

Houston Parks Board

# DESIGN GUIDELINES

For Greenways and Pedestrian and Bike Trails

May 2024



**HOUSTON**  
PARKS BOARD

photo by Anthony Rathbun,  
courtesy of Houston Parks Board

# INTRODUCTION

A greenway is a linear park system. It should be comfortable to use, be relatively uninterrupted and, at points, have enough open space around it to function as a neighborhood park. Greenways are part of a system of open space that connects the city. They are more than just connectivity; they are part of the landscape.

In Houston, greenways have helped to retrofit a city that was designed around cars. They allow people to walk or roll to jobs or school, connect them to transportation hubs to complete trips, and provide opportunities for recreation. Greenways can provide new options to households that have limited car access by connecting them to key destinations. These alternatives are also important to Houstonians who appreciate the health, environmental, and economic benefits of walking or biking over driving.

Greenways can also be a seamless part of a flood mitigation system. They can withstand periodic inundation and enhance flood control. Greenways connect people to nature in new ways and serve as ecological corridors that support the health of the Houston region's natural environment. As an urban amenity that threads diverse neighborhoods together, greenways are also equitable means of bringing people closer together. At their best, greenways create a new way to experience the city.

The Bayou Greenways initiative has already delivered these benefits to large swaths of the city. The current greenway system lays a solid foundation for an expanded greenway network that reaches more neighborhoods, introduces more options for different types of connections, and integrates more of the Houston experience into the system.

As Houston Parks Board continues to create greenways through Beyond the Bayous, it is important to record, build-upon, and create new guidelines for how new connectors should look and function, especially as new types of greenways are considered, like easement trails, greenways in street right-of-ways, and greenways around detention basins.



**HOUSTON**  
PARKS BOARD

May 2024  
Prepared for Houston Parks Board by Huitt-Zollars  
Funded with a generous grant from the Houston Endowment

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Thanks the following organizations and people who reviewed and provided input on this document. We are appreciative of all our partners and stakeholders time and expertise towards creating a quality network of trails across Harris County.

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# REFERENCES AND ABBREVIATIONS

## Reference Documents

AASHTO Guide for the Development of Bicycle Facilities

AASHTO Guide for the Planning, Design, and Operation of Pedestrian Facilities

ADA Accessibility Standards

City of Houston, Houston Public Works Infrastructure Design Manual (IDM)

Design Guidelines for HCFCF Wet Bottom Detention Basins with Water Quality Features HCFCF

FHWA Guide for Improving Pedestrian Safety at Uncontrolled Crossing Locations

Harris County Low Impact Development & Green Infrastructure Design Criteria for Storm Water Management

HPARD Standards

Master License Agreement for Hike and Bike Trails between CenterPoint and the City of Houston (2014)

Master License Agreement for Hike and Bike Trails between CenterPoint and Harris County

Texas Manual on Uniform Traffic Control Devices (MUTCD)

TxDOT Bikeway Guidance

## Abbreviations

ADA The Americans with Disabilities Act

AASHTO The American Association of State Highway and Transportation Officials

BNSF Burlington Northern Santa Fe Railway Company

COH City of Houston

FHWA Federal Highway Administration

HAWK High-Intensity Activated Crosswalk Beacon

HCFCF Harris County Flood Control District

HPARD Houston Parks and Recreation Department

HPB Houston Parks Board

IDM Infrastructure Design Manual

MUTCD Manual on Uniform Traffic Control Devices

RRFB Rectangular Rapid Flashing Beacons

TxDOT Texas Department of Transportation

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# EXECUTIVE SUMMARY

The Houston Parks Board (HPB) Design Guidelines document is designed to be a tool and resource for Houston Parks Board and their partners to use for the design of greenways to ensure that the greenway system is as comfortable, safe, and identifiable as possible.

This document serves many functions. The creation of this document allowed Houston Parks Board to establish a set of guidelines for elements that did not already have standards. The guidelines in this document meet, and many exceed, the City of Houston, Harris County, and Harris County Flood Control District (HCFCD) standards already in place.

It also serves as a statement of aspirations. It documents what Houston Parks Board believes a high-quality greenway includes, and can be used not only by Houston Parks Board but also by potential partners or any group trying to build trails in the Houston region.

It is also a reference guide for Houston Parks Board employees, contractors, partners, and other groups building trails. It documents existing standards and consolidates them into one reference, which can be used as a basis for technical design moving forward with projects. It is an educational resource, which offers explanations for why these guidelines were developed. Throughout the document, there are explanations for why each element of the greenway system is important. For example, why should a trail be ten feet wide, or why are trees not allowed below the lower shelf on the bayou?

However, these are just guidelines and they cannot account for or apply to every situation that will be encountered when designing and building trails. There will sometimes be field conditions that will not allow Houston Parks Board to meet all of the guidelines listed in this document.

We have attempted to add flexibility to these guidelines by including “Typical”, “Recommended”, and “Minimum Recommended” sections within the guidelines. Guidelines that fall under “Typical” are guidelines that should be followed whenever possible. Guidelines in the “Recommended” sections are above and beyond regulatory standards and are great to incorporate, when possible. They will elevate the safety and comfort of the trail for all users. Guidelines in the “Minimum Recommended” sections should only be followed if the field conditions do not allow for the “typical” guidelines to be met. These guidelines should only be followed if absolutely necessary, and not just to make the design or construction of a trail easier.

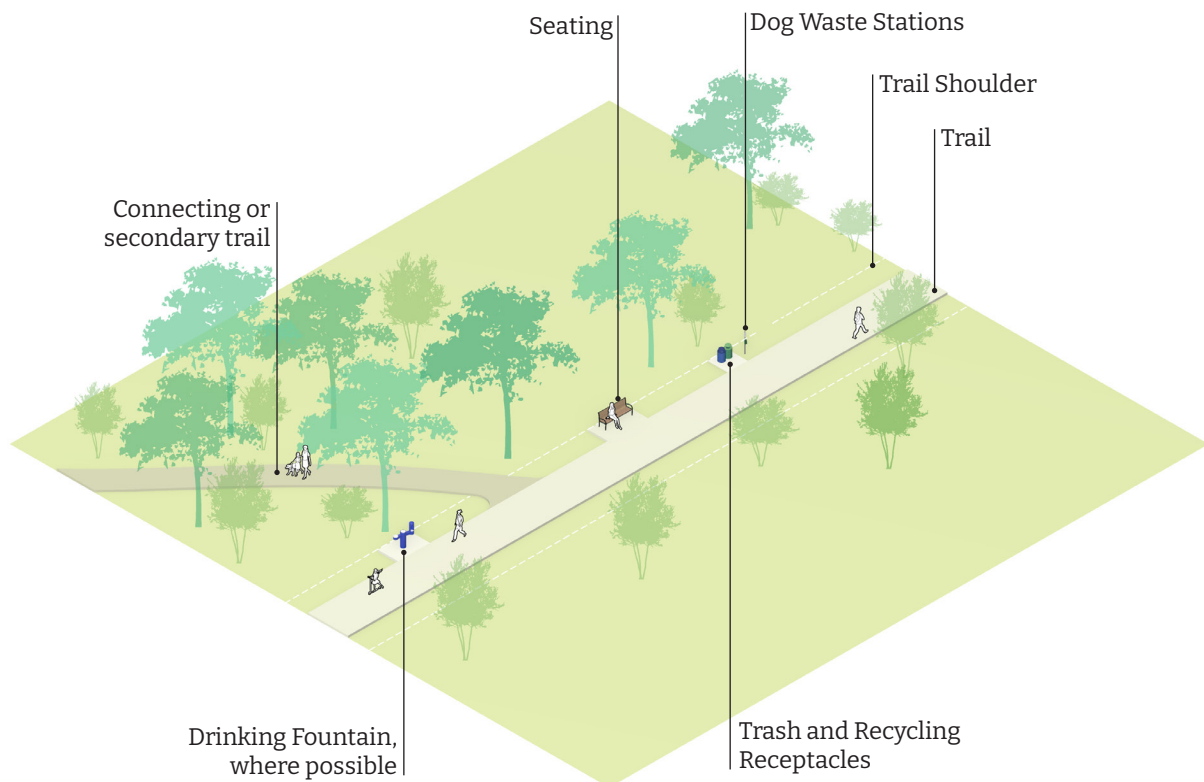
In some cases, the constraints of field conditions will warrant extraordinary exceptions beyond the “Minimum Recommended” guidelines. These cases will need to be dealt with on a case-by-case basis.

Although these standards are designed to meet all other regulatory standards, it is still necessary to refer back to the Houston Public Works Infrastructure Design Manual (IDM), Texas Manual on Uniform Traffic Control Devices (MUTCD), and all other applicable regulatory documents. Regulatory standards are subject to change and may not be reflected in this document.

# GENERAL GREENWAY ELEMENTS

## Typical Conditions

Greenways are linear park systems with trails and other elements. There are many different types of greenways such as bayou greenways, easement trails, and greenways in street right-of-ways. While these different types of greenways have some specific requirements and differences, they share many of the same elements. This section identifies standards for the common elements found in all greenway types. Some elements have the same base standards but have additional requirements for certain types of greenway conditions.





## Trails

Trails should be 10 feet wide to allow pedestrians, bike riders, people with strollers, and people using wheelchairs to pass each other comfortably. For additional details, see Appendix A: "Trails" on p. A9.

### TYPICAL

- Design trail to be at least 10 feet wide, where possible.
- Design transitions in trail width to be a smooth and continuous taper of 1-foot width to a 5-foot transition.
- Limit walking surfaces to slopes of 1:20 (5 percent) and cross slopes to 1:48 (2 percent) to maximize accessibility. Refer to section 403 of the ADA Accessibility Standards for additional details.
- When trails intersect, round the inside corner where the trails meet with a 5 to 10-foot radius where possible and include appropriate signage (see "Appendix B" on p. B1).
- If trails have a curve with limited visibility, center stripe the trail and install curve warning signs.

### RECOMMENDED

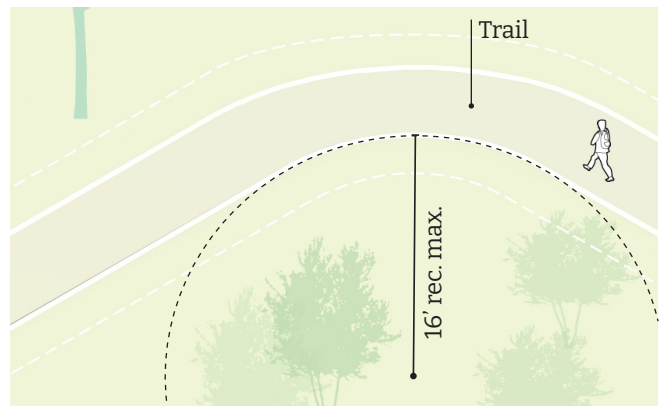
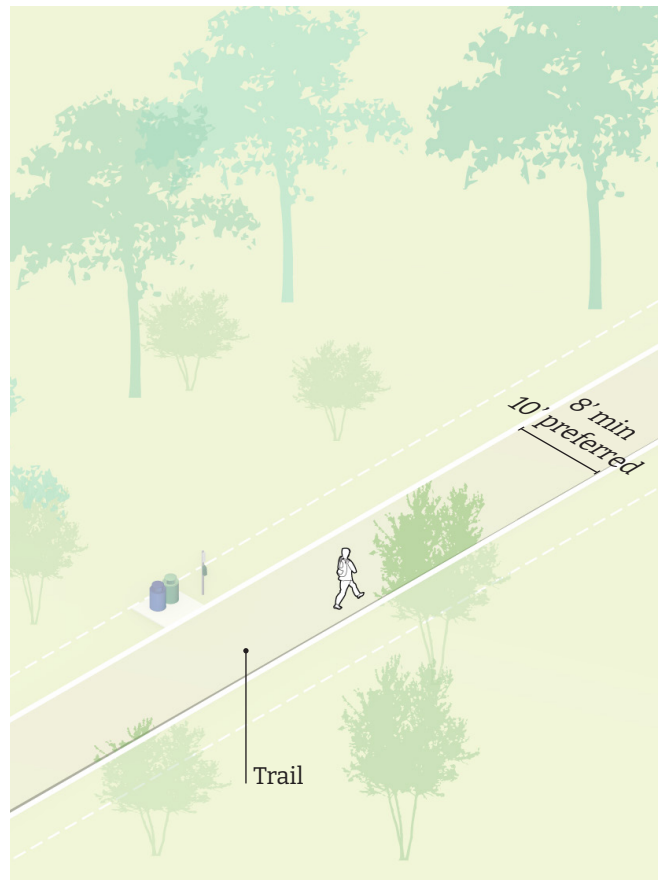
- Consider a 12-foot width if the trail is expected to be highly used.
- Design trail curves with a maximum 16-foot radius to encourage cyclists to slow down.
- Use concrete whenever possible. It is more durable and requires less maintenance than asphalt. Asphalt should only be used where required by partners.
- Consider adding lane striping in busy areas, narrow sections, or blind corners.
- If pedestrian and bike trail conflicts become a problem, add simple trail etiquette signs that note that bike riders should yield to pedestrians.

### RECOMMENDED MINIMUM

- Design trail to be at least 8 feet wide if a 10-foot trail is not possible due to restrictions. Minimize the narrow trail segment to 8 feet of run or less. If a trail narrows to 8 feet or less, provide warning signs for trail-users and stripe the centerline of the trail. For additional details, see Appendix D: "Signing" on p. D139.

### SPECIAL CONDITIONS

- Greenways along bayous: "Trails" on p. 62
- Greenways in power line easements: "Trails" on p. 75
- Greenways in street right-of-ways: "Trails" on p. 81



## Trail Shoulder

Trail shoulders are areas on either side of the trail that are typically unpaved, but mowed to allow maintenance vehicles to access and park along the trail without impeding trail-users. For additional details, see Appendix A: “Maintenance” on p. A8 and Appendix D: “Path Width, Vertical Elements, and Shy Space” on p. D135.

### TYPICAL

- Maintain a 5-foot safety shoulder between the trail and existing obstruction (support columns, retaining walls, hand/guard rails, signs, trees, benches, trailheads, etc.), if possible.
- Maintain 15-foot vertical clearance along the trail and shoulder wherever possible.
- Adjust trail shoulder to ensure visibility cones are clear of vertical obstacles around curves and intersection points.

### RECOMMENDED

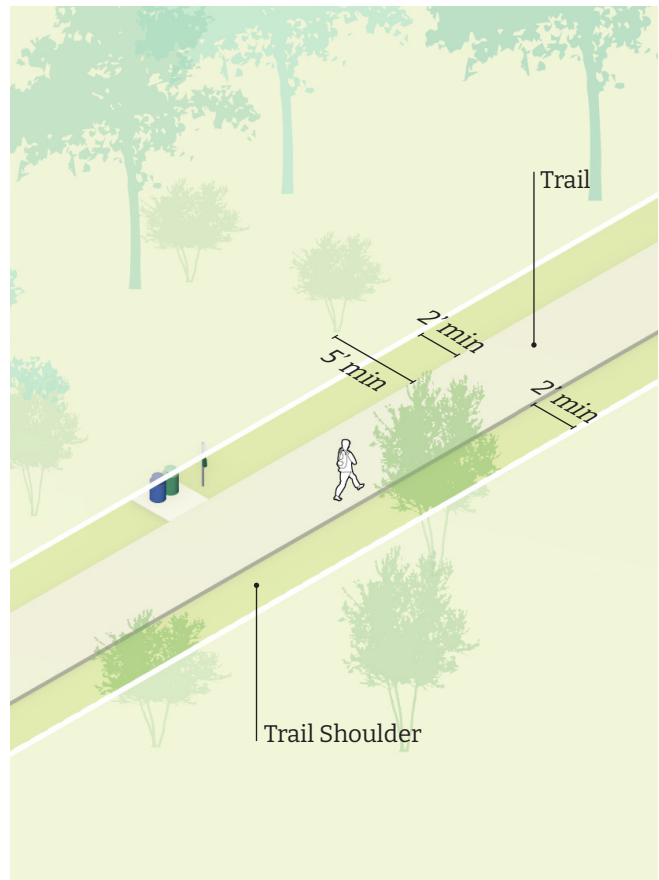
- Maintain a 6-foot safety shoulder, on both sides of the trail, where possible.

### RECOMMENDED MINIMUM

- Maintain a 2-foot minimum safety shoulder.
- Maintain 8-foot minimum vertical clearance.

### SPECIAL CONDITIONS

- In HCFCFCD right-of-way, maintain 15-foot vertical clearance and 20-foot horizontal clear area. HCFCFCD maintenance right-of-way is mandatory unless a variance is requested by the design team and granted by HCFCFCD. A 20-foot clear area can wrap around obstructions like signs, benches, existing trees, etc. as long as the 20-foot clear space is provided.
- Greenways in power line easements: “Trail Shoulder” on p. 79



## Connecting or Secondary Trails

Connecting or secondary trails connect the main greenway trail to a street sidewalk, park connection, etc., or are secondary walks within the greenway itself. They can also provide a slower-moving path through special vegetation features or viewpoints. For additional details, see Appendix A: [“Connecting or Secondary Trails”](#) on p. A10.

### TYPICAL

- Design transitions in trail width to be a smooth and continuous taper of 1-foot width to 5-foot transition.

### RECOMMENDED

- Can match existing sidewalk width but should be at least 6 feet wide and can be up to 10 feet wide.
- Where feasible, plan for connections to future bayou greenway trails, neighborhood sidewalks and streets, abutting parks, schools, and other public places even if the project does not currently include the connection paving. Study the connections in the plan, profile, and surface grading to make sure they can be added in the future.

### RECOMMENDED MINIMUM

- Design trails to follow ADA guidelines outlined in section 4 of the ADA Accessibility Standards.



## Seating

Seating is important to allow trail-users to rest along the trail and enjoy views. They are especially important for people with limited mobility who want or need to use the trail. For additional details, see Appendix A: [“Furnishings”](#) on p. A22 and [“Seating Areas”](#) on p. A21.

### TYPICAL

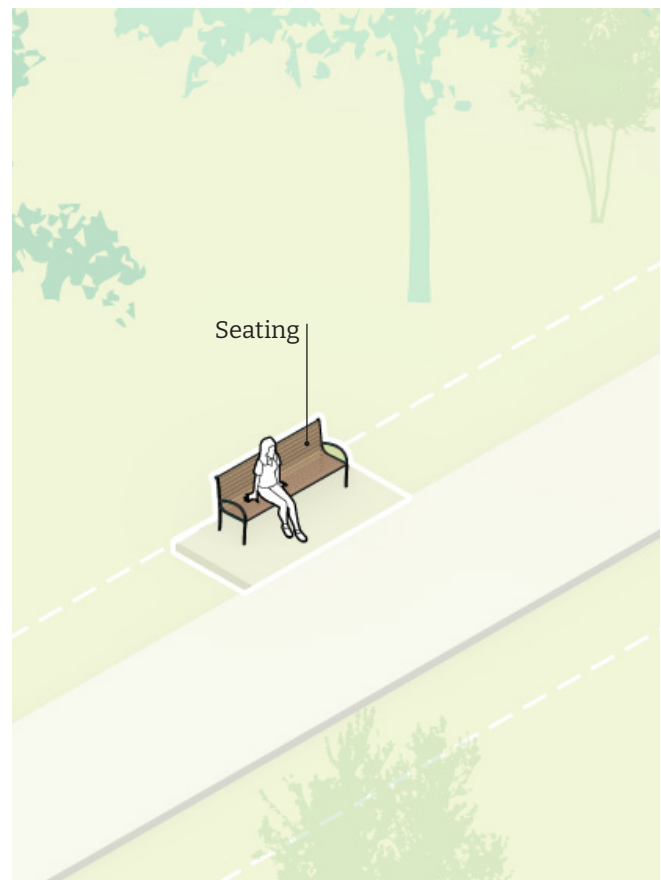
- Locate benches at least 2 feet from the edge of the trail, where possible, and extend concrete to allow access to benches.
- Ensure ADA accessible/wheelchair clearance.

### RECOMMENDED

- In ideal and allowable conditions, provide seating at trailheads and along the trail at approximately 1/4 mile increments, especially in locations with special views or environmental conditions.
- Locate near trees or plant trees near seating areas for shade where possible, or add shade structures when the budget allows.

### SPECIAL CONDITIONS

- In HCFCD right-of-way, do not locate benches within the 20-foot maintenance area or along the bottom bench of a bayou.
- Seating not allowed on greenways in utility easements.



