking lane and the sidewalk (in contrast to conventional bike lanes). Protection should be provided through physical barriers and can include bollards, parking, a planter strip, an extruded curb or on-street parking. Cycle tracks using these protection elements typically share the same elevation as adjacent travel lanes.

Shared Use Path along Roadway (Sidepath)

Description. Similar to a two-way cycle track, a shared used path adjacent to a roadway provides for two way travel separated from motor vehicle traffic.

Occasionally referred to as a roadside trail or a sidepath, a shared use path allows for two-way, off-street bicycle use and also may be used by pedestrians, skaters, wheelchair users, runners and other non-motorized users. These facilities are frequently found in parks, along rivers, and in greenbelts or utility corridors where there are few conflicts with motorized vehicles.

Along roadways, these facilities create a situation where a portion of the bicycle traffic rides against the normal flow of motor vehicle traffic and can result in wrong-way riding where bicyclists enter or leave the path. In addition, driveways, cross streets, and other access points to the adjacent road increase the number of motor vehicle turning movements across the trail. These trail crossings must be carefully controlled with appropriate signage, pavement markings and other physical improvements to minimize the potential for conflict.

When designing a bikeway network, the presence of a nearby or parallel path should not be used as a reason to not provide adequate shoulder or bicycle lane width on the roadway, as the on-street bicycle facility is preferred over a sidepath or roadside trail by experienced bicyclists and those who are cycling for transportation purposes.

Guidance. While sidepath width varies depending on its context, volume, and mix of users, typical widths range from 10 to 14 feet. Twelve to 14 feet is recommended for heavy use situations with high concentrations of multiple users such as runners, bicyclists, inline skaters (rollerbladers) and pedestrians. In rare circumstances, a width of 8 feet may be permitted. These circumstances include low bicycle traffic, occasional pedestrian use, minimal maintenance vehicle usage, and short distances in which physical constraints limit path width.

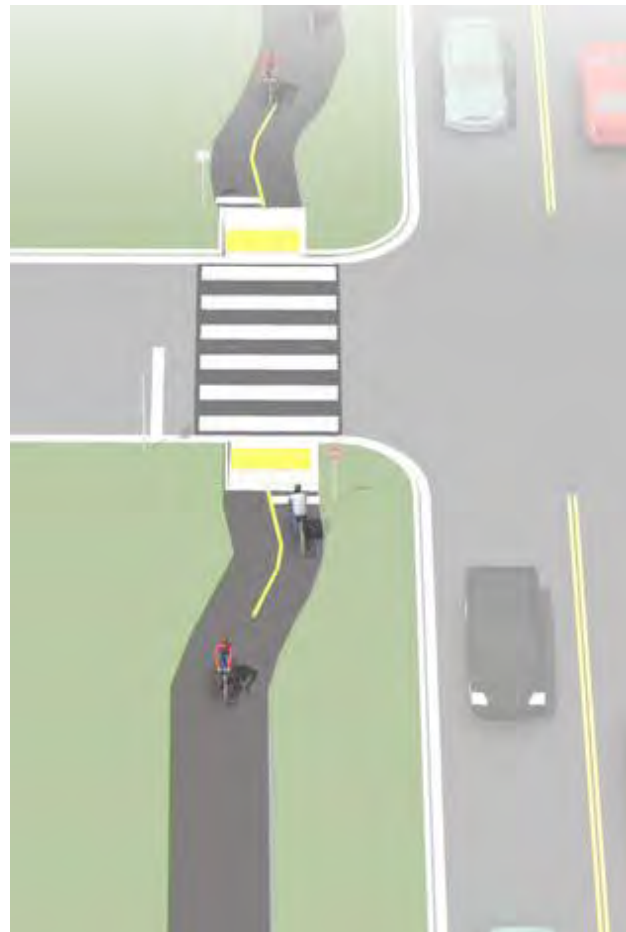


Figure 91: Sidepaths are separated from the road by a minimum of five feet.



Figure 92: This sidepath incorporates a yellow striped centerline to separate bi-directional traffic.

Traffic Calming

Motor vehicle speeds affect the frequency at which automobiles pass bicyclists as well as the severity of bicycle and pedestrian crashes that can occur on a roadway. Slower vehicular speeds also improve motorists' ability to see and react to non-motorized users, minimize conflicts at driveways and other turning locations and in many cases can improve vehicular throughput. Maintaining slower motor vehicle speeds and reducing traffic in areas where pedestrian and bicycle traffic is regularly expected greatly improves comfort and safety for non-motorized users on a street.