## Trees

Trees are important for shade and aesthetic appeal and can also be used for bank stabilization, water filtration or absorption, and carbon sequestration. For additional details, see Appendix A: “Planting” on p. A23 or the HPARD Standards.

### TYPICAL

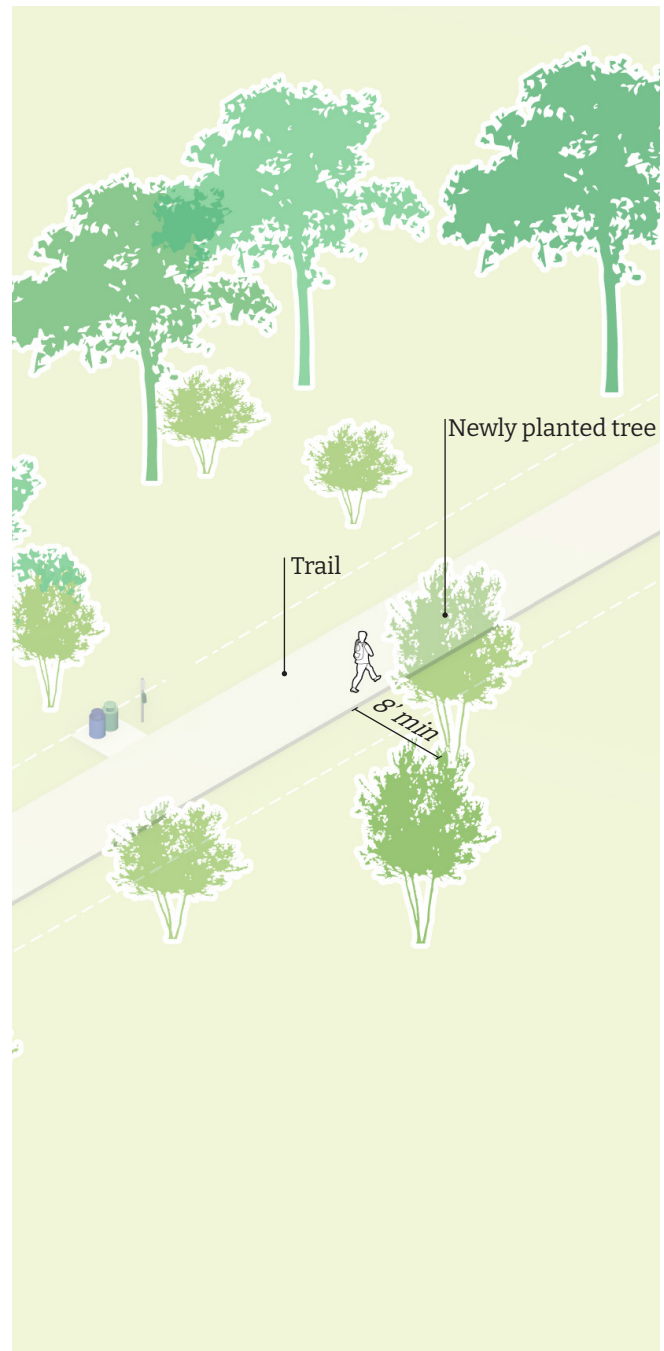
- Do not locate trees within 8 feet of the trail edge.
- Ensure tree canopies will allow for 15 feet of vertical clearance.
- Use native trees hardy enough to withstand drought conditions.
- Plant trees in motts (groves or clumps of trees) to provide gaps for maintenance access.
- Where any park amenity is to be installed, evaluate the health and structural condition of all existing trees and limbs that are within the fall zone of that amenity. Remove any trees or limbs that present an unacceptable risk to public safety.
- Check for and remove any deadwood higher than 15ft that overhangs trails and other areas with occasional to frequent pedestrian occupancy.

### RECOMMENDED

- Locate trees at least 10 feet away from the trail edge to avoid damage to tree roots from maintenance vehicles.
- Avoid and preserve significant trees when possible.
- Choose shade trees with an appropriate canopy size to provide shade for the trail and locate them on the side of the trail that will provide the most shade.
- Some native tree species have short lifespans and can pose safety hazards if they drop limbs or uproot entirely in storms. Consider avoiding planting new or keeping existing Pecan, Water Oak, Willow Oak, Hackberry, Arizona Ash, and Post Oak trees adjacent to trails and amenities.

### SPECIAL CONDITIONS

- In HCFCD right-of-way, do not locate trees within the 20-foot maintenance area or on the bayou banks.
- Trees not allowed on greenways in utility easements.



## Signage

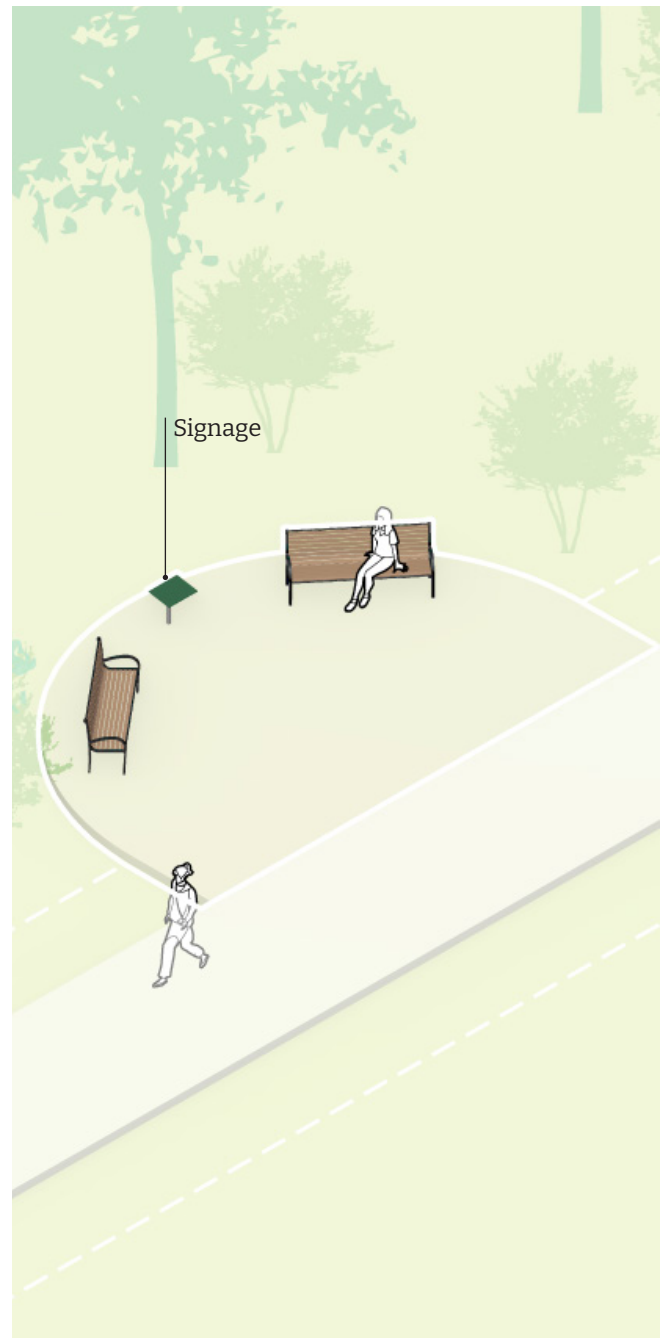
Signage along trails can serve a variety of functions. They can provide wayfinding assistance where the trail splits or intersects with another trail, they can provide safety assistance information about the trail, important views, histories, or wildlife species that can be viewed along the trail, and donor recognition. For additional details, see [“Appendix B” on p. B1](#).

### TYPICAL

- Locate gateway signs at trailheads and other primary and secondary access points.
- Locate directional and informational signs at decision points along the trail.
- Locate interpretive signage at points of interest.
- Locate safety and regulatory signs in areas of cross traffic or safety concerns.
- Locate markers along public streets near access points and along the trail as needed to identify things like the trail system and landscape features.
- Distance markers with emergency signage must be coordinated with emergency providers. Supply one marker every  $\frac{1}{4}$  mile of trail. Final locations to be provided based on GPS location.

### RECOMMENDED

- Consider adding in-grade signage for wayfinding. This is especially important for utility easement trails where vertical signage isn't allowed.
- Interpretive signage content should be determined through outreach to nearby neighborhoods, which should be conducted to ensure that the art is unique to the community and contributes to the neighborhood's sense of place.
- If pedestrian and bike trail conflicts become a problem, add simple trail etiquette signs that note that bike riders should yield to pedestrians.



## Trash and Recycling Receptacles

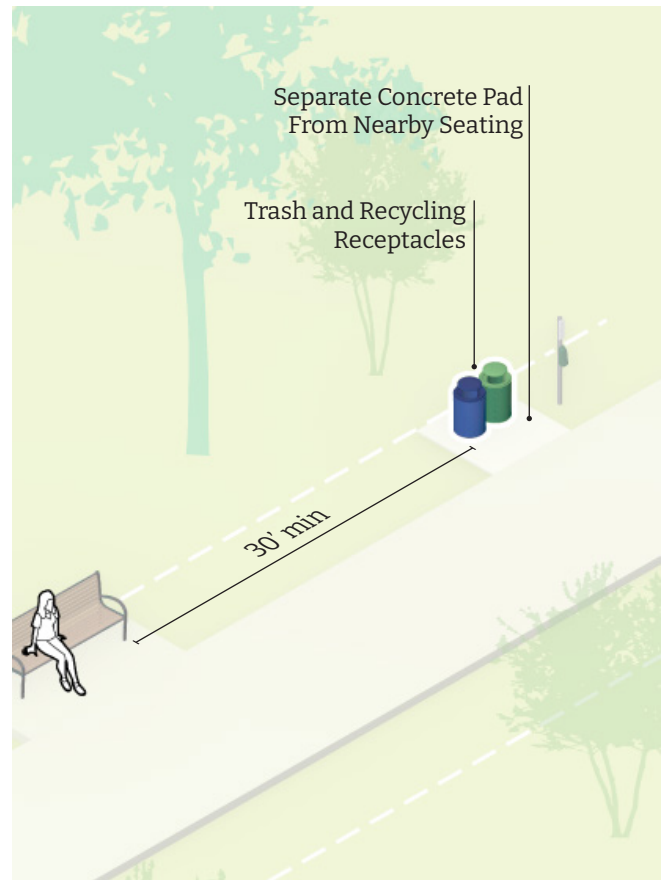
Trash and recycling receptacles are important for helping keep the trails clean and free of litter. For additional details, see Appendix A: “Furnishings” on p. A22.

### TYPICAL

- Locate trash receptacles at trailheads, gateways, and near gathering spaces, but not immediately adjacent to seating.

### RECOMMENDED

- Locate receptacles along the trail at approximately ½ mile increments, or as needed.
- Locate trash and recycling receptacles in pairs at trailheads and gateways.
- Locate trash receptacles at least 30 feet from benches or seating areas. Trash and recycling receptacles should be on their own concrete pad adjacent to the trail.
- Establish who will maintain the trash receptacles.



## Drinking Fountains

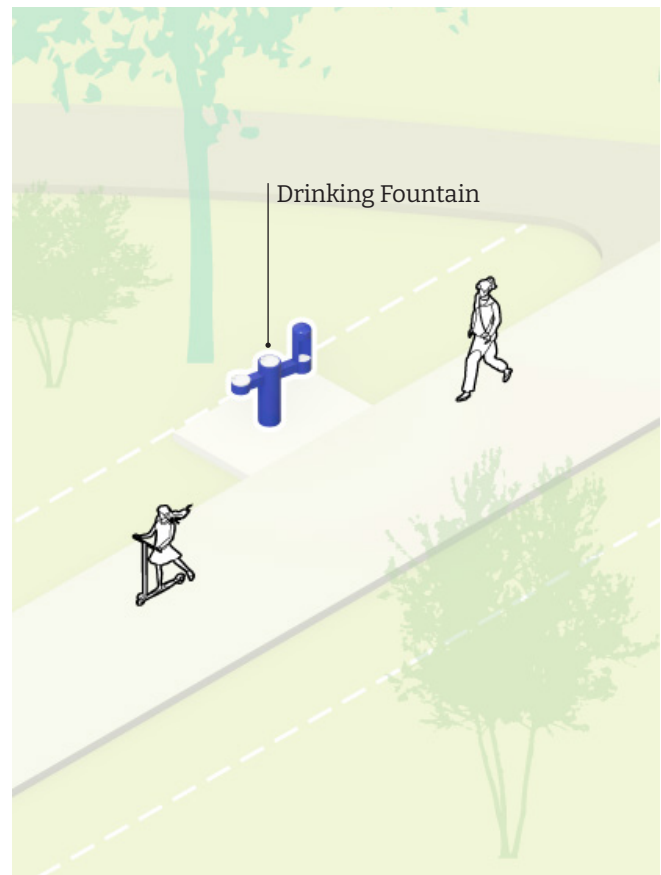
Houston is very hot for much of the year, and many people use the greenway trails to exercise. Supplying drinking fountains at major gathering and resting locations and at regular intervals along the trail helps ensure the health and well-being of trail-users.

### TYPICAL

- Locate drinking fountains close to public water sources, such as near streets.

### RECOMMENDED

- When possible, locate drinking fountains along the trail at trailheads, major gateways, and other areas where people often stop to rest or gather.
- Use an ADA-accessible water fountain with bottle filler and dog bowl.



## Dog Waste Stations

Dog waste stations are important for helping keep the trails clean and free of pet waste. They also help keep pet waste out of the local water supply, which helps maintain clean drinking water. It is also important to pair these with trash receptacles.

### RECOMMENDED

- Locate dog waste stations along the trail at trailheads, major gateways, parklets, and other areas where trail-users often stop to rest, and at least 30 feet from benches or seating areas.
- Use a style that does not have a trash bin attached, but locate a trash receptacle nearby.



## Bicycle Fix-it Stations

Bicycle Fix-it stations are very helpful for bikers of all skill levels to help them deal with common, easily fixable problems that occur while biking, like flat tires, chain derailment, loose fasteners, etc.

### RECOMMENDED

- Locate fix-it stations along the trail at approximately 3-5-mile increments, and at trailheads, major gateways, and other areas where bike riders often stop to rest.
- Locate in high-visibility areas.



## Optional Elements

### Bike Racks

Bike racks are important infrastructure to have at trailheads and near parks since they allow people to switch modes when they arrive at the trail. A good bike rack allows bikes to rest firmly against the rack with two points of contact and is compatible with a U-type lock.

#### TYPICAL

- Use Houston Parks Board leaf-shape style bike rack.
- Locate bike racks wherever vehicle parking is provided and in locations where the trail meets a park. If the park already has bike racks, coordinate with HPARD to provide bike racks near the trail so that trail-users can keep their bikes safe while using the park without having to traverse the whole park. Most trailheads and parks require 2-5 bike parking spaces.
- Install bike racks in high-visibility areas.
- Provide paved trail access to the bike racks if not immediately adjacent to the trail.
- Ensure that bikes will not encroach on the 2-foot safety shoulder around the trail, sidewalk, or parking lot when locked up.
- Space bike racks at least 3 feet apart.

#### RECOMMENDED

- Place bicycle fix-it stations near bike racks.
- Add concrete pad for future BCycle station.

### Overlooks

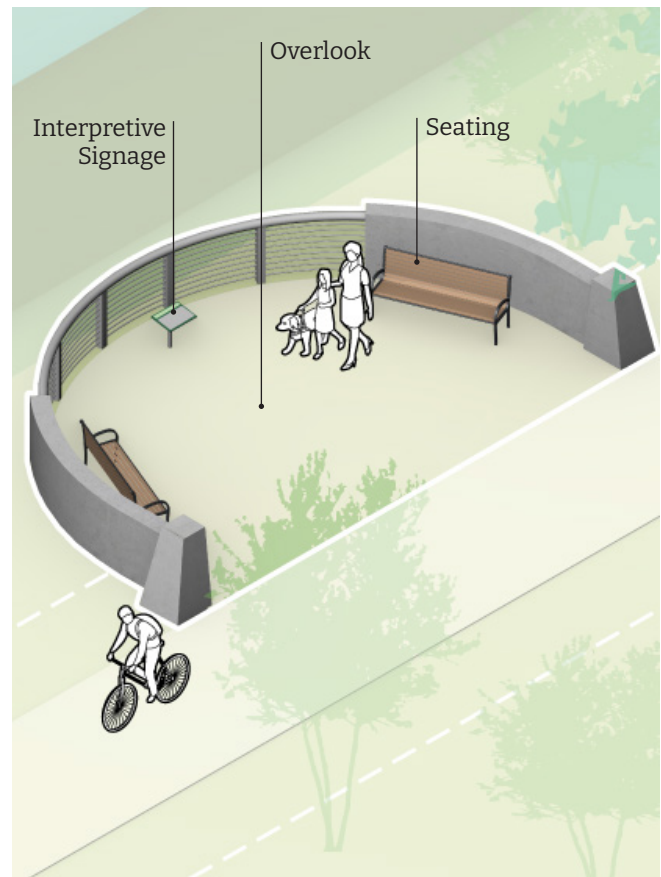
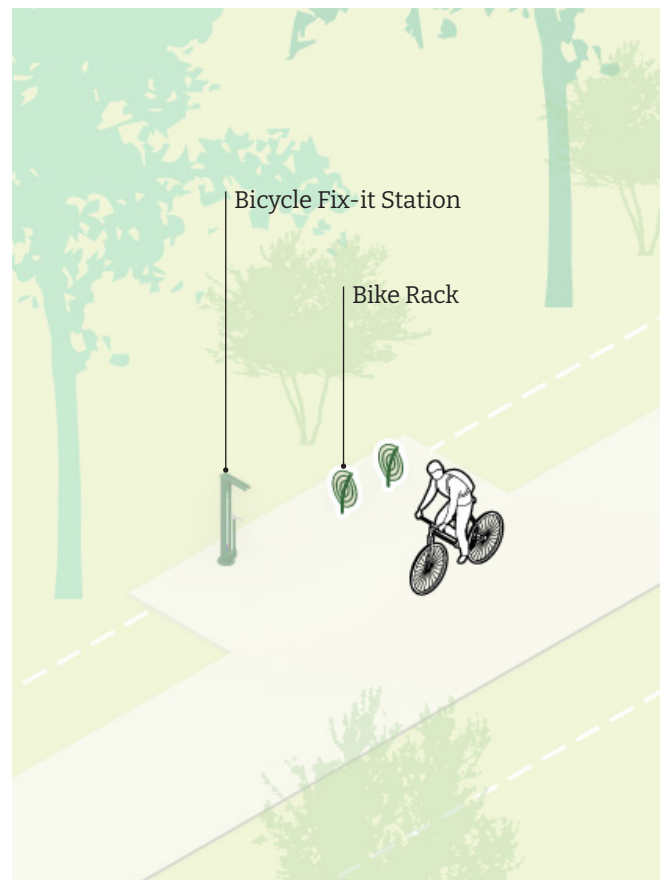
Overlooks are spaces that pull off of the trail to provide seating in places with special views. For additional details, see Appendix A: [“Seating Areas” on p. A21.](#)

#### TYPICAL

- Locate in areas with special views.
- Pull the overlook off of the trail and pave it to allow ADA access. Pavement can have a different finish to differentiate it from the main trail.
- Do not place signs, benches, or other vertical obstacles within 2 feet of the trail edge.
- If guardrails are needed, see [“Guardrails” on p. 43.](#)

#### RECOMMENDED

- Include amenities like interpretive signage, benches, trash and recycling receptacles, or art. Trash/recycling receptacles should be separated from seating by at least 30 feet.
- Locate near or plant additional trees for accent or shade. No trees within 8 feet of trail edge. No trees within HCFCD’s 20-foot maintenance access.
- Add shade structures when the budget allows.





## Seating Areas

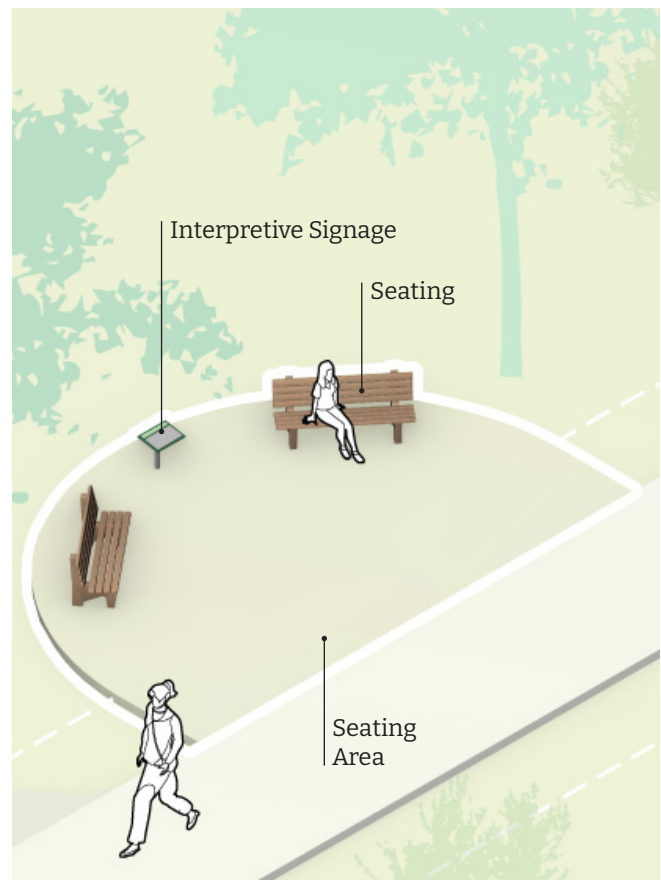
Seating areas are areas along the trail with seating and other amenities that can accommodate small- to medium-sized groups of people and can also include other amenities like seating, trash and recycling receptacles, and signage. For additional details, see Appendix A: “Seating Areas” on p. A21.

### TYPICAL

- Locate all amenities in the seating areas at least 2 feet from the edge of the trail.
- Pave the area to allow ADA access, or use other ADA-approved hardscaping. Pavement can have a different finish to differentiate it from the main trail.

### RECOMMENDED

- Consider including interpretive signage, benches, trash and recycling receptacles, or art. Trash and recycling receptacles should be separated from seating by at least 30 feet.
- Locate near or plant additional trees for accent or shade. No trees within 8 feet of the trail edge or within HCFC 20-foot clear zone, if applicable.
- Add shade structures when the budget allows.
- Limit the large paved areas and rock decorations within riparian zones to limit impact. Consider linking to existing trails and amenity areas in parks.
- Seating areas can be good locations for art installations. See “Art” on p. 17.



## Fitness Stations

Fitness stations are places along the trail that have outdoor exercise equipment.

### TYPICAL

- Opt for simple exercise equipment without moving parts to reduce the need for maintenance, unless maintenance is done by others.
- Locate in high-traffic areas with good visibility on a case-by-case basis.
- Fitness stations can be clustered together to create an outdoor gym or can be spread out along the trail.
- If there is a park near a proposed fitness station location, coordinate with HPARD to provide them at the park instead.

### RECOMMENDED

- Include exercise stations that can be used by people with disabilities.
- Limit the large paved areas and rock decorations within riparian zones to limit impact. Consider linking to existing trails and amenity areas in parks.
- Include shade structures or sail shades so that equipment does not get too hot to touch.



## Picnic Tables

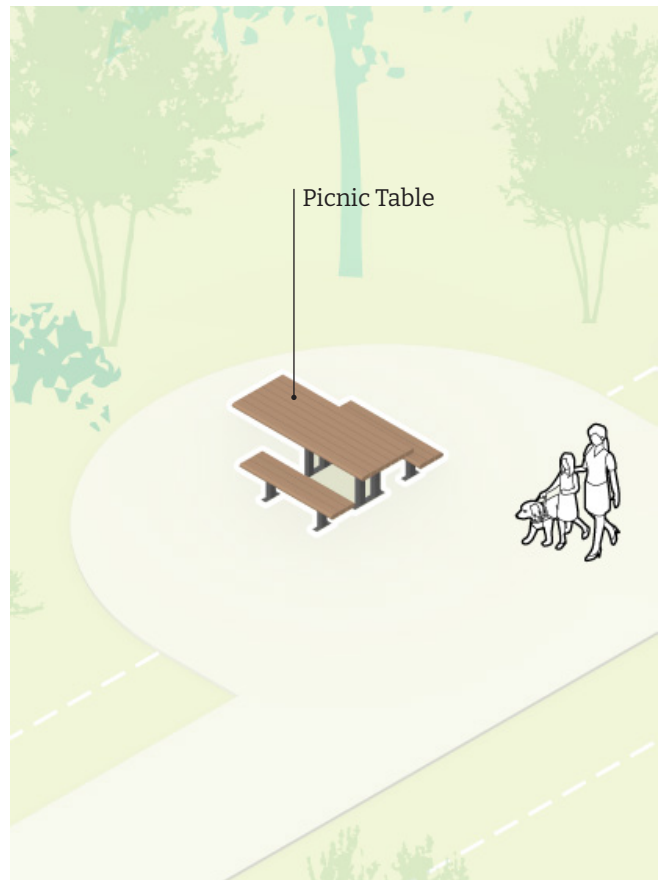
Picnic tables are useful to provide so that people can stop to rest and eat. Greenway trails do not typically function as standalone destinations for picnicking, but they may be appropriate near trailheads, common gathering spaces, and parks within the greenway right-of-way, if picnic tables are not provided nearby.

### TYPICAL

- Provide no more than 2 picnic tables, one to be ADA accessible.
- Provide trash and recycling receptacles near picnic areas, but separated from the tables by at least 30 feet.
- If there is a park near a proposed picnic area, coordinate with HPARD to provide them at the park instead.
- Pave the area to allow ADA access. Pavement can have a different finish to differentiate it from the main trail.

### RECOMMENDED

- Add shade structures when the budget allows.
- Locate near trees or plant trees near picnic benches for shade, where possible.
- Consider providing barbecue grills near picnic tables if they are not provided in other places in the area.
- Limit the large paved areas and rock decorations within riparian zones to limit impact. Consider linking to existing trails and amenity areas in parks.



## Prairies / Native Landscaping

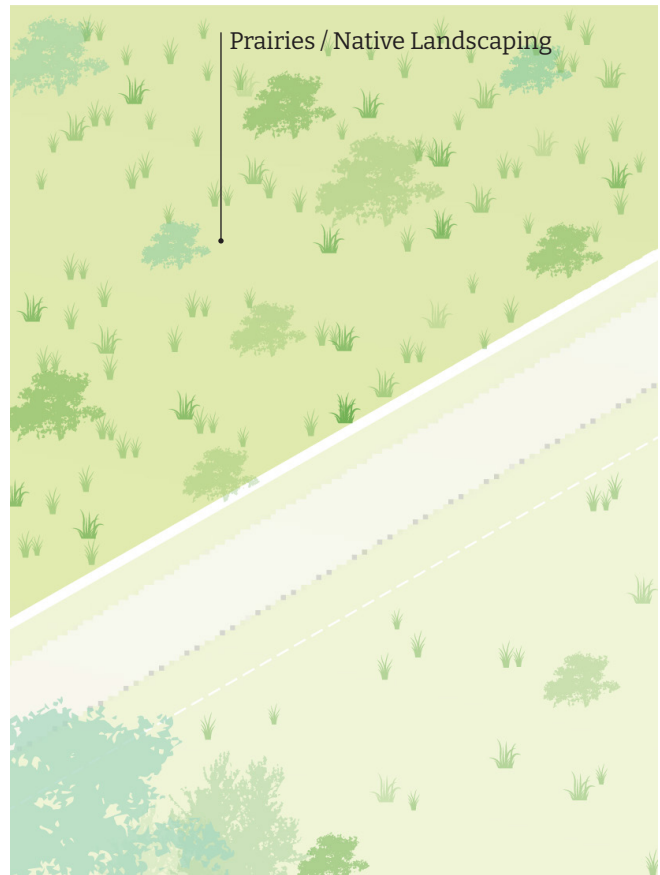
Prairies and native landscaping are great amenities to provide along trails. They can provide habitat to small animals and insects as well as visual interest along the trail.

### TYPICAL

- Install “Do Not Mow” signs for the maintenance crew
- Include educational elements for the community on the “Do Not Mow” signs.
- Mow trail shoulder to prevent overgrowth onto the trail.

### RECOMMENDED

- Remove invasive species and reseed native species periodically. These activities can be considered for community involvement opportunities.



## Art

Art can be placed along the trail, near seating areas, at outlooks, or in other high-impact/high-use areas to provide additional interest, and helps to promote and support artists. If art is incorporated into a trail project, outreach to nearby neighborhoods should be conducted to ensure that the art is unique to the community and contributes to the neighborhood's sense of place.

### TYPICAL

- Acquire special funding for these enhancements.
- Locate in high-impact, high-use areas.
- Do not locate art within 2 feet of the trail edge or within the 20-foot maintenance area.
- The theme/design of the artwork should be determined through outreach to nearby neighborhoods to ensure that the art is unique to the community and contributes to the neighborhood's sense of place.

### RECOMMENDED

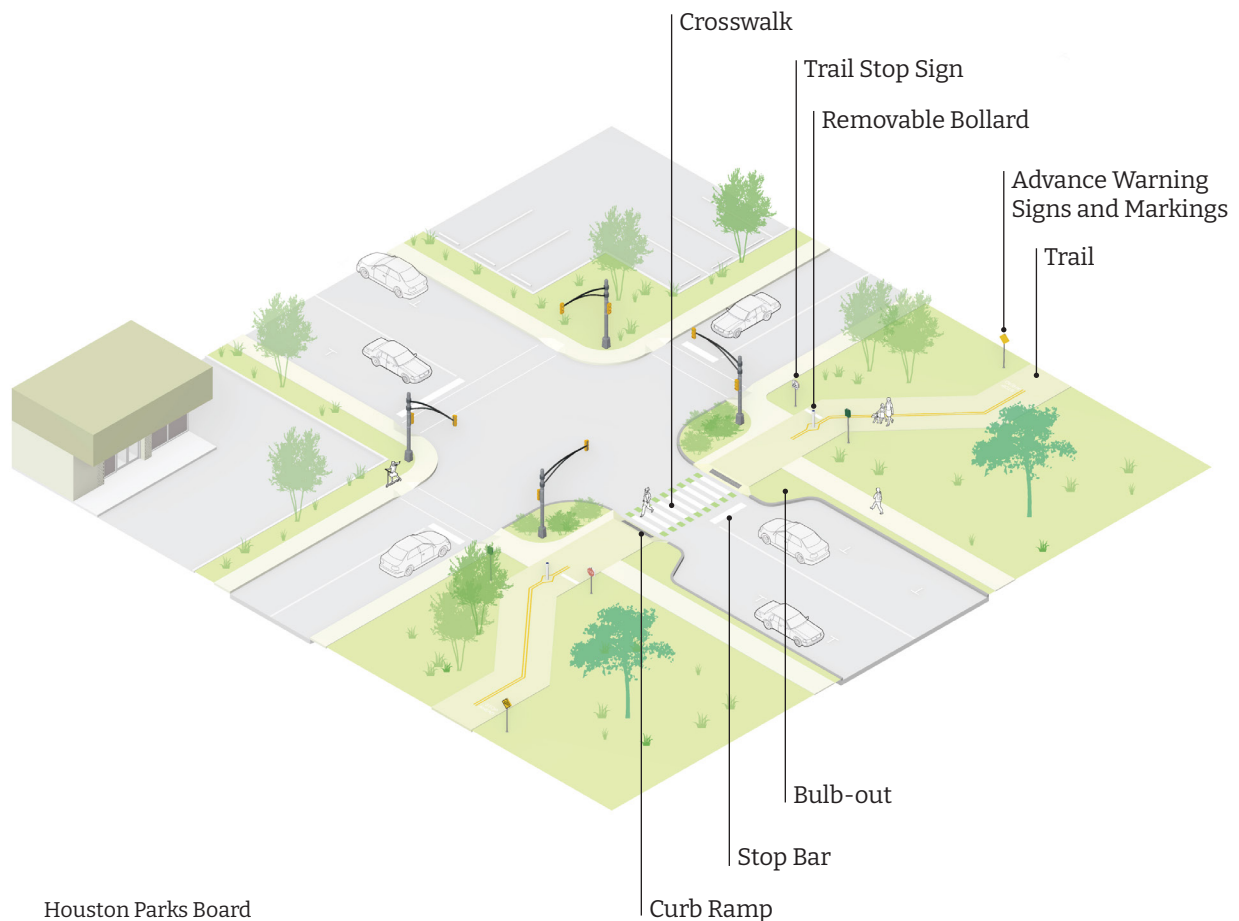
- Anti-graffiti coating should be considered on murals.
- Prefer partnering with the City of Houston art administrator or other local arts groups or alliances for installation and ongoing maintenance.

# GENERAL GREENWAY ELEMENTS

## Street Crossing at Intersections

Trails often need to cross streets. The safest way to do this is a separate crossing: either going under a road (common for greenways along bayous) or bridging over. If crossings cannot be grade-separated, or grade-separated crossings do not make sense in the location being considered, the first preference is to run the trail along the right-of-way of the road to cross at the nearest signalized intersection.

The standards in this section apply in addition to the standards listed in General Greenway Elements "Typical Conditions" on p. 6.



## Trails

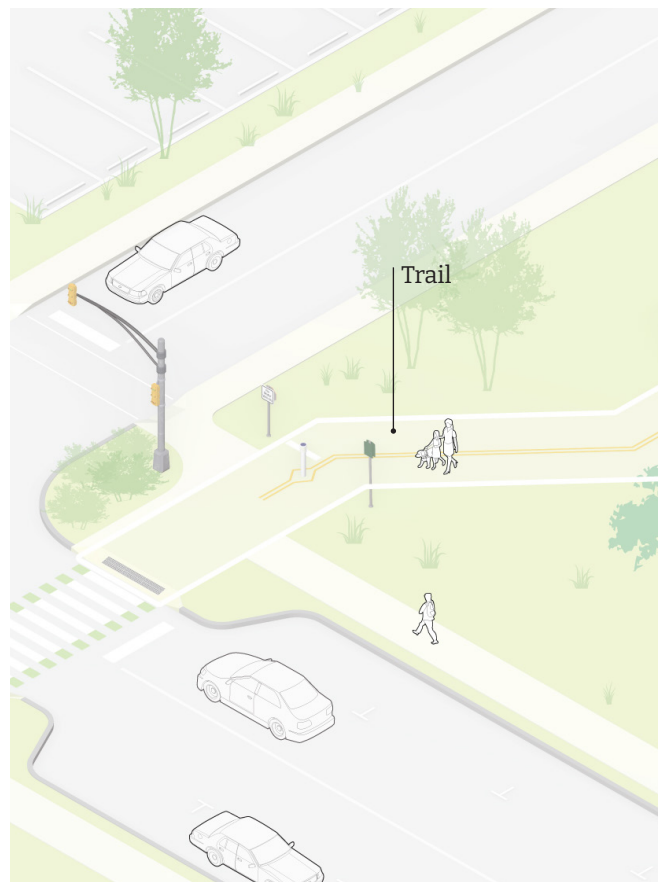
In this condition, the following standards apply in addition to the standards described under General Greenway Elements [“Trails” on p. 7](#).

### TYPICAL

- Run the trail along the street right-of-way until the closest signalized intersection to construct a safe crossing there.

### RECOMMENDED

- Where possible, maintain a minimum 10-foot width throughout, even where the trail meets the intersection. If the existing intersection does not already accommodate this trail width, the trail section of the intersection should be reconstructed.

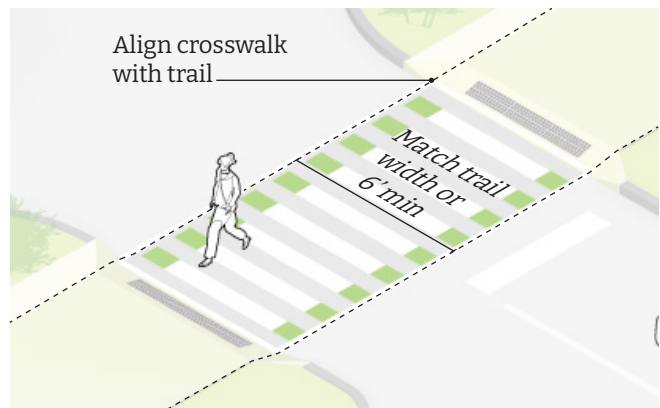


## Crosswalk

Crosswalks are essential for allowing trail-users to safely access the trail from the other side of the intersecting street. For additional details, see Appendix D: [“All Crossing Locations” on p. D119](#).

### TYPICAL

- Design crosswalk to match the width of the trail or at least 6 feet.
- Locate the crosswalk in line with the trail and curb cut.
- Use high-visibility continental-style pavement markings: white striping with green squares at the ends of the crosswalk to indicate it is protected for both pedestrians and people on wheels.



### RECOMMENDED

- Consider adding a raised crosswalk at trail crossings.
- Design crosswalk to be flush with the sidewalk.
- Design crosswalk ramps to have at least 6 feet of run, and up to 9 feet to accommodate freight vehicles, if necessary.
- Consider stormwater drainage. Additional drainage infrastructure, such as inlets or catch basins, may be needed to prevent stormwater ponding on the roadway.
- Consider a pedestrian refuge if the street is a 4-lane road or cut a refuge in an existing median. See Appendix D: [“Pedestrian Refuges” on p. 25](#).

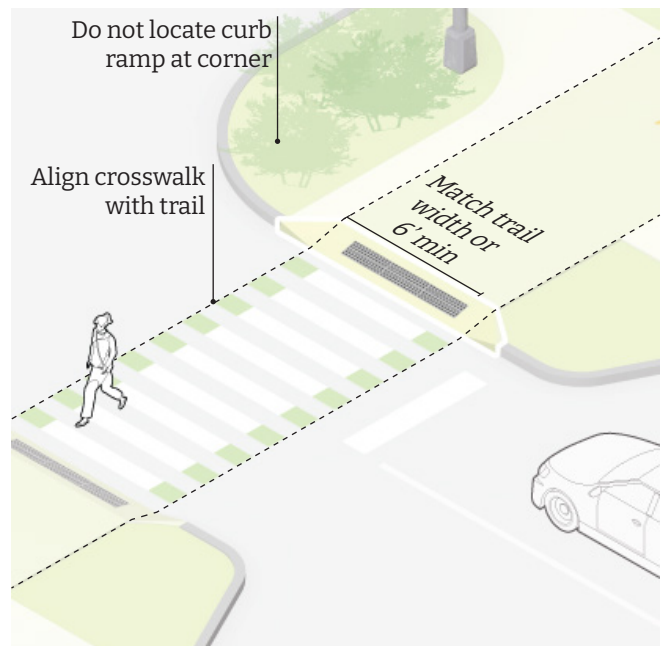


## Curb Ramp

Curb ramps are sections of pavement that ramp down from sidewalk level to the street level and create an opening in the curb that allows ADA access from a crosswalk to a trail. They should also be wide enough to allow maintenance vehicles to use them as a driveway onto the trail when necessary for maintenance. ADA-required detectable pavers warn people with visual impairments that they are approaching a street.

### TYPICAL

- Align with the trail, perpendicular to the street.
- Design the curb ramp to be at least as wide as the trail.
- Do not orient diagonally to the intersection or attempt to serve street crossings in both directions. Trail curb ramps should exclusively serve the trail crossing.
- Include detectable pavers for the full width of the ramp.



## Traffic Signal

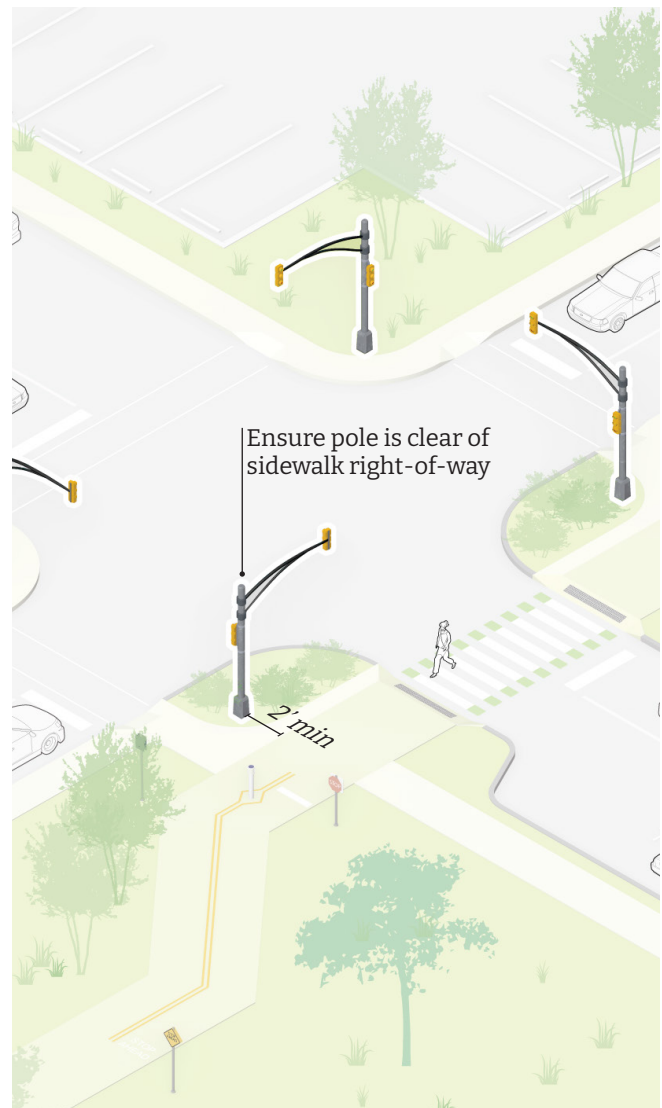
Traffic signals are helpful for keeping pedestrians safe when bayou trails cross at intersections because they give trail-users a dedicated time to cross the street. For additional details, see Appendix D: "[Signalized Intersection Crossings](#)" on p. D120.