This section presents an overview of traffic calming treatments that can be applied to Coppell's roadways. Traffic calming treatments can be divided into two different types:

- "Hard" traffic calming are engineering measures taken with the sole intent of slowing traffic and reducing conflict.
- "Soft" traffic calming includes placemaking design measures that have the added effect of traffic calming, as well as educational and enforcement measures.

Hard Traffic Calming Treatments

Speed Limit Reduction

A reduction in speed limit is a simple way to make the roadway a safer place for pedestrians and bicyclists. Statistically, eighty percent of pedestrians struck by a car going 40 mph will die; at 30 mph the likelihood of death is 40 percent. At 20 mph, the fatality rate drops to just 5 percent (The National Highway Traffic Safety Administration)

Lane Narrowing

Lane narrowing is when an excessively large lane is reduced through the striping of a shoulder or the addition of bike lanes. This helps reduce traffic speed and adds dedicated space for bicyclists.

Road Diet

Road diets are a reduction in the number of lanes along a roadway. Typically, these are four lane roads reduced to three lanes (although larger road diets are done as well), often with the addition of bike lanes. This not only improves conditions for bicyclists, but it enhances the pedestrian environment and often improves traffic flow and vehicle-on-vehicle collision rates as well. Average annual daily traffic volumes (AADT) for potential road diet candidates can range from as low as 3,000 to more than 25,000. For roadways with higher levels of AADT, a thorough traffic analysis should be undertaken to alleviate safety and capacity concerns.



Figures 93 and 94: Before and after images from this road diet show how roadway space can be reallocated to increase space for bicyclists.

Speed Humps/Speed Tables

Speed humps are raised areas usually placed in a series across both travel lanes. Longer humps reduce impacts to emergency vehicles. Some speed hump designs can be challenging for bicyclists, however gaps can be provided in the center or by the curb for bicyclists and to improve drainage. Speed humps can also be offset to accommodate emergency vehicles.



Figure 95: A speed table can effectively reduce motor vehicle speeds, increasing bicycle and pedestrian safety.

Traffic Diversion

Motor vehicle traffic volumes affect comfort for bicyclists and pedestrians on local streets. Higher vehicle volumes reduce bicycle and pedestrian comfort and can result in more conflicts. Traffic diversion treatments reduce motor vehicle volumes by completely or partially restricting through traffic on select neighborhood streets such as bicycle boulevards.



Figures 96 and 97: Traffic diverters allow through bicycle traffic while dispersing motor vehicle traffic onto adjacent roadways.

Pinchpoints/Neckdowns

These are curb extensions placed on both sides of the street, narrowing the travel lane and encouraging all road users to slow down. When placed at intersections, pinchpoints are known as chokers or neckdowns. They reduce curb radii and further lower motor vehicle speeds.



Figure 98: A neckdown reduces the street width at an intersection, decreasing pedestrian crossing widths, limiting turning radii, and slowing down motor vehicle speeds.

Chicanes

Chicanes are essentially curb extensions arranged in an alternating pattern that require cars to oscillate along a roadway to avoid them. These are effective on long, straight neighborhood streets where speeding is an issue.



Figures 99 and 100: Chicanes slow motor vehicle traffic, creating a more calm and welcoming environment for both bicyclists and pedestrians.

Soft Traffic Calming Treatments

Setback Reduction

Large setbacks in roadside development are a result of car-oriented development practices which typically locate a large parking lot in the front of the building. Redeveloping these properties with little or no setback creates a sense of enclosure, adds visual stimuli, and creates a seemingly pedestrian environment, all of which help to slow traffic.

Street Trees, Landscaping and Other Aesthetic Elements

Street trees, landscaping and other aesthetic elements such as art or banners produce a feeling of enclosure and add visual stimuli along a roadway corridor. Green elements often have added environmental benefits as well.



Figures 101 and 102: Planter boxes, trees, shrubs and other landscaping can transform the streetscape and attract bicyclists and pedestrians.

Street Material

Textured street material, such as the use of pavers, creates visual stimuli and a feeling of a special district or pedestrian-oriented area which can help to calm traffic.



Figures 103 and 104: The textured pavement markings and crosswalks help to build a sense of place and produce a unique and memorable experience for all road users.

Appropriately-Scaled Street Lighting

Appropriately scaled street lighting can provide a safer, more inviting and more visible environment for all roadway users. Pedestrian-scaled street lighting along with other improvements such as street trees can alert motorists to a potential presence of pedestrians and bicycles, slowing down traffic in these areas. Lighting must have uniform distribution along a roadway and not be designed based on spacing of light poles and street trees.

Enforcement and Awareness Measures

Enforcement and awareness measures such as signage, speed traps and educational programs can help to reduce speeding in problem areas. However, the effectiveness of these programs depends on adequate frequency and duration.

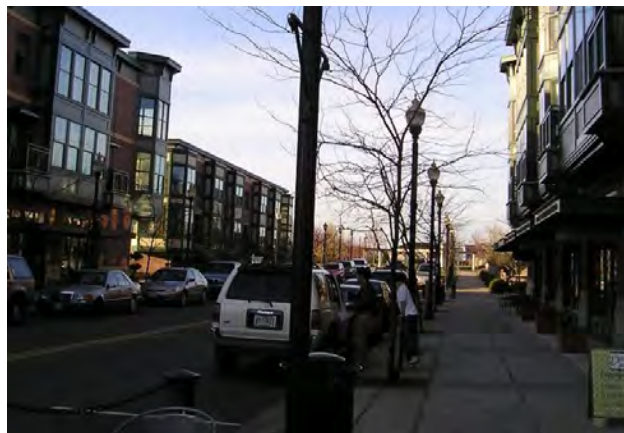


Figure 105: Pedestrian-scale lighting can support an active and vibrant night life.

Intersection Improvements

Intersections are junctions at which different modes of transportation meet and facilities overlap. An intersection facilitates the interchange between bicyclists, motorists, pedestrians and other modes in order to advance traffic flow in a safe and efficient manner. Designs for intersections with bicycle and pedestrian facilities should reduce conflict between non-motorized travelers and motorists by heightening the level of visibility, denoting clear right-of-way and facilitating eye contact and awareness with other modes. Intersection treatments can improve both queuing and merging maneuvers for bicyclists, and are often coordinated with timed or specialized signals.

Pedestrian/Trail Improvements

Minimize curb radius / Curb Extensions

The size of a curb's radius can have a significant impact on pedestrian comfort and safety. A smaller curb radius provides more pedestrian area at the corner, allows more flexibility in the placement of curb ramps, results in a shorter crossing distance and requires vehicles to slow more on the intersection approach. During the design phase, the chosen radius should be the smallest possible for the circumstances. One effective way of minimizing the curb ramp radius is by adding curb extensions or bulb-outs, which are appropriate for any crosswalk where it is desirable to shorten the crossing distance and there is a parking lane adjacent to the curb.



Figures 106 and 107: These curb extensions pictured above support pedestrian mobility in busy commercial districts. .

High-Visibility Crosswalk

A marked crosswalk signals to motorists that they must stop for pedestrians and encourages pedestrians to cross at designated locations. Installing crosswalks alone will not necessarily make crossings safer, especially on multi-lane roadways. However, high-visibility crosswalks make crossings more visible to motorists and add a sense of security for pedestrians. High-visibility crosswalks should be combined with advanced stop bars and other tools to increase safety. At mid-block locations, crosswalks can be marked where there is a demand for crossing and there are no nearby marked crosswalks.



Figure 108: High visibility crosswalks emphasize the importance of pedestrian mobility.

Median Pedestrian Refuge

Median pedestrian refuges at intersections provide pedestrians with a secure place to stand in case they are unable to walk the entire distance of the crossing in one movement. This is especially important for young, elderly and disabled users in areas where crossing distances are great.

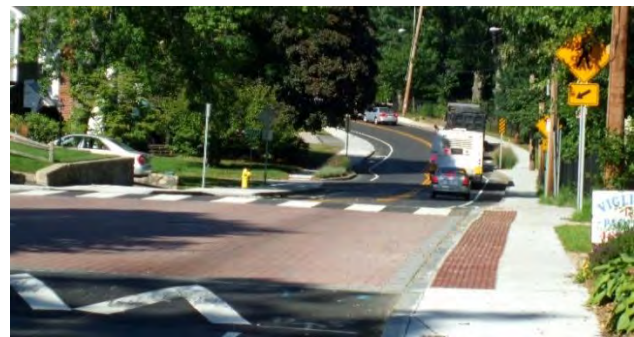


Figure 109: Raised crosswalks reinforce the importance of pedestrian travel by bringing motor vehicles up to the pedestrian level.

Traffic Circles

Traffic circles are a type of Horizontal Traffic Calming that can be used at minor street intersections. Traffic circles reduce conflict potential and severity while providing traffic calming to the corridor.