### TYPICAL

- Install, upgrade, or relocate the pedestrian push button systems at the signalized intersection to be easily accessible by trail-users like bike riders and wheelchair users.
- Design trails to maintain a minimum 2-foot distance between existing traffic signal poles and the trail edge.

### RECOMMENDED

- Design spaces around traffic signals for plantings, special paving, or artistic expression without compromising access to signals by trail-users.
- Consider working with transportation authorities to add a leading pedestrian interval at the intersection.
- Consider working with transportation authorities to restrict left turn on red across a trail crossing using protected-only left-turn phasing across the trail.
- Consider working with transportation authorities to restrict right turn on red or installing "turning vehicles stop for bicyclists and pedestrians" signs (see Appendix D: "[Figure B2](#)" on p. D121).
- If the trail continues diagonally across the intersection, consider working with transportation authorities to implement a pedestrian scramble.

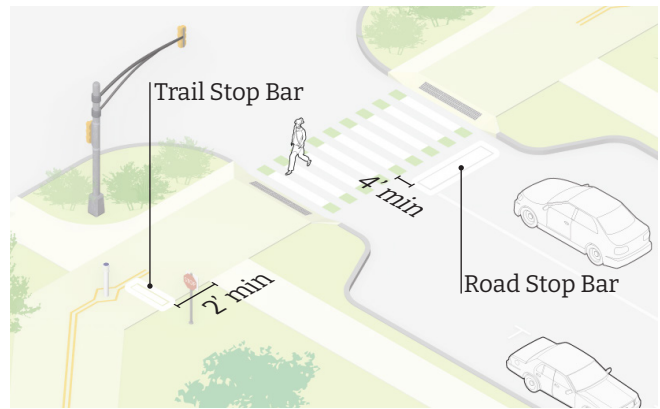


## Stop Bar

Stop bars are white lines painted on the street or trail that tell drivers or trail-users where they must stop.

### TYPICAL

- Place at all signalized intersections, signalized crossings, and before every stop sign.
- Locate at least 4 feet before the crosswalk in the oncoming lane for stop bars on the road and 2 feet before the sidewalk or roadway for trails.



## Stop Signs

If the trail crosses an intersection that is not signalized and does not warrant signalization, stop signs should be used to ensure that drivers stop for trail-users. This also applies to commercial driveways.

### TYPICAL

- If the intersection is not signalized, and does not already have stop signs, install stop signs at a minimum in the crossing direction. Stop signs can also be installed in all directions. Coordinate with traffic control authorities / commercial driveway owner.

### RECOMMENDED

- Consider adding a “Stop Here for Pedestrians” sign.



## Trail Stop Sign

Trail stop signs notify trail-users to stop and watch for cross traffic before crossing the street or the intersecting trail. For additional details, see Appendix D: [“Unsignalized Intersection Crossings”](#) on p. D124.

### TYPICAL

- Locate stop signs along the trail before any intersections where the roadway crossing does not have a stop sign or where the intersection sight distance between drivers and trail-users is not adequate.
- Locate the stop sign at least 2 feet ahead of the nearest sidewalk edge or edge of the roadway.
- If the cross street includes sidewalks, locate the stop sign before the intersecting sidewalk.
- “No Motor Vehicles” signs can be mounted to the back of trail stop signs at the entrances, facing oncoming trail traffic.



## Signage

In this condition, the following standards apply in addition to the standards described under General Greenway Elements “[Signage](#)” on p. 11.

### TYPICAL

- Include appropriate signage at the trail entrance.



## Advance Warning Signs and Markings

It is important to make sure that trail-users, especially bike riders and other people on wheels, know that a stop or trail crossing is coming. Warning signs or pavement markings can be added to help them prepare. These advance warning strategies should only be used if the sight distance is limited and the stop sign is not visible from the recommended sight distance. For additional details, see Appendix D: “[Pavement Markings](#)” on p. D137 and “[Signing](#)” on p. D139. Also, see Sections 2B and 9B of the MUTCD.

### TYPICAL

- Install advance warning signs or pavement markings if the sight distance is limited or the condition is otherwise unexpected.
- Locate “Stop Ahead” or “Road Crossing” signs along the trail if the stop sign is not visible from a sufficient stopping distance.
- Locate “Stop Ahead” or “Road Crossing” pavement markings near the warning signs. Pavement markings do not replace the advance warning signs. They are intended to supplement them.



## Centerline Pavement Marking

Centerline pavement markings warn people on wheels that the trail is approaching a trail crossing. They also help to discourage passing near crossings. For additional details, see Appendix D: “[Pavement Markings](#)” on p. D137.

### RECOMMENDED

- Stripe the centerline with a solid line for the length of the stopping sight distance from the edge of the sidewalk (or roadway, if no sidewalk is present).
- If bollards are present, stripe a diamond around the bollard.





## Removable Bollard

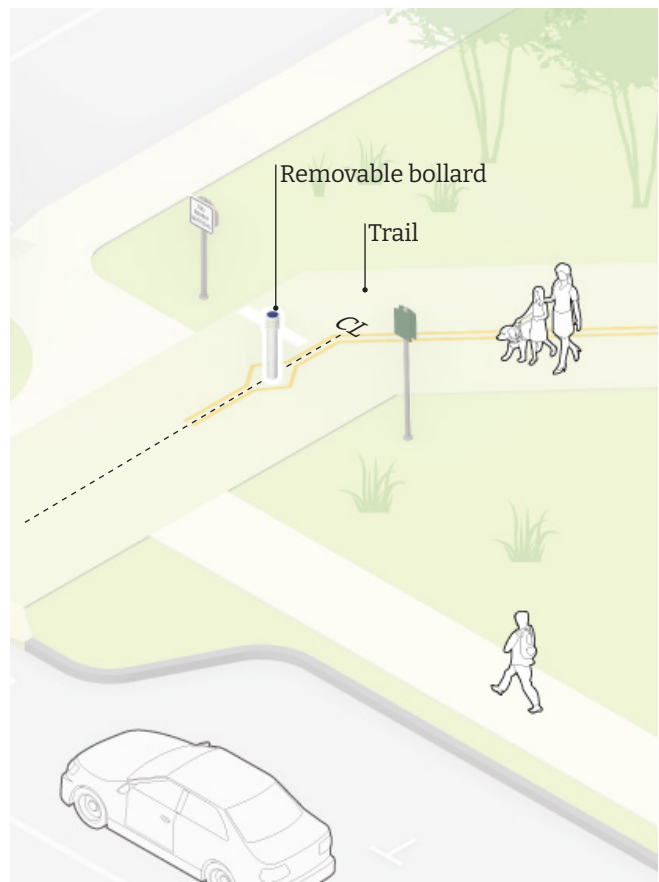
Removable bollards can be removed from the trail to allow authorized vehicle access. They do not stop trail-users from accessing the trail, but do stop unauthorized vehicles from entering the trail. However, removable bollards can pose a risk for trail-users. For additional details, see Appendix A: “Maintenance” on p. A8 and Appendix D: “Bollards” on p. D141.

### TYPICAL

- Bollards should be a fully removable type rather than a hinged type that can be laid down, to avoid being an obstacle when not in place.
- Use removable bollards only where there is documented history of unauthorized access by vehicle traffic and where people on wheels would anticipate the potential obstruction in the trail (like access points). Prioritize designing trail access points to clearly indicate that it is not a vehicle access area, such as with center islands.
- Locate on the centerline of the trail with at least 32 inches of clear width on either side between the bollard and the edge of the trail.
- If more than one bollard is used, use an odd number to avoid creating a center lane that could cause confusion and collisions, and ensure at least 32 inches of clear width between bollards.
- Stripe the pavement leading up to the bollard to alert people on wheels to their presence in advance.
- Bollards should be at least 40 inches tall with reflective material on both sides. However, if taller bollards are installed, they require additional trail width since they may conflict with bike handlebars.

### RECOMMENDED

- Use solar powered bollards where extra light may be useful at night.



## Optional Elements

### Bulb-outs

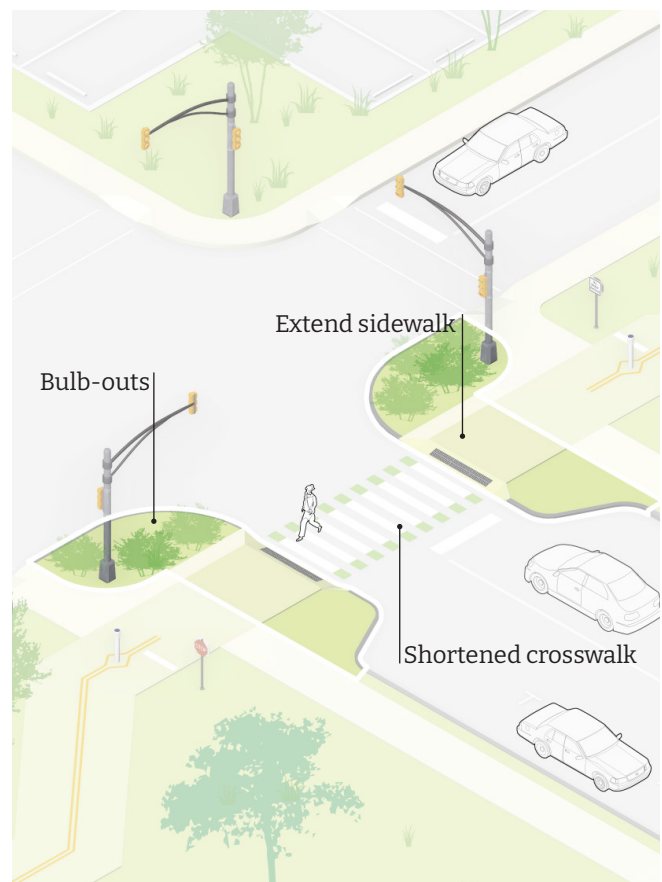
Bulb-outs are curb extensions that extend the pedestrian realm into the paved right-of-way by extending the curb into the parking lane. This reduces the length of the crosswalk and makes trail-users more visible at the crosswalk.

#### TYPICAL

- Bulb-outs can be constructed with temporary or quick-build materials.

#### RECOMMENDED

- When a crossing street has on-street parking, design bulb-outs at the crosswalk.



### Medians / Hardened Centerlines

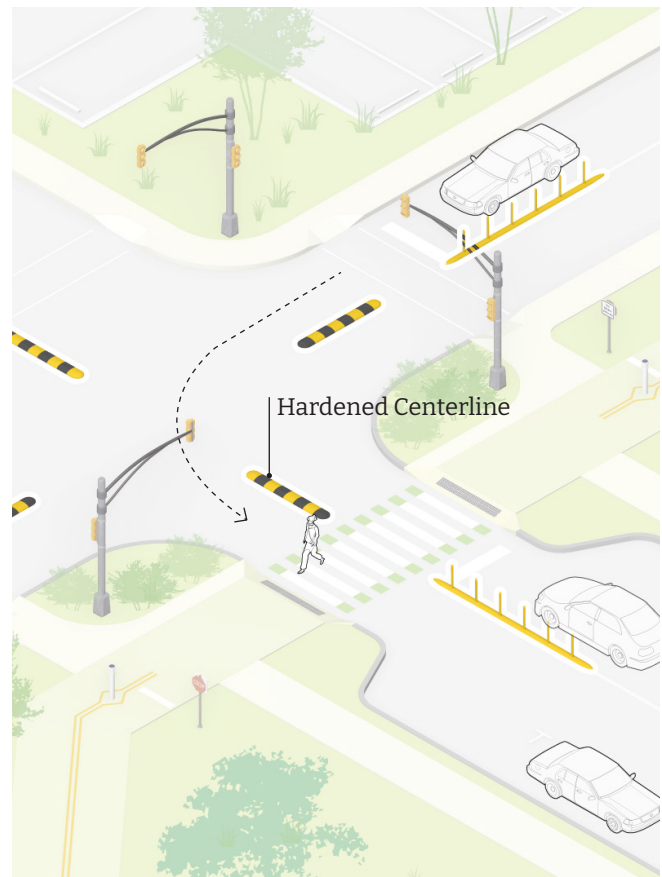
Medians and hardened centerlines (like rubber curbs or bollards) can make intersections safer for pedestrians because they encourage drivers to make slower turns through the intersection, making it more likely for drivers to see pedestrians crossing the street as they turn.

#### TYPICAL

- Medians can be constructed with temporary or quick-build materials.

#### RECOMMENDED

- If the road is wide enough, consider adding a median.
- If there is not enough room for a median, install a hardened centerline.



## Pedestrian Refuges

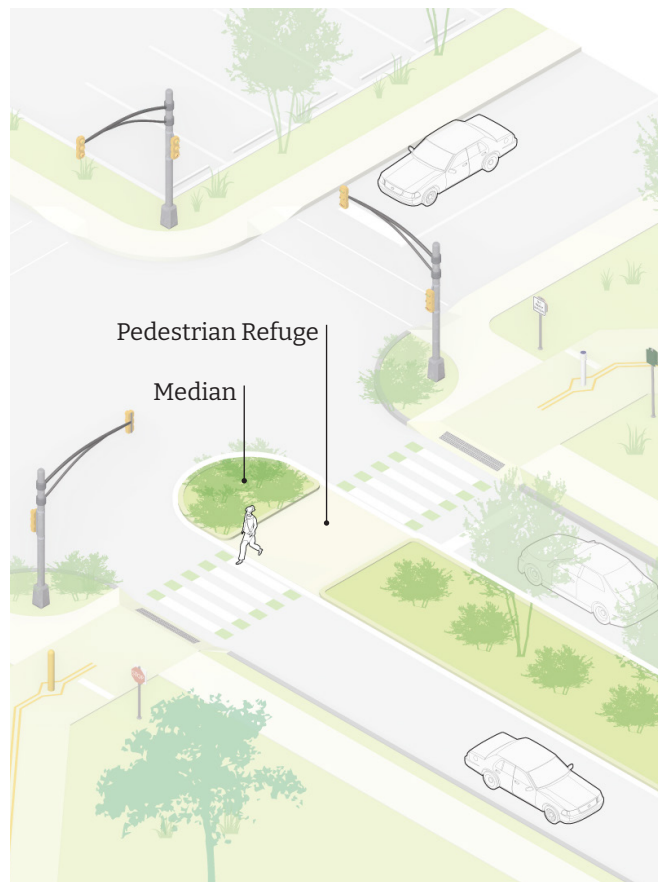
Pedestrian refuges make crosswalks shorter for pedestrians and give pedestrians a place to stop if they are not able to cross the full width of the street. They are especially useful on major roads with several lanes in each direction that are hard for pedestrians to cross, especially for people with limited mobility.

### TYPICAL

- If constructing a new median, include a pedestrian refuge at the crossing.
- Design refuge with front nose between the crosswalk and the intersection to provide a protected space.
- Design refuges to be at least 8 feet wide to accommodate a bicycle.

### RECOMMENDED

- When the road the trail is crossing has an existing median, consider reconstructing part of the median to include a pedestrian refuge.
- Landscape the median with low plants or appropriate trees that will not impede cars from seeing pedestrians in the refuge.

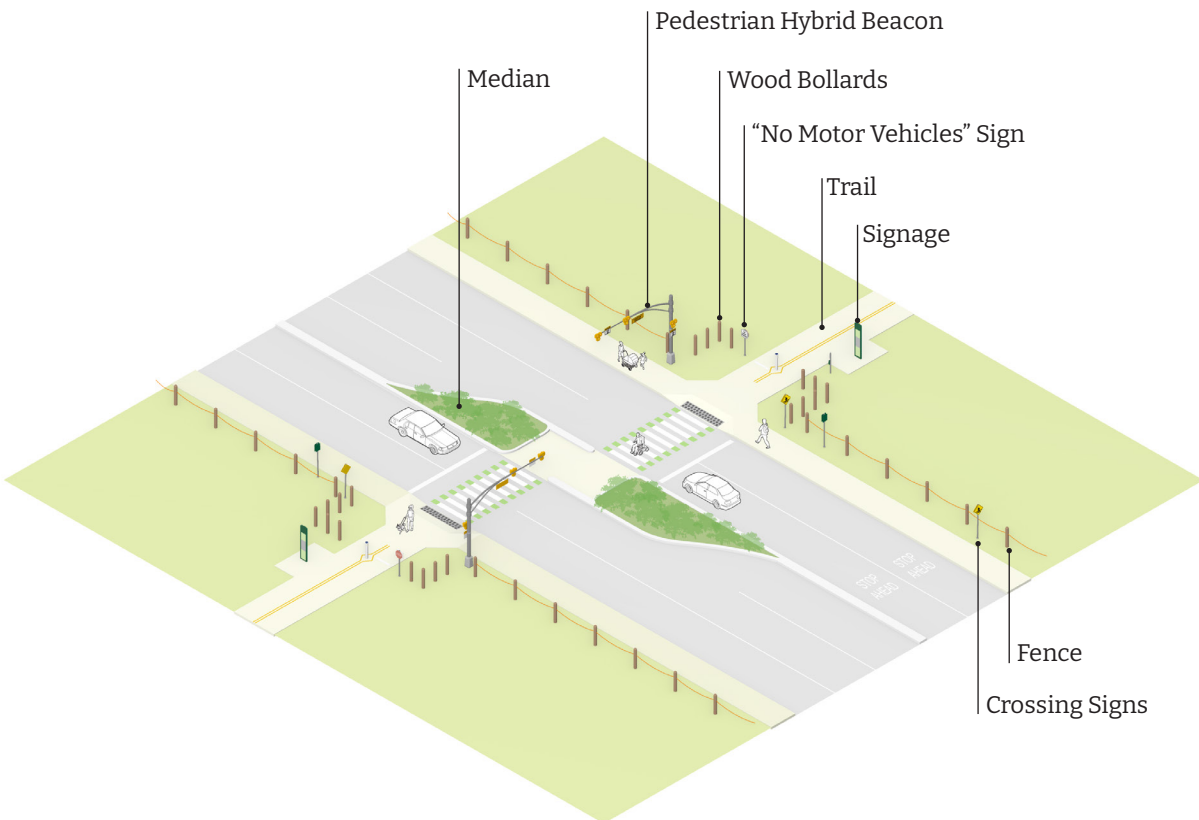


# GENERAL GREENWAY ELEMENTS

## Mid-Block Street Crossings

Trails often cross streets. It is preferable to run the trail along the right-of-way of the road to cross at the nearest signalized intersection, but sometimes a mid-block crossing is appropriate. The following standards apply when a trail crosses a road mid-block. When at-grade mid-block crossings are used, they must be further than 100 feet from any other signalized crossing.

The standards in this section apply in addition to the standards listed in General Greenway Elements “Typical Conditions” on p. 6 and the standards listed in General Greenway Elements “Street Crossing at Intersections” on p. 18.



## Connecting Sidewalks

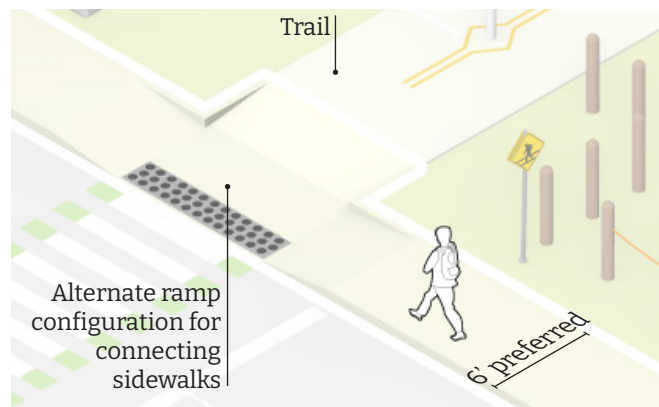
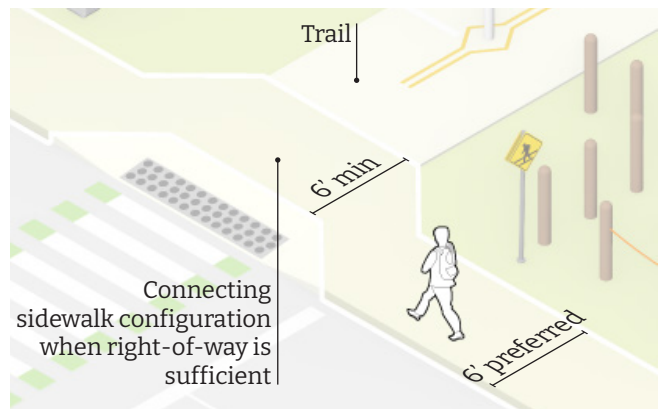
In this condition, the following standards apply in addition to the standards described under General Greenway Elements [“Connecting or Secondary Trails” on p. 9](#). For additional details, see Appendix A: [“Connecting or Secondary Trails” on p. A10](#).

### TYPICAL

- Any reconstructed or replaced sidewalks can match the existing sidewalk width but must be at least 6 feet wide and can be up to 10 feet wide.
- When sidewalks along the street do not have a buffer, either reconstruct the sidewalk around the curb ramp to maintain 6 feet of clear space for the sidewalk if right-of-way width is sufficient (11-12 feet) or create a flat landing and ramp up in three directions to maintain ADA accessibility.

### RECOMMENDED

- Where possible, upgrade sidewalks along street bridges to be at least 6 feet wide and include a buffer element between the sidewalk and street traffic.



## Crossing Signs

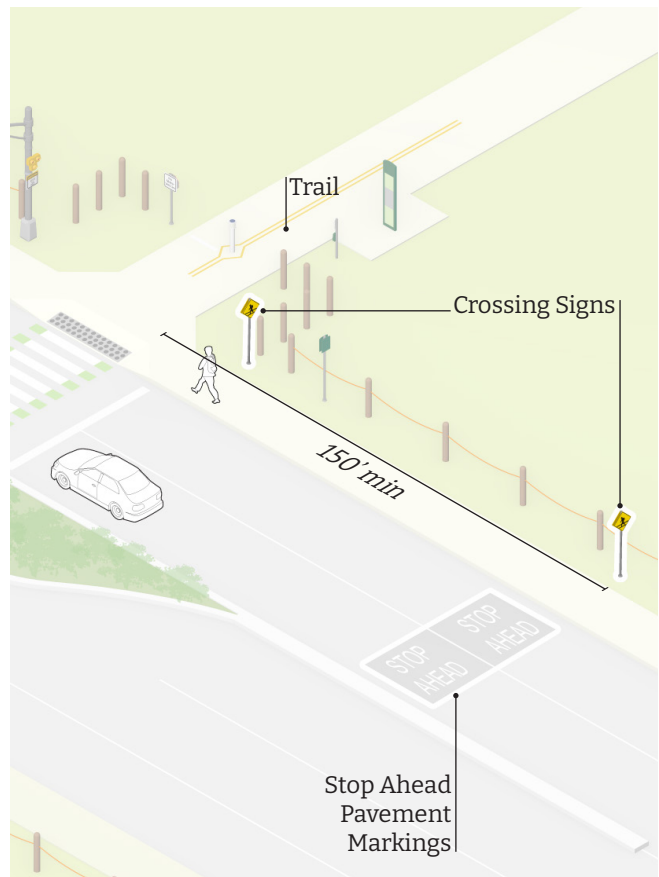
Crossing signs are yellow yield signs that indicate to drivers that they are approaching a crosswalk and that they should yield to pedestrians and people on wheels in the crosswalk. For additional details, see Appendix D: [“Unsignalized Intersection Crossings” on p. D124](#).

### TYPICAL

- Locate the pedestrian crossing sign with a diagonal downward arrow plaque near the crosswalk on both sides of the street, facing oncoming traffic.
- Locate another advance warning sign with an “ahead” plaque 150 feet in advance of the crosswalk in both directions, facing oncoming traffic.

### RECOMMENDED

- Paint “Stop Ahead” pavement markings near the advance warning signs. Pavement markings do not replace the advance warning signs. They are intended to supplement them.
- Consider adding the “Stop Here for Pedestrians” sign.



## Pedestrian Signals

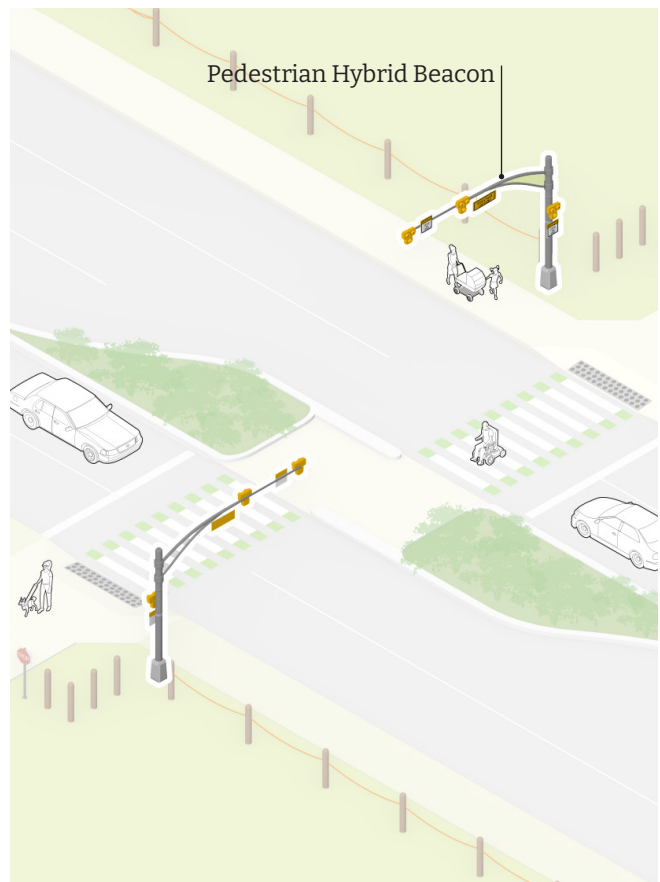
Pedestrian signals, like pedestrian hybrid beacons, HAWK crossings, rectangular rapid flashing beacons (RRFB), etc., are signal devices that are used to upgrade at-grade mid-block crosswalks into safer crossings by introducing signals or flashing lights to alert cars that they should stop. These are preferable for ped/bike-only crossings since they are cheaper to install than a traffic signal. For additional details, see Appendix D: “Mid-Block Crossings” on p. D126.

### TYPICAL

- Locate on both sides of the street with flashing yellow lights/HAWK signals visible from both directions of traffic on both sides of the street.
- Locate the pedestrian push button near the trail where pedestrians, wheelchair users, and people on wheels can easily push it without dismounting, overreaching, or going out of their way.

### RECOMMENDED

- Pedestrian hybrid beacons and HAWK signals are preferred for roadways with more traffic and higher speeds, but when there is no more than one lane of vehicle traffic in each direction.. For details on which signals to use for which type of street, see Appendix D: “Table B.1” on p. D129.



## Medians and Pedestrian Refuges

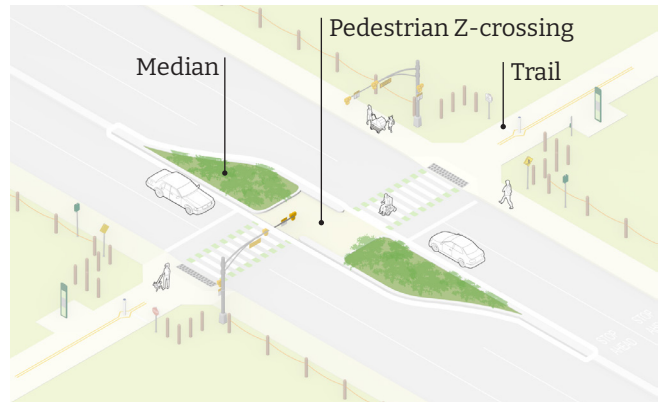
In this condition, the following standards apply in addition to the standards described under General Greenway Elements “Pedestrian Refuges” on p. 25. For criteria for what determines whether a mid-block crossing requires signals and advanced warning signs, see Appendix D: “Table B.1” on p. D129.

### TYPICAL

- Match refuge width to width of the crosswalk.

### RECOMMENDED

- For mid-block crossings, use Z-style refuge.



## Wood Posts

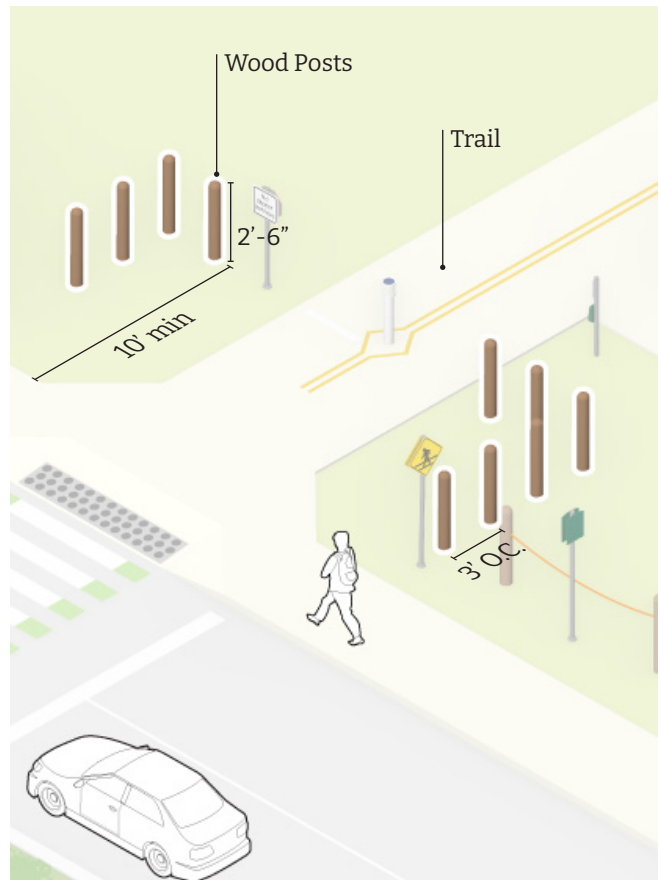
Wood posts indicate the trail entrance and prevent cars from entering the trail.

### TYPICAL

- Space posts 3 feet on center.
- Design posts to be round and at least 7 inches in diameter, at least 2 feet 6 inches tall, with a rounded cap.
- In locations where maintenance vehicles may need to enter the trail right-of-way and the street does not allow space to safely park a maintenance vehicle, set posts at least 10 feet back from the road to allow maintenance vehicles to temporarily park off the road near the trail entrance without blocking the trail.

### RECOMMENDED

- Considering installation of reflective material on wood posts.

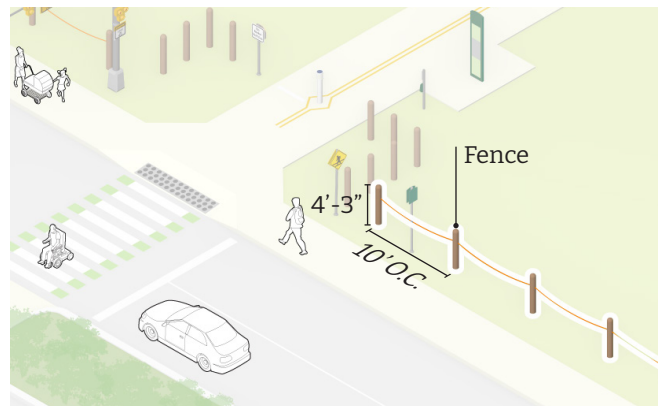


## Fence

Fences are typically used along easement boundaries to indicate the extent of the public space.

### TYPICAL

- For cable fences, cover the cable with orange flexible corrugated polyethylene tubing to ensure that the cable is visible.
- For cable fences, design posts to be round and at least 7 inches in diameter, 4 feet 3 inches tall, with a rounded cap.

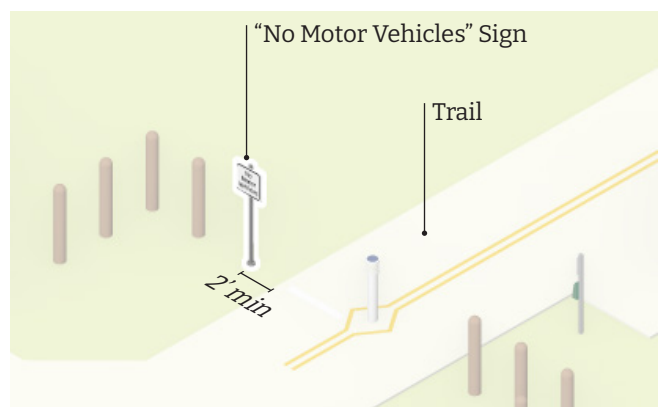


## “No Motor Vehicles” Sign

The “No Motor Vehicles” sign lets motorists know that they are not allowed on the trail.

### TYPICAL

- Locate at the trail entrances where vehicles may be tempted to enter the trail.
- Orient signs to face the street.
- Include a note that ‘Motor Vehicles’ include ATVs, electric bikes, electric scooters, mini-motorcycles, etc.



## Signage

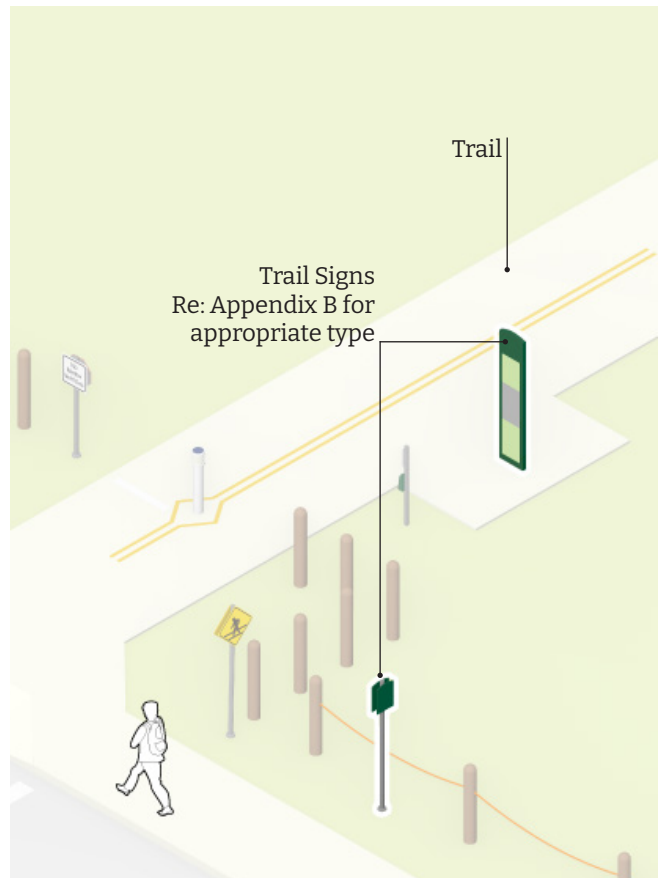
Houston Parks Board has a signage package detailing types of signs and sign placement. Trail access markers and trailhead signs may be appropriate at mid-block crossings. For additional details, see [“Appendix B” on p. B1](#).

### TYPICAL

- Sign placement must not interfere with the 20-foot maintenance access.

### POWER LINE CORRIDOR CONDITION

- Signs are not allowed in CenterPoint easements. Locate signs within street right-of-ways at entrances to the trail.



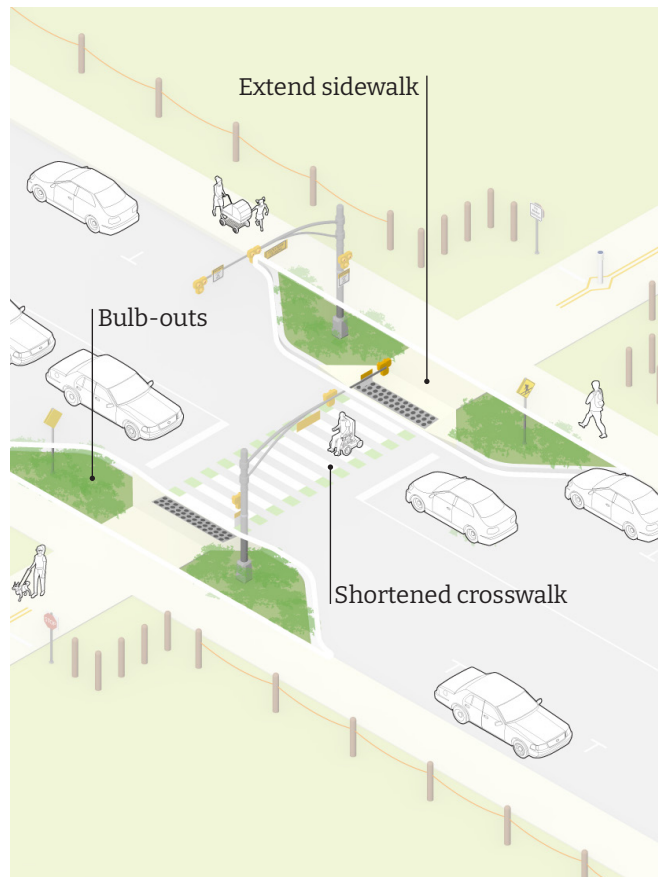
## Optional Elements

### Bulb-outs

In this condition, the following standards apply in addition to the standards described under General Greenway Elements [“Bulb-outs” on p. 24](#).

### RECOMMENDED

- When the street the trail is crossing has on-street parking, design bulb-outs at the crosswalk.



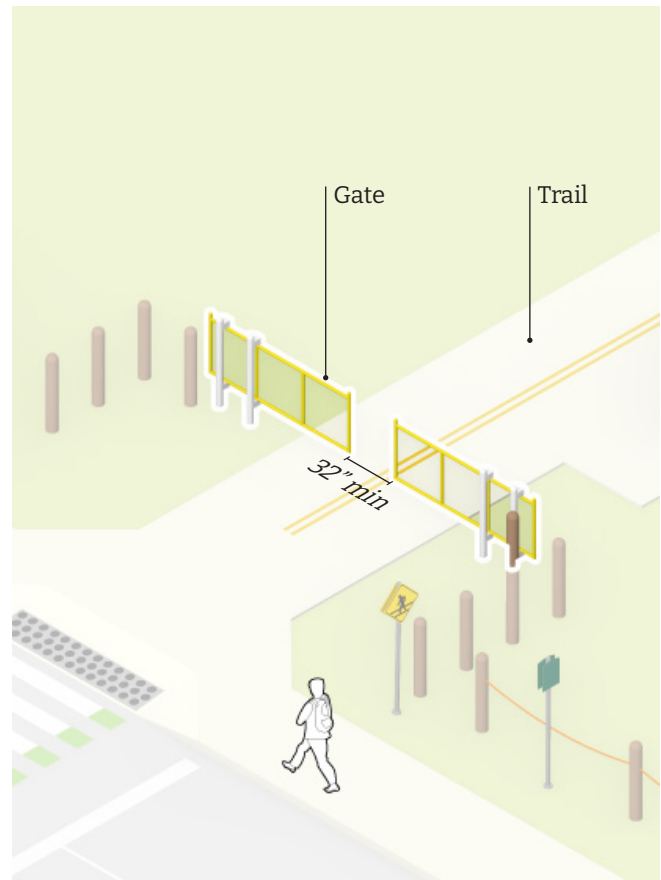


## Gates

Gates work similarly to removable bollards (see [“Removable Bollard” on p. 23](#)) in that they do not stop trail-users from accessing the trail, but do stop unauthorized vehicles from entering the trail. They are more expensive than removable bollards but are generally safer for trail-users. They come in several styles. For additional details, see Appendix D: [“Bollards” on p. D141](#).

### TYPICAL

- Install gate ahead warning signs when gates are used.
- Ensure gates are visible from the minimum stopping sight distance.
- Only use gates where they are not easily bypassed by vehicles.
- Choose gates with openings that allow access for wheelchairs and bikes, including recumbent bikes, cargo bikes, and bikes with trailers, or place gates so that there is a gap in the closed position with a clear width of at least 32 inches.
- Do not use gates in conjunction with bollards on the same trail access point.