Raised Crosswalks and Intersections

A raised crosswalk or intersection can eliminate grade changes from the pedestrian path and give pedestrians greater prominence as they cross the street. Raised crosswalks should be used where a special emphasis on the pedestrian is desired.

Intersection Parking Control

Parking control involves restricting or reducing on-street parking near intersections with high pedestrian activity. Locating parking away from the intersection improves motorist's visibility on the approach to the intersection and crosswalk. Improved sight lines at intersections reduces conflicts between motorists and pedestrians. This can be accomplished in part through the use of bulb-outs.



Figure 110: Median crosswalks increase pedestrian connectivity and access while also calming motor vehicle traffic.

ADA-Compliant Curb Ramps

Curb ramps are the design elements that allow all users to make the transition from the street to the sidewalk. There are a number of factors to be considered in the design and placement of curb ramps at corners. Properly designed curb ramps ensure that the sidewalk is accessible from the roadway. A sidewalk without a curb ramp can be useless to someone in a wheelchair, forcing them back to a driveway and out into the street for access.

Bicycle Improvements at Intersections

The configuration of a safe intersection for bicyclists may include elements such as color, signage, medians, signal detection and pavement markings. Intersection design should take into consideration existing and anticipated bicyclist, pedestrian and motorist movements. In all cases, the degree of mixing or separation between bicyclists and other modes is intended to reduce the risk of crashes and increase bicyclist comfort. The level of treatment required for bicyclists at an intersection will depend on the bicycle facility type used, whether bicycle facilities are intersecting, and the adjacent street function and land use.

Bike Boxes

A bike box is a designated area located at the head of a traffic lane at a signalized intersection that provides bicyclists with a safe and visible space to get in front of queuing motorized traffic during the red signal phase. Motor vehicles must queue behind the white stop line at the rear of the bike box.

Bike Lanes at Right Turn Only Lanes

The appropriate treatment at right-turn lanes is to place the bike lane between the right-turn lane and the rightmost through lane or, where right-of-way is insufficient, to use a shared bike lane/turn lane. A bike lane pocket should have signage indicating that motorists should yield to bicyclists through the conflict area.

Colored Bike Lanes in Conflict Areas

Colored pavement within a bicycle lane increases the visibility of the facility and reinforces priority of bicyclists in conflict areas where the paths of motor vehicles and bicycles are likely to cross. For example, Figure 113 shows a motorist preparing to merge across the bicycle lane (the conflict area) and into the right-turn-only lane. Green colored pavement was given interim approval by the Federal Highway Administration in March 2011. The colored surface should be skid resistant and retro-reflective.

Shared Bike Lane/Turn Lane

The shared bicycle/right turn lane places a standard-width bike lane on the left side of a dedicated right turn lane. A dotted line delineates the space for bicyclists and motorists within the shared lane. This treatment includes signage advising motorists and bicyclists of proper positioning within the lane. This treatment is recommended at intersections lacking sufficient space to accommodate both a standard through bike lane and right turn lane. Maximum shared turn lane width is 13 feet, and the bike lane pocket should have a minimum width of 4 feet, with 5 feet preferred.



Figure 111: Bike boxes allow bicyclists to proceed through the intersection before motor vehicles.



Figure 112: Green bike lanes increase road user attentiveness through high conflict areas.



Figure 113: Where width is insufficient to provide a separate bike lane, providing a shared bike and right-turn-only lane can also be acceptable.

Intersection Crossing Markings

Bicycle pavement markings through intersections indicate the intended path of bicyclists through an intersection or across a driveway or ramp. They guide bicyclists on a safe and direct path through the intersection and provide a clear boundary between the paths of through bicyclists and either through or crossing motor vehicles in the adjacent lane.



Figure 114: Bike lane markings inside the intersection box increase bicyclist predictability.

Bicycle Detection and Actuation

User-activated push buttons, bicycle-activated loop detectors, video detection cameras, and remote traffic microwave sensor detection (RTMS) are all useful and effective tools to assist bicyclists at intersections. Proper bicycle detection should meet two primary criteria: 1) accurately detects bicyclists and 2) provides clear guidance to bicyclists on how to actuate detection (e.g., what button to push, where to stand). Bicycle loops and other detection mechanisms can also provide bicyclists with an extended green time before the light turns yellow so that bicyclists of all abilities can reach the far side of the intersection.



Figures 115 and 116: Signage and pavement markings direct bicyclists to use the pavement detection loop to activate a traffic signal.

Bicycle Signal Heads

A bicycle signal is an electrically powered traffic control device that should only be used in combination with an existing conventional or hybrid signal. Bicycle signals are typically used to improve identified safety or operational problems involving bicycle facilities. Bicycle signal heads may be installed at signalized intersections to indicate bicycle signal phases and other bicycle-specific timing strategies. Bicycle signals are typically used to provide guidance for bicyclists at intersections where they may have different needs from other road users (e.g., bicycle-only movements, or leading bicycle intervals).



Figure 117: Bicycle signal heads can be used to allow bicyclists to clear the intersection before motor vehicles receive a green light.

Wayfinding Signage

The ability to navigate through a city is assisted by landmarks, natural features and other visual cues. Signs throughout the city should indicate to bicyclists:

- Direction of travel
- Location of destinations
- Travel time/distance to those destinations

These signs will increase users' comfort and accessibility to the bicycle systems.

Signage can serve both wayfinding and safety purposes including:

- Helping to familiarize users with the bicycle network
- Helping users identify the best routes to destinations
- Helping to address misperceptions about time and distance
- Helping overcome a "barrier to entry" for people who are not frequent bicyclists (e.g., "interested but concerned" bicyclists)

A community-wide bicycle wayfinding signage plan would identify:

- Sign locations
- Sign type – what information should be included and design features
- Destinations to be highlighted on each sign – key destinations for bicyclists
- Approximate distance and travel time to each destination

Bicycle wayfinding signs also visually cue motorists that they are driving along a bicycle route and should use caution. Signs are typically placed at key locations leading to and along bicycle routes, including the intersection of multiple routes. Too many road signs tend to clutter the right-of-way, and it is recommended that these signs be posted at a level most visible to bicyclists rather than per vehicle signage standards.



Figure 118: Wayfinding signs can increase users' ability and confidence to bicycle throughout the community.

Wayfinding Sign Types and Placement

A bicycle wayfinding system consists of comprehensive signing and/or pavement markings to guide bicyclists to their destinations along preferred bicycle routes. There are three general types of wayfinding signs: confirmation, turn, and decisions signs.

Confirmation Signs

Confirmation signs indicate to bicyclists that they are on a designated bikeway and make motorists aware of the bicycle route. These signs can include destinations, distance/time, and arrows.

Confirmation signs should be placed every $\frac{1}{4}$ to $\frac{1}{2}$ mile on off-street facilities and every 2 to 3 blocks along on-street bike facilities, unless another type of sign is used. They should be placed soon after turns to confirm destination(s). Pavement markings can also act as confirmation that a bicyclist is on a preferred route.

Turn Signs

Turn signs indicate where a bikeway turns from one street onto another street. Turn signs can be used with pavement markings and should include destinations and arrows.

Turn signs should be placed on the near-side of intersections where the bike routes turn (e.g. where the street ceases to be a bicycle route or does not go through). Pavement markings can also indicate the need to turn to the bicyclist.

Decisions Signs

Decisions signs mark the junction of two or more bikeways and inform bicyclists of the designated bike route to access key destinations. Decisions signs can include destinations and arrows, distances and travel times.

Decisions signs should be placed on the near-side of intersections in advance of a junction with another bicycle route, and along a route to indicate a nearby destination.



Figure 119: An example of a typical confirmation sign.



Figure 120: Turn signs are placed in advance of a turn in the bike route network.



Figure 121: Decisions signs are used in advance of intersecting bike routes.

Off-Street Multi-Use Trail (Shared Use Path) Design

An off-street multi-use trail allows for two-way, off-street bicycle use and also may be used by pedestrians, skaters, wheelchair users, joggers and other non-motorized users. These facilities, sometimes called greenways or shared use paths, are frequently found in parks, along rivers, beaches, and in greenbelts or utility corridors where there are few conflicts with motorized vehicles. Trail facilities can also include amenities such as lighting, signage, and fencing (where appropriate).

Key features of multi-use trails include:

- Frequent access points from the local road network.
- Directional signs to direct users to and from the path.
- A limited number of at-grade crossings with streets or driveways.
- Terminating the path where it is easily accessible to and from the street system.
- Separate treads for pedestrians and bicyclists when heavy use is expected.



Figure 122: Shared use paths support both recreation and transportation uses.

General Design Practices

Multi-use trails can provide a desirable facility, particularly for recreation, and users of all skill levels preferring separation from traffic. Bicycle paths should generally provide directional travel opportunities not provided by existing roadways.