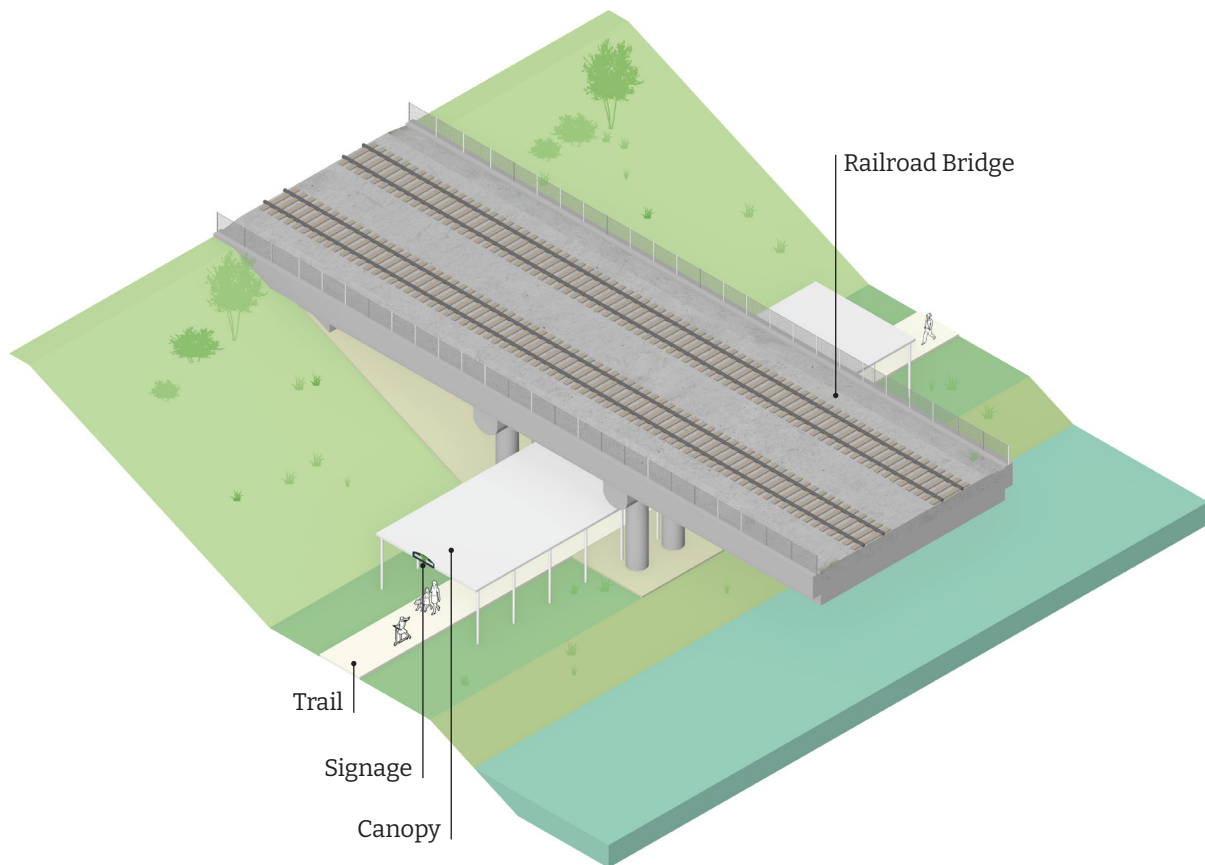


# GENERAL GREENWAY ELEMENTS

## Railroad Under Crossing

Greenway trails sometimes cross railroad rights-of-way. Trails can either cross over the railroad, under the railroad or cross at-grade. At-grade crossings are much less safe for trail-users and should be avoided, if possible. Under crossings are preferred because they are typically cheaper and easier for trail-users to navigate.

The standards in this section apply in addition to the standards listed in General Greenway Elements "Typical Conditions" on p. 6.



## Canopy

All trails crossing through the railroad right-of-way and under the tracks must be protected by a solid canopy.

### TYPICAL

- Ensure the canopy extends at least 30 feet beyond the bridge on either side.
- Provide 3-foot clearance between the top-of-canopy and bottom-of-bridge to allow for access to the bridge.
- Follow BNSF Railway design requirements and coordinate with HCFCF and the railroad to work through conflicting requirements.
- For BNSF Railway, the canopy structure can be concrete or metal.
- If clearance under a canopy is less than 15 feet, provide clearance warnings.

### SPECIAL CONDITIONS

- At the time of this document, Union Pacific Railroad is not allowing railroad crossings on their easements. For additional details, see Appendix A: [“Railroad Canopies and Fencing”](#) on p. A17.

## Trail Shoulder

In this condition, the following standards apply in addition to the standards described under General Greenway Elements [“Trail Shoulder”](#) on p. 8 and Appendix D: [“Path Width, Vertical Elements, and Shy Space”](#) on p. D135.

### REQUIRED

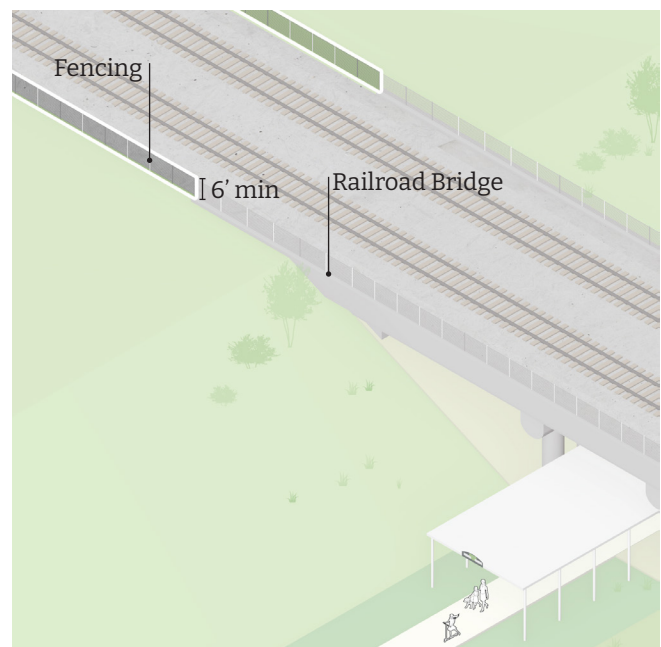
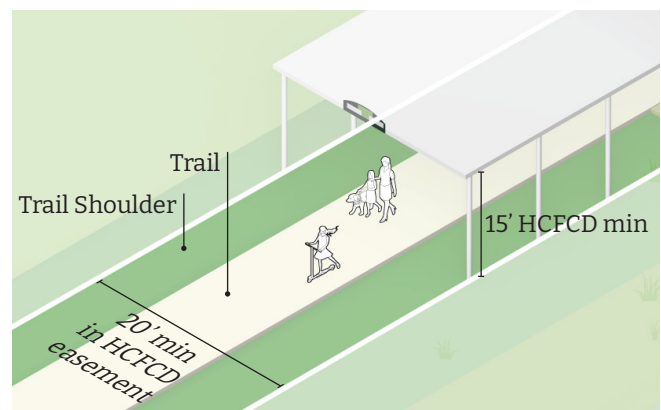
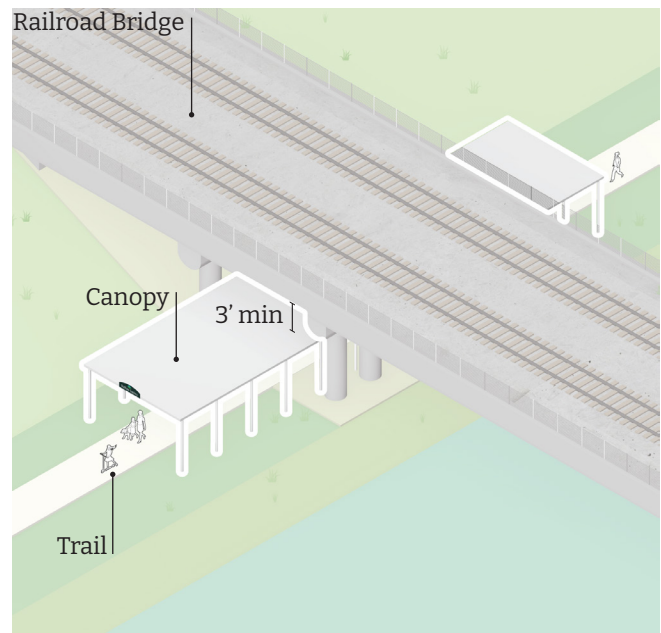
- If the HCFCF access route is through the canopy structure, provide the 20-foot horizontal x 15-foot vertical clearance.

## Fencing

Railroads may require fencing to protect their tracks from pedestrians and may require fences to be installed beyond their bridges. However, HCFCF does not allow fences within their right-of-way since fences can impede water flow. Sometimes these requirements conflict with each other and require additional coordination. For additional details, see Appendix A: [“Railroad Canopies and Fencing”](#) on p. A17.

### TYPICAL

- If a trail crosses under a railroad in HCFCF right-of-way and requires additional fencing, coordinate with HCFCF and the railroad owner to determine fence locations. If the fence must be within HCFCF right-of-way because of railroad requirements then this must be submitted as a Variance to HCFCF.
- Fences should be at least 6 feet tall.

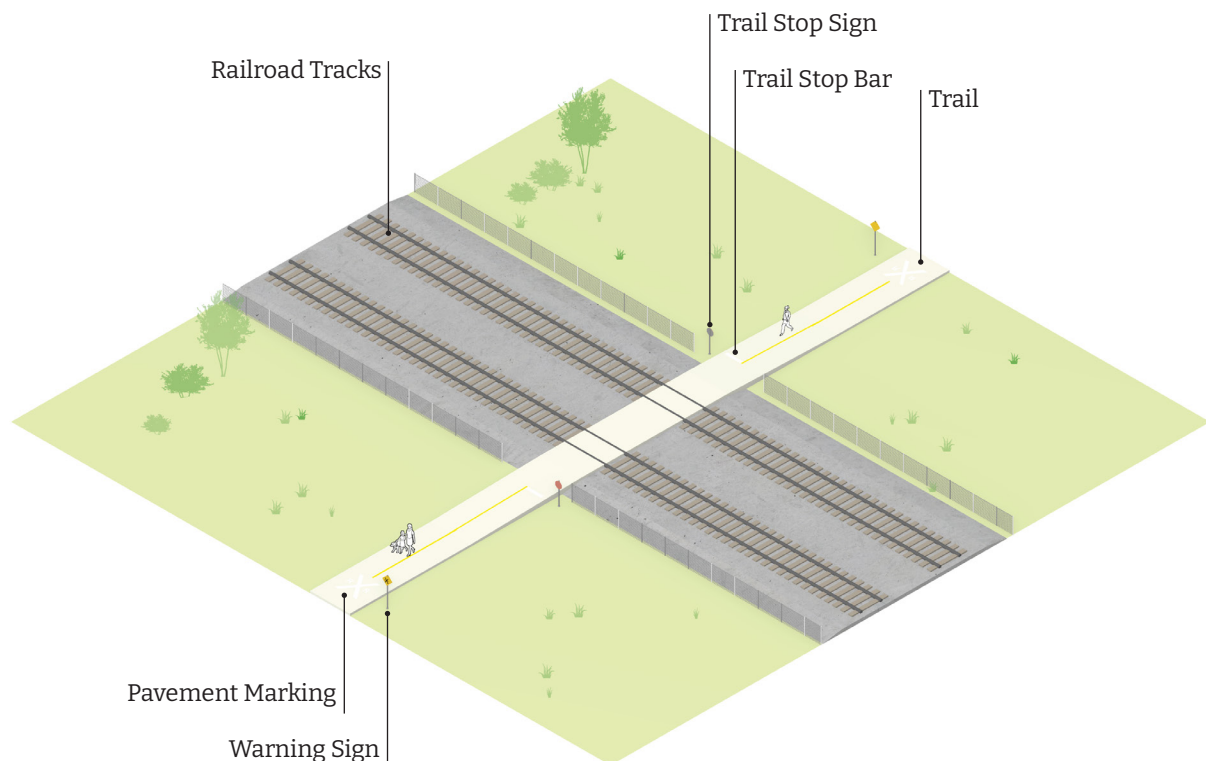


# GENERAL GREENWAY ELEMENTS

## At-Grade Railroad Crossing

Greenway trails sometimes cross railroads. Trails can either cross over the railroad, under the railroad or cross at-grade. At-grade crossings are much less safe for trail-users and should be avoided, if possible. However, if separated crossings are not an option and the railroad owner allows an at-grade crossing, the following standards apply.

The standards in this section apply in addition to the standards listed in General Greenway Elements "Typical Conditions" on p. 6.

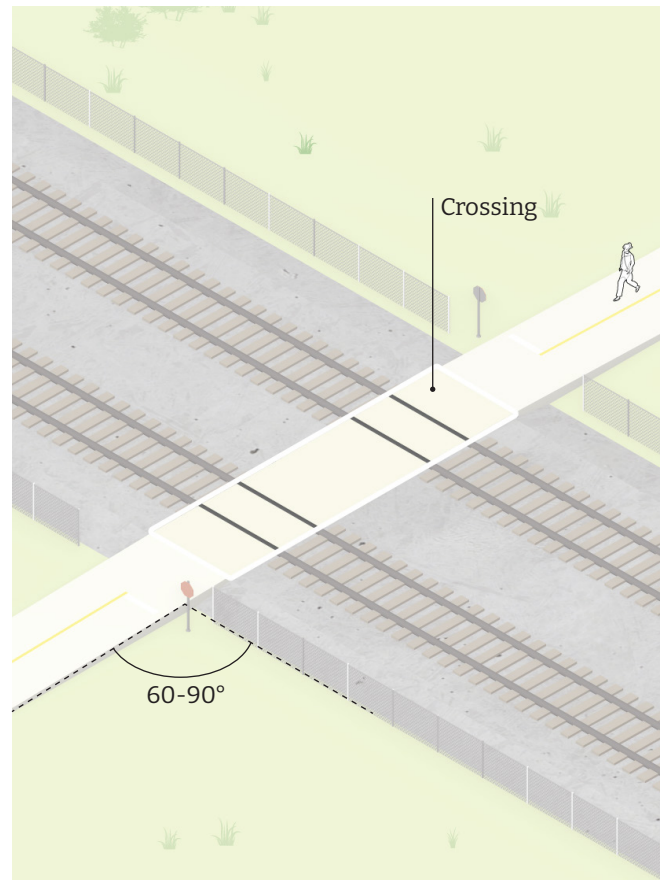


## At-Grade Railroad Crossing

At-grade railroad crossings can be dangerous for trail-users, especially for bike riders, people using wheelchairs or strollers, and people on scooters since their wheels can get caught in the tracks and cause crashes. For additional details, see Appendix D: “[Railroad Crossings](#)” on p. D146.

### TYPICAL

- Design crossing to allow people on wheels to cross at an angle between 60 and 90 degrees.
- Provide warning signs in advance of the crossing to warn people on wheels.
- Pave the trail so that railroad tracks are flush with the trail to provide a smooth riding surface.

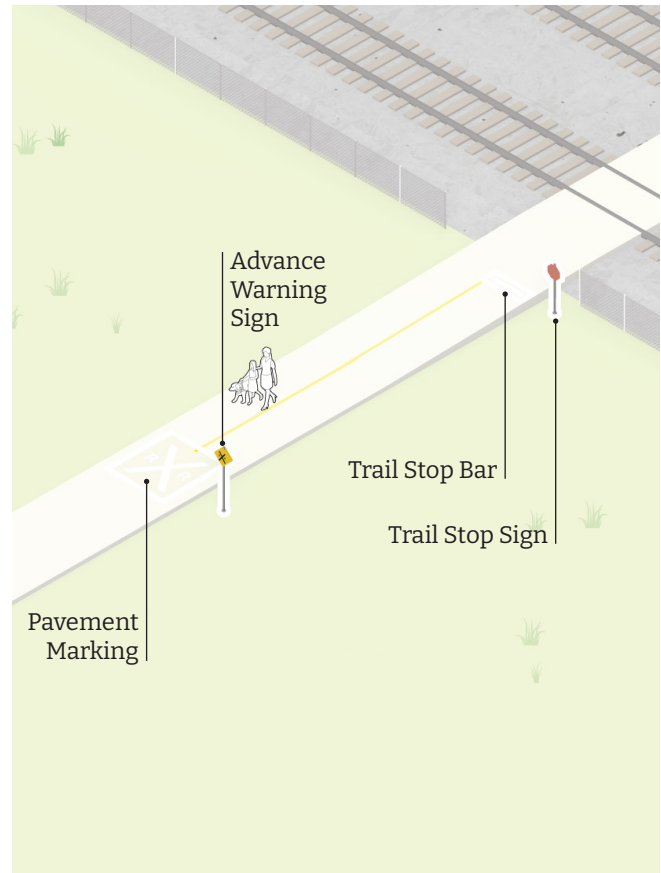


## Signage

It is important to make sure that trail-users, especially for bike riders, people using wheelchairs or strollers, and people on scooters, know that a railroad crossing is coming since their wheels can get caught in the tracks and cause crashes. Warning signs and pavement markings can be added to help them prepare. Warning signs and pavement markings should always be used in advance of the crossing, even if sight distances would not otherwise require signage.

### TYPICAL

- Locate railroad crossing signs along the trail in advance of the crossing.
- Locate railroad crossing pavement markings near the warning signs. Pavement markings do not replace the advance warning signs. They are intended to supplement them.
- Determine if it is appropriate to install trail stop signs and stop bars ahead of the crossing.



# GENERAL GREENWAY ELEMENTS

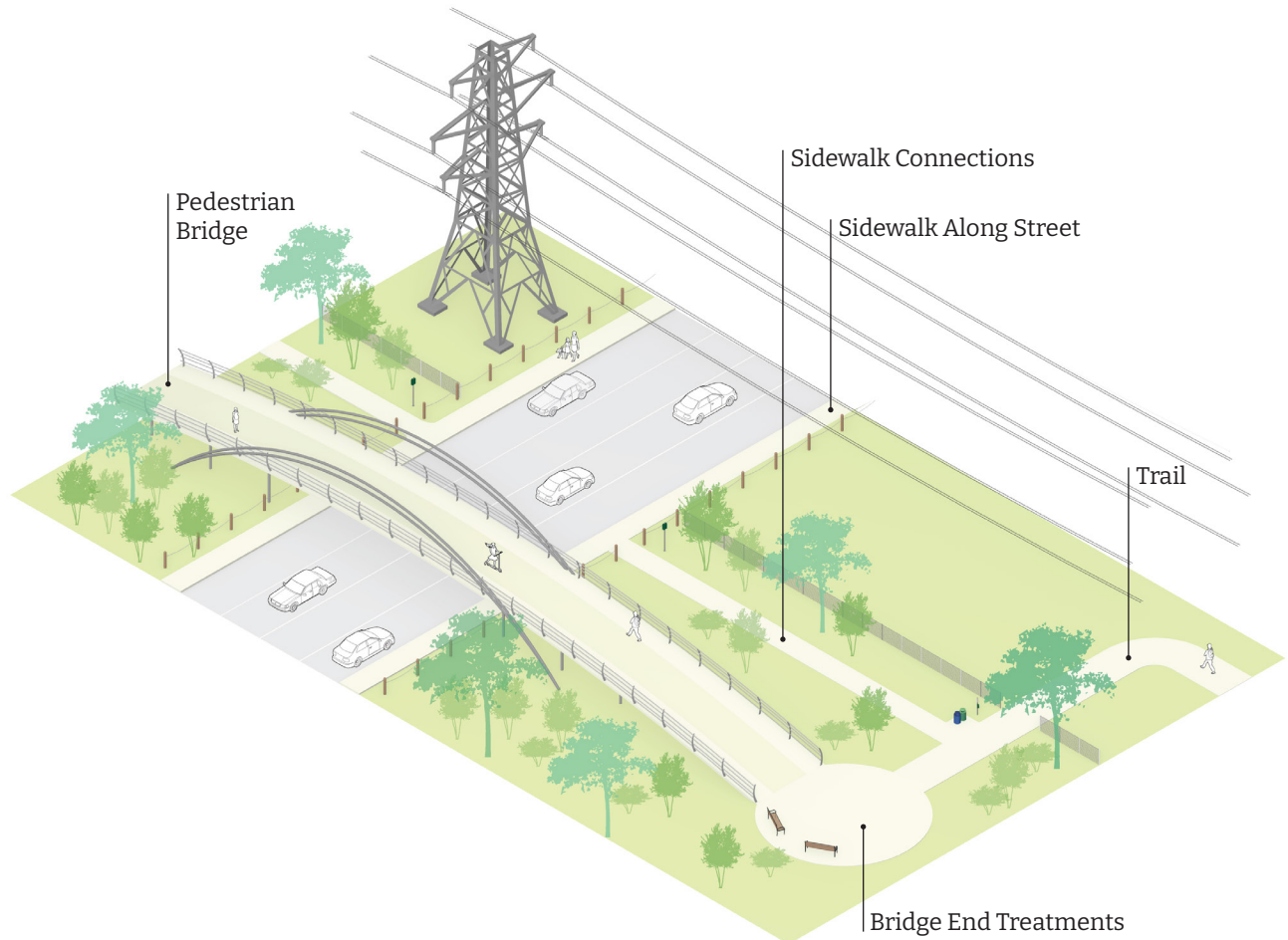
## Pedestrian Overpass

Greenway trails often cross streets and other grade-level obstacles like railroads. When the obstacles that the trail must cross are wide, busy streets, freeways, or railroads, crossing at grade may not make sense or may be too dangerous. In these cases, trails can either cross over or under these obstacles. Under crossings are often preferred over overpasses, if possible because they are typically cheaper and easier to build and for trail-users to navigate.