Width

Ten feet is the minimum allowed for a multi-use trail. Twelve to fourteen feet are recommended for heavy use situations with high concentrations of multiple users. A separate track (5' minimum) can be provided for pedestrian use. Multi-use trail widths can be narrowed to eight feet for rare exceptions, such as low anticipated bicycle use, minimal maintenance vehicle use, and physically constrained conditions.



Figure 123: Surrounding land uses, environmental conditions and other factors can influence trail width.

Lateral Clearance

A 2 foot or greater shoulder on both sides of the trail should be provided. An additional foot of lateral clearance (total of 3') is required by the MUTCD for the installation of signage or other furnishings. When constructed from crushed limestone, decomposed granite, or a similar aggregate surface, a shoulder can also serve runners and walkers that desire a softer surface than asphalt or concrete, which effectively widens the functional width of the path. When developing a shoulder with the intention of serving runners and walkers, it is important to minimize cross slope in order to provide the flattest possible surface.

Overhead Clearance

Clearance to overhead obstructions should be 8 feet minimum, with 10 feet recommended.

Striping

When striping is required, use a 4 inch dashed yellow centerline stripe with 4 inch solid white edge lines. Solid centerlines can be provided on tight or blind corners, and on the approaches to roadway crossings. Edge striping can be provided along turns and in constrained situations with little or no shoulder or effective clear width.

Material

While asphalt is the most common surface for multi-use trails, concrete has proven to be more durable over the long term. Saw-cut concrete joints (rather than troweled) improve the experience of trail users. In contrast to paved surface paths, unpaved multi-use trails limit user types and are not as conducive to transportation-oriented trips, especially in wet or snowy conditions. In corridors with considerable bicycle and pedestrian use, the provision of 2 foot gravel shoulders or a parallel granular surface trail can help to separate bicycle and pedestrian traffic.



Figure 124: Decomposed granite or crushed limestone can provide an excellent shoulder to meet clearance requirements and provide a desirable surface for walkers and runners.



Figure 125: A busy trail corridor incorporates both paved and unpaved surfaces to separate pedestrians from bicyclists and inline skaters.



Figure 126: Some shared use paths incorporate both centerline and edge striping.

Access

Any access point to the trail should be well-defined with appropriate signage designating the pathway as a bicycle facility and prohibiting motor vehicles. High-visibility access points and trailheads can also incorporate gateway structures, public art, or other unique features to highlight the trail as an important community amenity.



Figure 127: This trail access point utilizes a gateway structure to increase visibility.

Wayfinding

A clear and consistent wayfinding signage program is essential to the success of any trail. These signs help trail users track their locations, mark their progress, and navigate a trail or trail system with confidence. A wayfinding signage program should include kiosk maps at trailheads, reference location signs (mile markers) along the trail, street and trail name signs at crossings, and guide signs highlighting destination(s) distance/time.

Multi-use trail wayfinding signs should follow the general principles for bicycle route and guide signs found in the AASHTO Guide to Bicycle Facilities (4th Edition). The use of green and white D Series Route Signs, described in greater detail in the Guide to Bicycle Facilities and the FHWA's Manual on Uniform Traffic Control and Design, can provide continuity throughout the trail network, both on-street and off.

A trail or trail network should have a consistent, uniform brand that imparts a unique identity and resonates with both users of the trail system and the general community. This brand can be applied to trailheads, guide signs, mile markers, trail entry points, and trail crossings, and other points of increased visibility. The brand can also be used on printed and online material. While a combination of the D Series Route Signs and uniquely branded wayfinding signs can visually connect the on-street bikeway network to off-street shared use path(s), care must be taken to reduce visual clutter and still provide essential information to trail users.

Map signs and information kiosks at trailheads convey important information to trail users before they begin their journey. This information can include maps of the trail or trail system, location of attractions and destinations, trail intersections with other trails or bikeways, trail etiquette, intended trail users, and hours of operation.



Figure 128: This trailhead map provides a clear illustration of the park trail within the larger context of the regional trail network.