Pedestrian bridges are not allowed in most of the common easements used for trails, such as CenterPoint, but may still be worth building. In these cases, land may need to be acquired adjacent to the easement for the bridge.

The following standards apply when a trail crosses over an obstacle like a railroad. These standards do not apply to bridges over bayous and drainage channels, although they are similar. For standards for over crossings, see [“Pedestrian Bridge” on p. 42.](#)

The standards in this section apply in addition to the standards listed in General Greenway Elements [“Typical Conditions” on p. 6.](#)



## Pedestrian Bridge

Pedestrian bridges are important tools that allow pedestrians to bypass the hazards of crossing dangerous obstacles like busy streets, freeways, or railroad tracks.

### TYPICAL

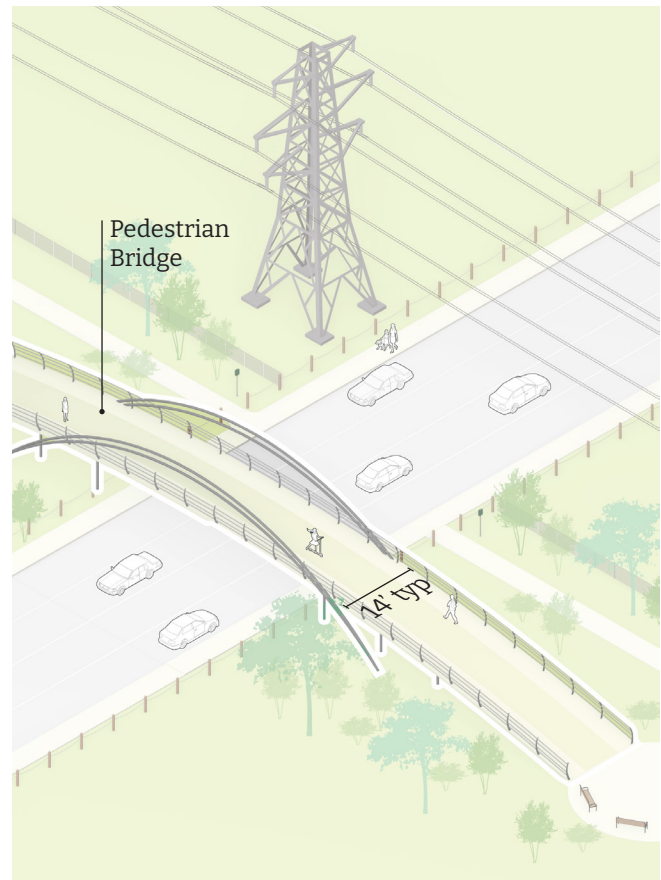
- Coordinate with the owning agency or refer to the owning agency standards to determine the necessary clearance.
- Use cast-in-place concrete abutments, seat walls, and concrete decking with the optional textured surfacing.
- Design bridges to be as wide as trails plus 2 feet on either side. (trail width + 4 feet)
- Pedestrian bridges are not allowed in most easements, like CenterPoint.

### RECOMMENDED

- If possible, design bridges so that the slope extends into approach trails with smooth vertical curve transitions to trail grades.

### MINIMUM RECOMMENDED

- Design bridges to be at least as wide as the trail.



## Guardrails

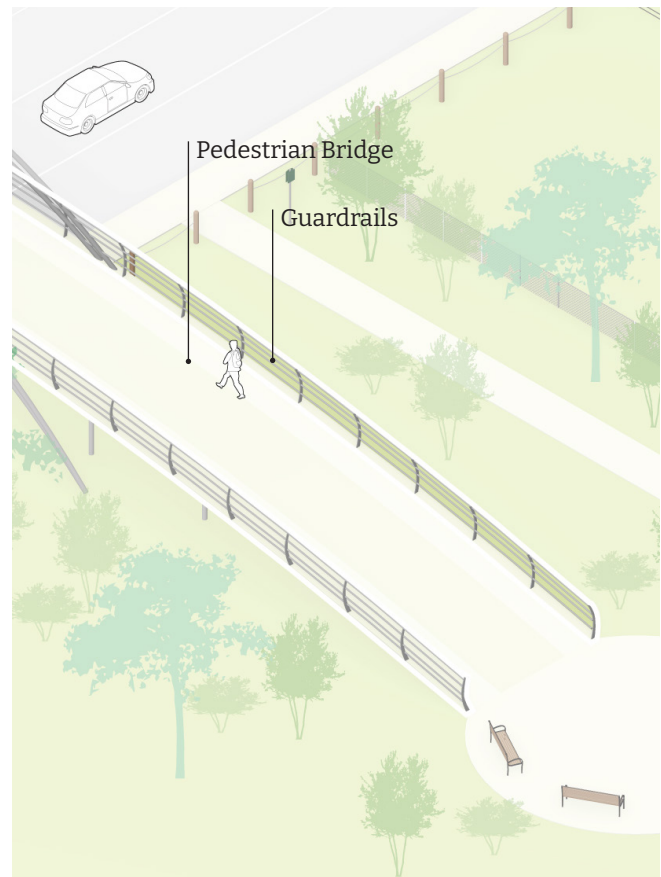
Guardrails prevent trail-users from going over beyond the edge of a trail and are used in places where the conditions on the side of the trail could be unsafe. For additional details, see Appendix A: [“Railings/Barriers” on p. A16](#).

### TYPICAL

- Minimize the use of guardrails beyond the bridge.
- Always locate where the drop from the trail edge to the ground surface exceeds 30 inches.
- Follow the true geometry of the trail; no segmenting on curves.
- Install reflective material on the end of guardrails that are installed on the edge of the trail surface.

### RECOMMENDED

- Use parapet wall guardrails at overlooks and bridge plazas in nodal areas or special viewing areas.
- Guardrails can be unique or incorporate art to highlight the neighborhood that the bridge crosses or connects to. For guidelines about incorporating art, see [“Art” on p. 17](#).
- Use TxDOT standard handrail detail as an example. See Appendix A: [“Standard TxDot Rail Type” on p. A41](#)

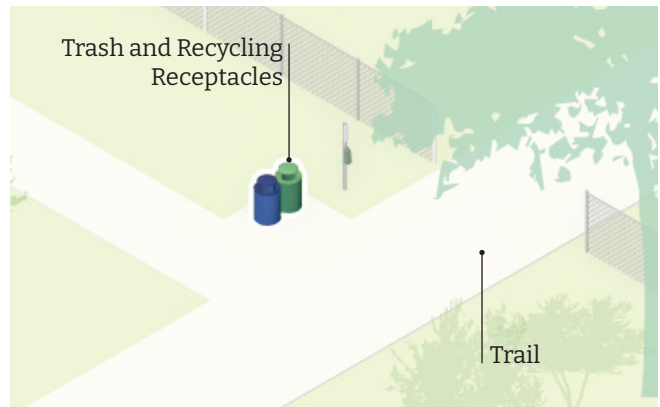


## Trash and Recycling Receptacles

In this condition, the following standards apply in addition to the standards described under General Greenway Elements [“Trash and Recycling Receptacles”](#) on p. 12.

### TYPICAL

- Do not place trash or recycling receptacles on the bridge or bridge abutments.

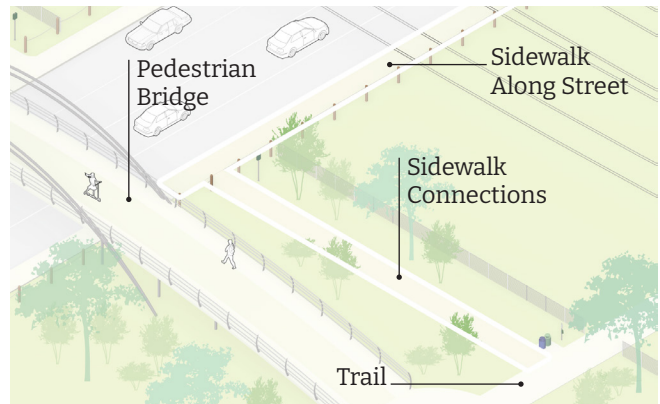


## Sidewalk Connections

When pedestrian bridges are used over a street that has a sidewalk, trails should still connect to the existing sidewalks, even if there is no at-grade crossing. This allows people to access the trail from the street and also allows people on the street to use the pedestrian bridge to cross the street if they need to. For additional details, see [“Connecting or Secondary Trails”](#) on p. 9.

### TYPICAL

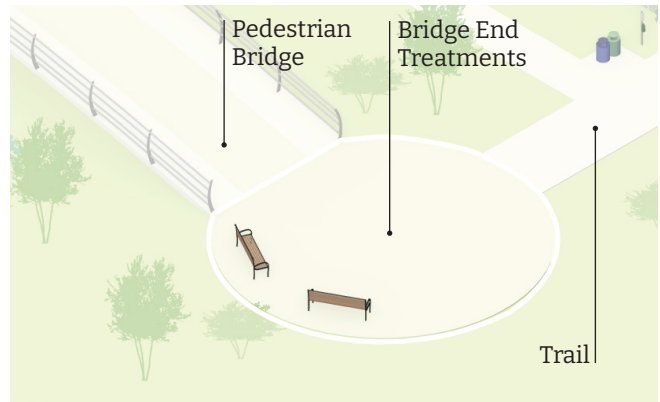
- When the pedestrian overpass crosses a street with sidewalks, connect to the existing sidewalks, even if an at-grade crossing is not provided.



## Optional Elements

### Bridge-end Treatments

Bridge-end treatments are small context-appropriate plazas or other special treatments to the trail on either end of the bridge. They can be used for small groups of people to gather without obstructing the trail and make the bridge more welcoming. For ramp details, see [“Bridge-end Treatments”](#) on p. 45.





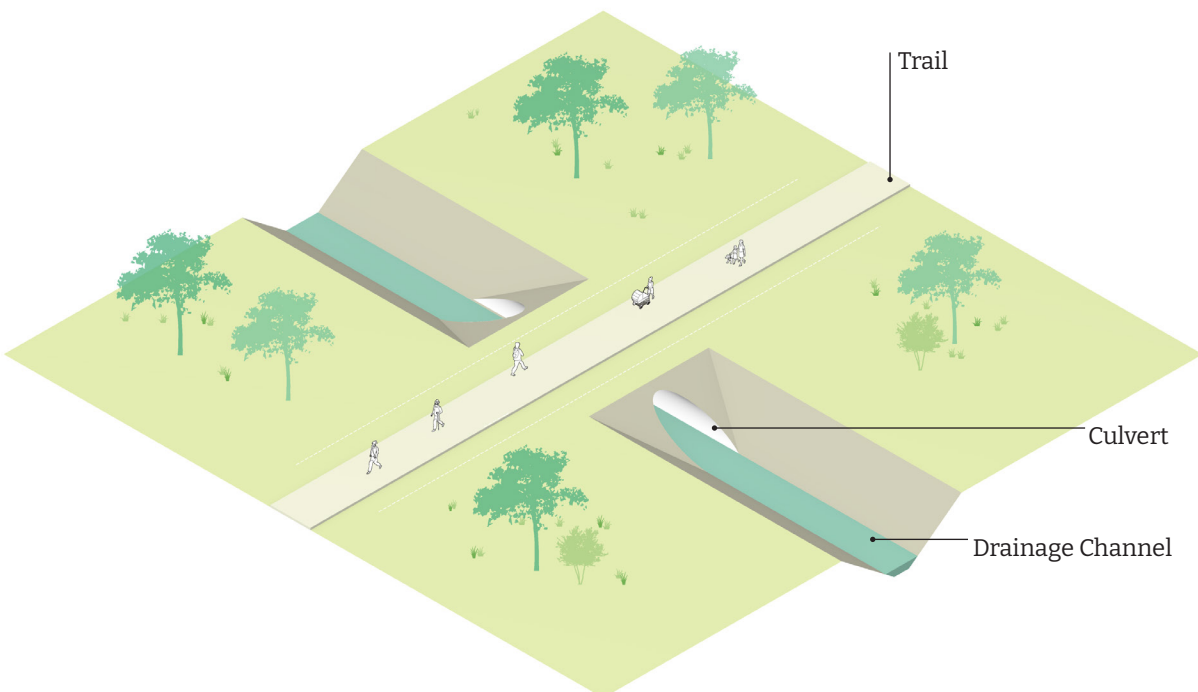
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# GENERAL GREENWAY ELEMENTS

## Drainage Channel Crossing

Greenway trails often cross drainage channels or bayou tributaries. Drainage channels can be crossed using a culvert or a pedestrian bridge. Drainage channels are stormwater features that are controlled by HCFCD and are have their own easements and sets of restrictions. Any design that is within HCFCD right-of-way must be approved and permitted by HCFCD. For standards for bridge crossings, see [“Pedestrian Bridge” on p. 42](#) and [Design Guidelines for HCFCD Wet Bottom Detention Basins with Water Quality Features HCFCD](#).

The standards in this section apply in addition to the standards listed in General Greenway Elements [“Typical Conditions” on p. 6](#).



## Culvert

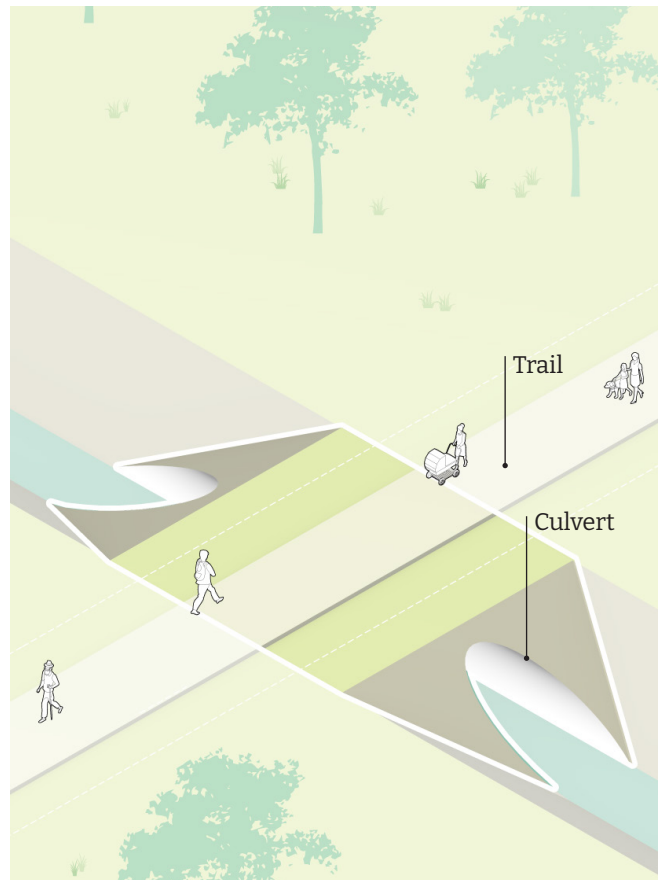
A culvert is a tunnel structure that allows water to pass underneath an obstacle like a road or trail, and is often embedded in the surrounding soil. Culverts are generally used when trails cross small drainage channels, and bridges are used for larger channels. For additional details, see Appendix A: [“Culverts” on p. A18.](#)

### TYPICAL

- Design culverts to be at least 2 feet in diameter.
- Trim pipe inlets and outfalls be flush with the final grade; pipe ends can be manufactured ends of field cut and constructed.
- Avoid using vertical headwalls in order to reduce maintenance costs, but where they are needed, design them to be long enough to resolve adjacent final grades with slopes no steeper than 3:1.

### CONCRETE-LINED TRIBUTARY CROSSING CONDITION

- Do not raise the base flood elevation in the main stem or tributary with the design of the culvert.
- Provide the 20-foot-wide maintenance access on the culvert crossing. Depending on the height of the crossing and potential fall issues, other protection devices may be utilized outside of the 20-foot maintenance access.

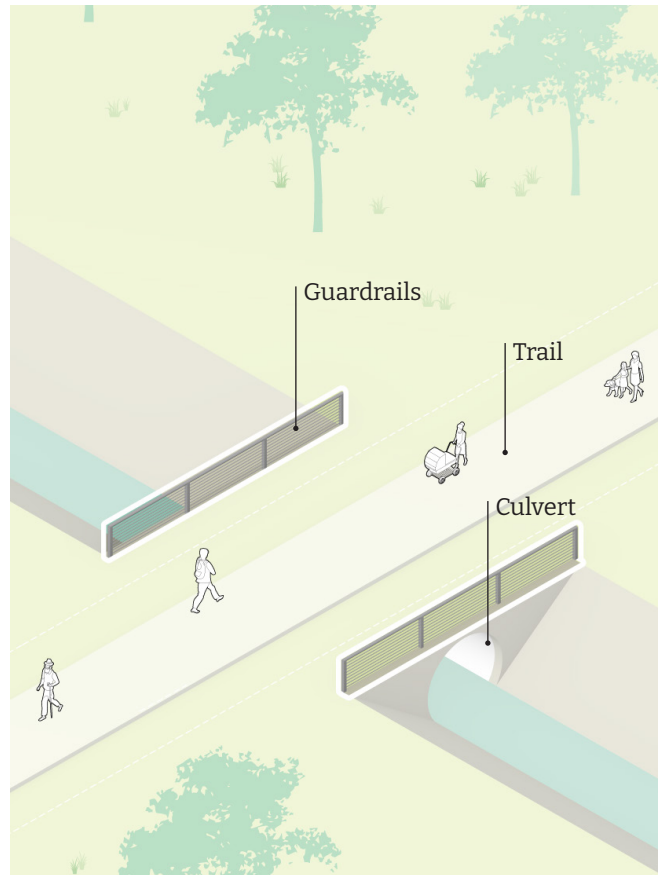


## Guardrails

If a headwall is used for a culvert or slopes are too steep, guardrails will be required along the trail. For guardrail details, see [“Guardrails” on p. 37.](#)

### TYPICAL

- Install guardrails if the vertical drop is more than 30 inches



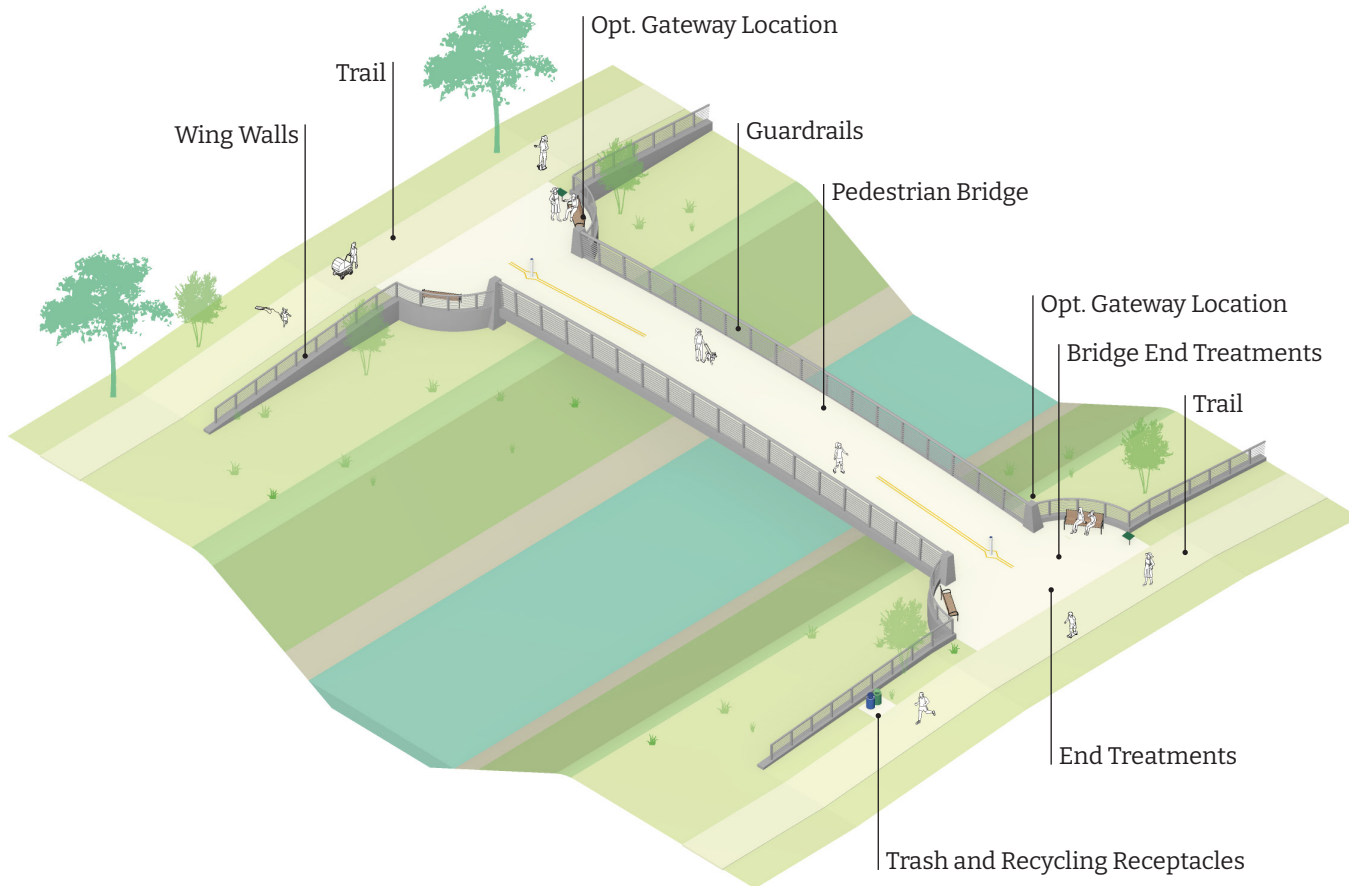
# GENERAL GREENWAY ELEMENTS

## Pedestrian Bridge

Greenway trails often cross drainage channels, bayous, or bayou tributaries. Drainage channels can be crossed using a culvert or a pedestrian bridge. For culvert crossing standards, see [“Drainage Channel Crossing” on p. 40.](#)

The standards in this section apply in addition to the standards listed in General Greenway Elements [“Typical Conditions” on p. 6.](#)

Pedestrian bridges are important because they allow people to get from one side of the waterway to the other without going all the way to the next street crossing, which can sometimes be miles away. They are especially important to include along bayou greenways to ensure that there are frequent, convenient ways for people to access destinations on the opposite side of the bayou.