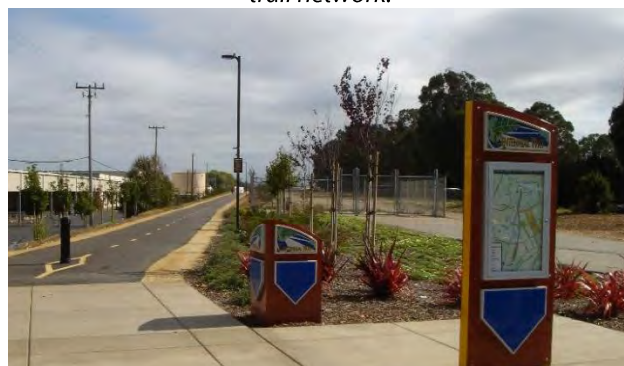


Figure 129: Maps and monuments provide clear orientation and direction for trail users.

Trail Crossings

Well-designed crossings can mitigate many operational issues and provide a higher degree of safety and comfort for path users. In most cases, at-grade path crossings can be properly designed to provide a reasonable degree of safety and can meet existing traffic and safety standards. Path facilities that cater to bicyclists can require additional considerations due to the higher travel speed of bicyclists versus pedestrians.

Consideration must be given to adequate warning distance based on vehicle speeds and line of sight, with the visibility of any signs absolutely critical. Directing the active attention of motorists to roadway signs may require additional alerting devices such as a flashing beacon, roadway striping or changes in pavement texture. Signing for path users may include a standard “STOP” or “YIELD” sign and pavement markings, possibly combined with other features such as bollards or a bend in the pathway to slow bicyclists. Care must be taken not to place too many signs at crossings lest they begin to lose their visual impact.

A number of striping patterns have emerged over the years to delineate path crossings. A median stripe on the path approach will help to organize and warn path users. Crosswalk striping is typically a matter of local and State preference, and may be accompanied by pavement treatments to help warn and slow motorists. In areas where motorists do not typically yield to crosswalk users, additional measures may be required to increase compliance.

Marked/Unsignalized Crossings

A marked/unsignalized crossing typically consists of a marked crossing area, signage and other markings to slow or stop traffic. The approach to designing crossings at mid-block locations depends on an evaluation of vehicular traffic, line of sight, pathway traffic, use patterns, vehicle speed, road type, road width, and other safety issues such as proximity to major attractions.

When space is available, using a median refuge island can improve user safety by providing pedestrians and bicyclists space to perform the safe crossing of one side of the street at a time.



Figure 130: Bollards, ADA compliant curb ramps, high-visibility crosswalk markings, and rectangular rapid flashing beacons help improve user safety at this street crossing.



Figure 131: At unsignalized trail crossings, high-visibility crosswalk markings increase motorist awareness of crossing pedestrians.

Active Warning Beacons

Enhanced marked crossings are unsignalized crossings with additional treatments designed to increase motor vehicle yielding compliance on multi-lane or high volume roadways. These enhancements include pathway user or sensor actuated warning beacons, Rectangular Rapid Flash Beacons (RRFB), or in-roadway warning lights.

Rectangular rapid flash beacons show the most increased compliance of all the warning beacon enhancement options. A study of the effectiveness of going from a no-beacon arrangement to a two-beacon RRFB installation increased yielding from 18 percent to 81 percent. A four-beacon arrangement raised compliance to 88%. Additional studies of long term installations show little to no decrease in yielding behavior over time.

Route Users to Signalized Crossings

Path crossings within approximately 400 feet of an existing signalized intersection with pedestrian crosswalks are typically diverted to the signalized intersection to avoid traffic operation problems when located so close to an existing signal. For this restriction to be effective, barriers and signing may be needed to direct path users to the signalized crossing. If no pedestrian crossing exists at the signal, modifications should be made.

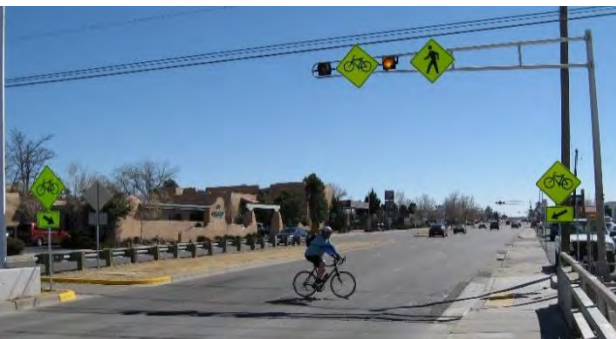
Path crossings should not be provided within approximately 400 feet of an existing signalized intersection. If possible, route path directly to the signal. In the US, the minimum distance a marked crossing can be from an existing signalized intersection varies from approximately 250 to 660 feet. Engineering judgment and the context of the location should be taken into account when choosing the appropriate allowable setback. Pedestrians are particularly sensitive to out of direction travel and jaywalking may become prevalent if the distance is too great.

Signalized/Controlled Crossings

Signalized crossings provide the most protection for crossing path users through the use of a red-signal indication to stop conflicting motor vehicle traffic. The two types of path signalization are full traffic signal control and hybrid signals.



Figure 132: Rectangular rapid flashing beacons help to identify important pedestrian crossings.



Figures 133 and 134: Full signals (left) and hybrid signals (right) can be used at trail crossings.

A full traffic signal installation treats the path crossing as a conventional 4-way intersection and provides standard red-yellow-green traffic signal heads for all legs of the intersection.

Hybrid beacon installation faces only cross motor vehicle traffic, stays dark when inactive, and uses a unique 'wig-wag' signal phase to indicate activation. Vehicles have the option to proceed after stopping during the final flashing red phase, which can reduce motor vehicle delay when compared to a full signal installation. While full traffic signals must meet MUTCD pedestrian, school, or modified warrants, hybrid beacons may be installed without meeting traffic signal control warrants if roadway speed and volumes are excessive for comfortable path crossings.

Underpasses

Bicycle/pedestrian underpasses provide critical non-motorized system links by joining areas separated by barriers such as railroads and highway corridors. In most cases, these structures are built in response to user demand for safe crossings where they previously did not exist.

Grade-separated crossings are advisable where existing bicycle/pedestrian crossings do not exist, where ADT exceeds 25,000 vehicles and where 85th percentile speeds exceed 45 miles per hour.

Safety is a major concern with underpasses. Shared-use path users may be temporarily out of sight from public view and may experience poor visibility themselves. To mitigate safety concerns, an undercrossing should be designed to be spacious, well-lit, equipped with emergency cell phones at each end and completely visible for its entire length from end to end.



Figure 135: Trail underpasses separate trail users from motor vehicle traffic and/or rail traffic, reducing delays for all users.

Overpasses

Bicycle/pedestrian overcrossings provide critical non-motorized system links by joining areas separated by barriers such as deep canyons, waterways or major transportation corridors. In most cases, these structures are built in response to user demand for safe crossings where they previously did not exist.



Figures 136 and 137: Pedestrian and trail overpasses provide grade-separated crossings that can also serve as iconic structures, gateways, and unique branding opportunities for a trail system or community.

As mentioned above, grade-separated crossings may be needed where existing bicycle/pedestrian crossings do not exist, where ADT exceeds 25,000 vehicles, and where 85th percentile speeds exceed 45 miles per hour.

Overpasses require a minimum of 17 feet of vertical clearance to the roadway below versus a minimum elevation differential of around 12 feet for an undercrossing. This results in potentially greater elevation differences and much longer ramps for bicycles and pedestrians to negotiate.

Overcrossings for bicycles and pedestrians typically fall under the Americans with Disabilities Act (ADA), which strictly limits ramp slopes to 5% (1:20) with landings at 400 foot intervals, or 8.33% (1:12) with landings every 30 feet. These requirements can provide challenges in physically constricted conditions.

Rail-To-Trails

Commonly referred to as Rails-to-Trails or Rail-Trails, these projects convert vacated rail corridors into off-street paths. Rail corridors offer several advantages, including relatively direct routes between major destinations, fewer at-grade crossings than parallel alternative routes, and generally flat terrain. Rail-Trails can be found in urban, suburban and rural settings, often traveling from cities and towns out into the countryside.

In some cases, rail owners may rail-bank their corridors as an alternative to a complete abandonment of the line, thus preserving the rail corridor for possible future use.

The railroad may form an agreement with any person, public or private, who would like to use the banked rail line as a trail or linear park until it is again needed for rail use. Municipalities should acquire abandoned rail rights-of-way whenever possible to preserve the opportunity for trail development.

Rail-to-trails can involve many challenges including the acquisition of the right of way, cleanup and removal of toxic substances, and rehabilitation of tunnels, trestles and culverts. It is often impractical and costly to add material to existing railroad bed fill slopes. This results in trails that meet minimum path widths, but often lack preferred shoulder and lateral clearance widths. A structural engineer should evaluate existing railroad bridges for structural integrity to verify they are capable of carrying the appropriate design loads.



Figure 138: The linear character of rails-to-trails projects allows for a high level of connectivity within a community and can serve both recreational uses and transportation-oriented trips.



Figure 139: Abandoned rail corridors provide a flat surface that appeals to a wide variety of trail users.