## Pedestrian Bridge

Pedestrian bridges are important because the bayous are natural barriers. Adding pedestrian bridges across the bayous allows people to get from one side to the other without going all the way to the next street crossing, which sometimes is miles away. Bayou crossings should be frequent enough to make the bayou trails convenient, easy, and practical ways for people on either side of the bayou to use to go where they need to go. For additional details, see Appendix A: “Bridges” on p. A19.

### TYPICAL

- Design bridges so that the lowest member is at least 18 inches above the Base Flood Elevation.
- Use cast-in-place concrete abutments, seat walls, and concrete decking with the optional textured surfacing.
- Design bridges to be as wide as trails plus 2 feet on either side. (trail width +4 feet)

### RECOMMENDED

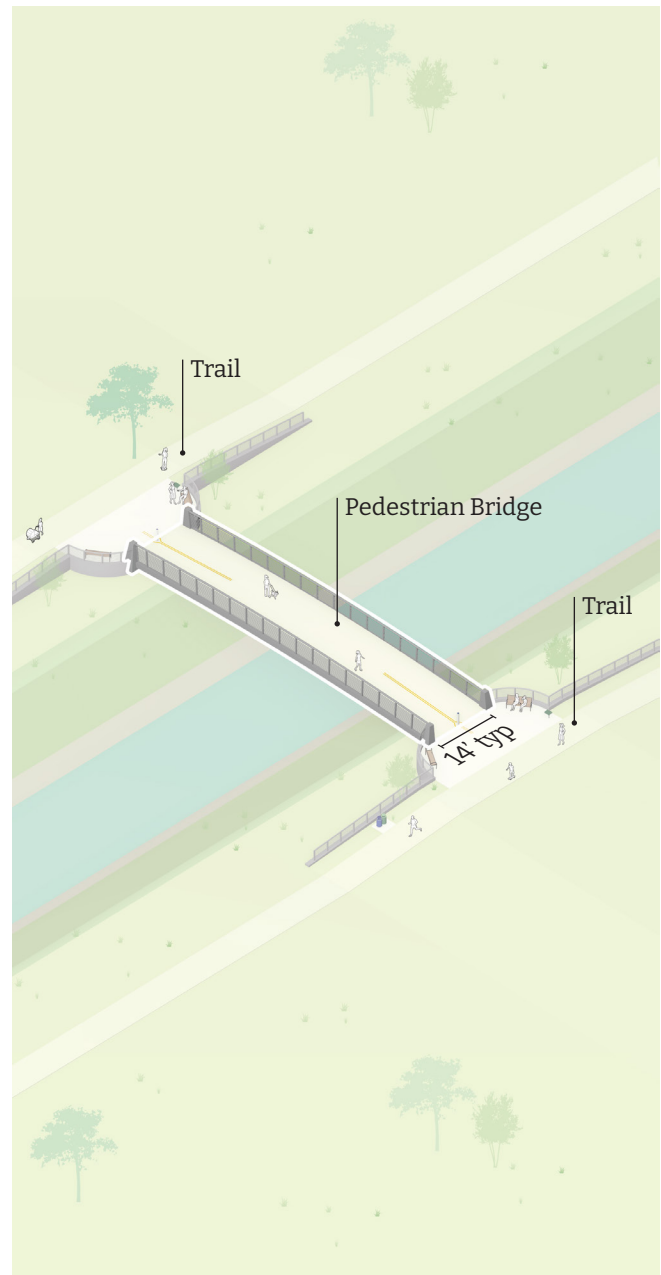
- Design bridges to be flat, where possible. If camber is necessary, the slope should extend into the approach trails with smooth vertical curve transitions to trail grades.

### MINIMUM RECOMMENDED

- Design bridges to be at least as wide as the trail.

### SPECIAL CONDITIONS

- In HCFCF right-of-way, if the bridge replaces existing access routes, the bridge width should be at least 14 feet.
- If the bridge is located within CenterPoint right-of-way or runs underneath power lines outside of CenterPoint easements, coordinate with CenterPoint to determine proper clearances.



## Guardrails

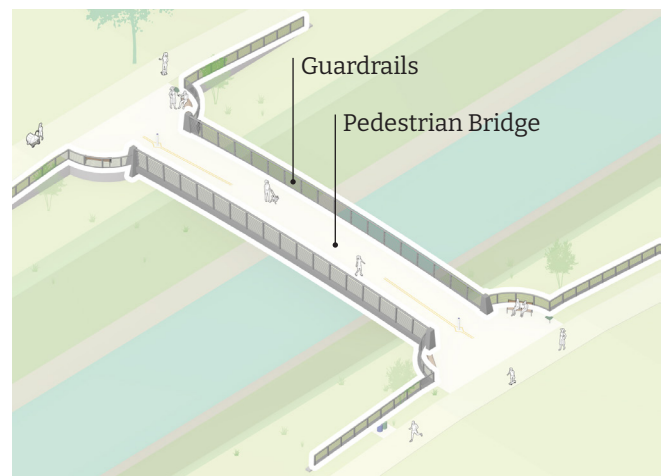
In this condition, the following standards apply in addition to the standards described under General Greenway Elements “Guardrails” on p. 37.

### TYPICAL

- Always locate on downhill walls adjacent to trails and on uphill walls if they are higher than 6 feet or 30 inches if there is an accessible area above the wall.

### RECOMMENDED

- Guardrails can be unique to highlight the tributary, bayou, or neighborhood that the bridge crosses or connects to.



## Removable Bollard

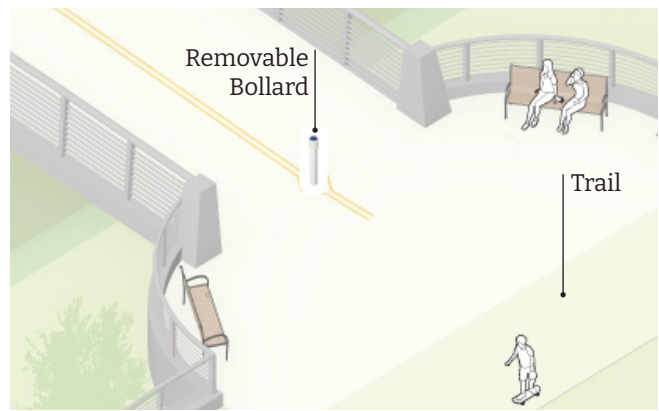
In this condition, the following standards apply in addition to the standards described under General Greenway Elements "[Removable Bollard](#)" on p. 23.

### TYPICAL

- Locate removable bollards on both sides of pedestrian bridges to restrict vehicles and ATVs on bridges.

### RECOMMENDED

- National trail guidelines recommend not installing bollards since they can be a safety hazard for people on wheels. Consider other options for restricting vehicles on trails and bridges.

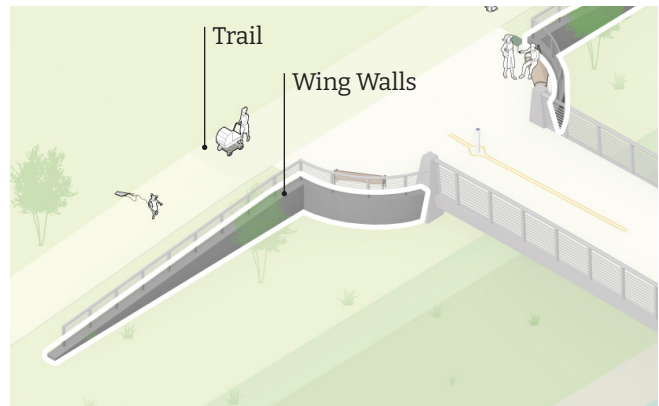


## Wing Walls

Wing walls are short retaining walls adjacent to the bridge abutments. They retain the soil and resolve the grading at slopes around the trail leading up to the bridge. For additional details, see Appendix A: "[Bridges](#)" on p. A19.

### TYPICAL

- Use to resolve grading at slopes no steeper than 4:1.
- Use guardrails that continue the bridge guardrail geometry (in plan and in elevation) to the point that the finish grade meets the trail surface.



## Trash and Recycling Receptacles

In this condition, the following standards apply in addition to the standards described under General Greenway Elements "[Trash and Recycling Receptacles](#)" on p. 12.

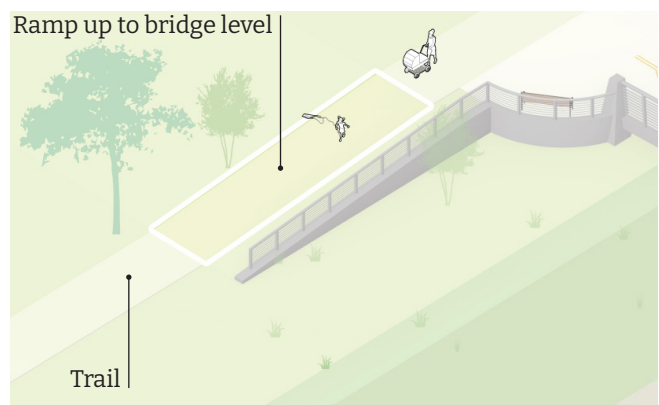
### TYPICAL

- Do not place trash or recycling receptacles on the bridge or bridge abutments.



## Ramp

Bridges must be a specific height above water or flood levels, and this often requires the trail to ramp up to the bridge level. For ramp details, see "[Ramp](#)" on p. 73.



## Optional Elements

### Bridge-end Treatments

Bridge-end treatments are small context-appropriate plazas or other special treatments to the trail on either end of the bridge. They can be used for small groups of people to gather without obstructing the trail and make the bridge more welcoming. For additional details, see Appendix A: “Bridges” on p. A19.

#### RECOMMENDED

- Design of treatments should depend on the character of the trail and neighborhood/area.
- Consider seating areas, planting, signage, or other elements and amenities.

### Seating

Seating near a bridge can give trail-users a chance to rest before crossing the bridge. They can highlight views of the bayou, the city or special features. This is particularly useful because bridges often are not shaded and may be hot to cross during the summer months.

#### TYPICAL

- Design so they provide safe areas to congregate off of the main trail area.
- Do not limit the 20-foot maintenance access required on either end of the bridge.

### Gateways

Gateways are decorative elements on either end of a bridge that add interest and character to the bridge.

#### TYPICAL

- Maintain at least 15-foot vertical clearance.

#### RECOMMENDED

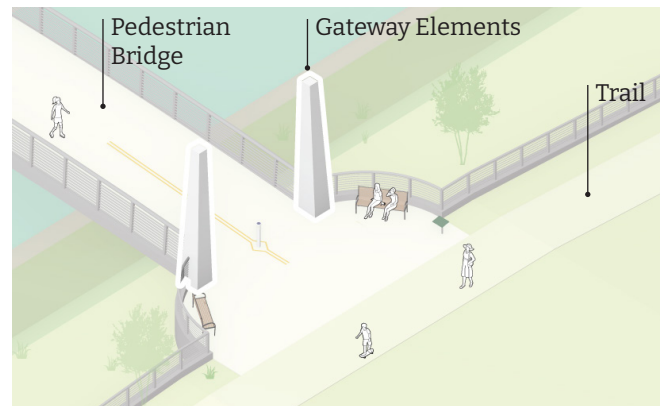
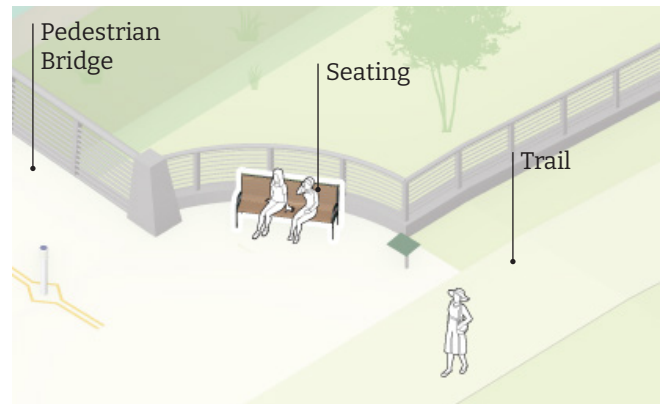
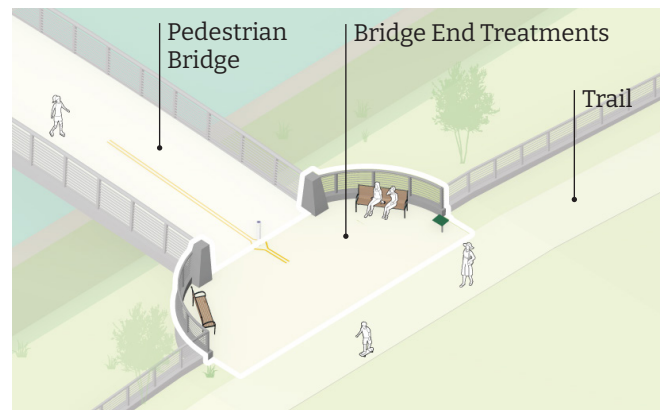
- Design gateways to be consistent in style with other columns and features along the trail.

### Art / Neighborhood Character

In this condition, the following options are available in addition to the standards described under General Greenway Elements “Art” on p. 17.

#### RECOMMENDED

- Bridge guardrails may be upgraded to include design elements reflective of the design vocabulary for the full watershed or to reflect a design or graphic vocabulary of a special district or neighborhood in which the bridge is located.
- Special funding should be acquired to implement these enhancements.

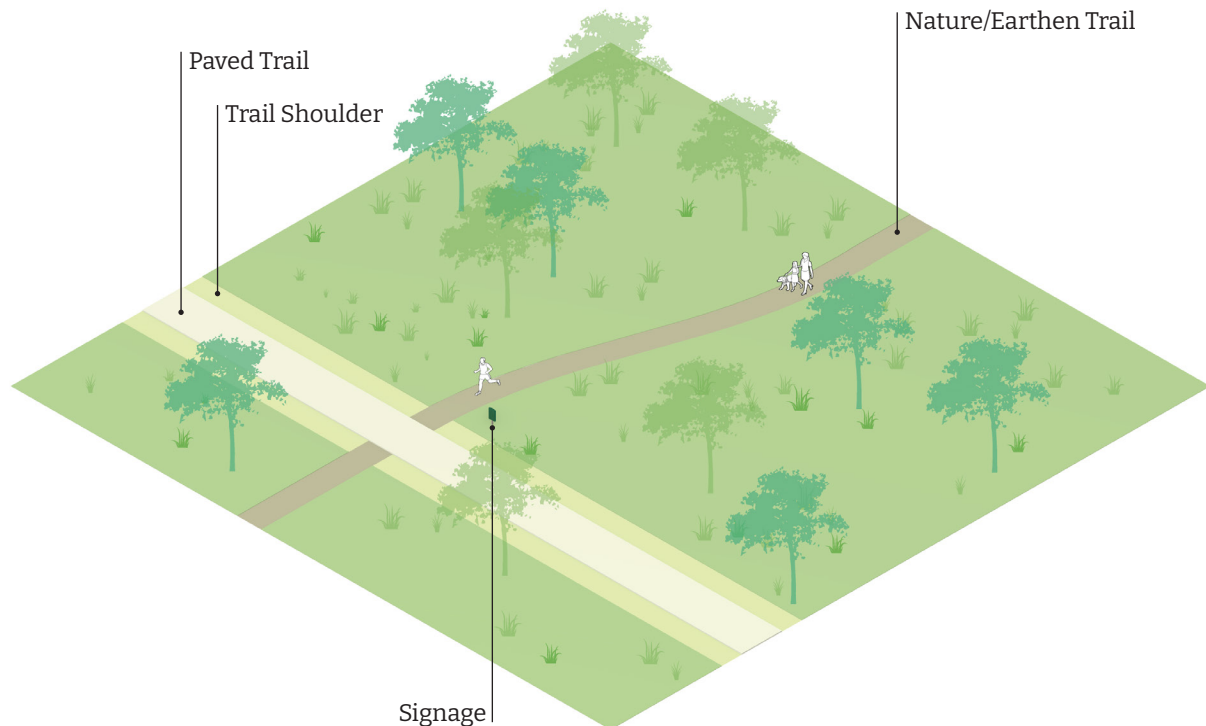


# GENERAL GREENWAY ELEMENTS

## Nature/Earthen Trails

Nature or earthen trails are unpaved trails, often through more forested or natural areas. These trails are usually used as secondary paths since they are not ADA-accessible. They may be considered as an option for trails that go through sensitive habitats, or where paved trails are not allowed to be constructed, but should not be used as a main trail.

The standards in this section apply in addition to the standards listed in General Greenway Elements "Typical Conditions" on p. 6.



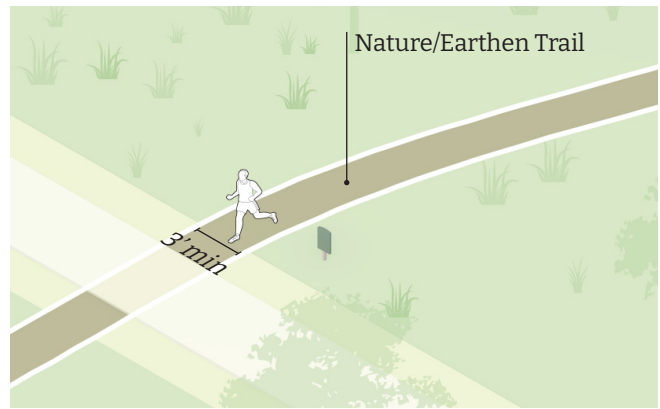


## Nature/Earthen Trails

Nature or earthen trails are unpaved earthen or stabilized gravel paths. They are pedestrian-only paths and should not be used as main trails because they are not ADA-accessible.

### TYPICAL

- Design of the trail to be at least 3 feet wide.
- May be used in areas that are environmentally sensitive or do not allow for the construction of a concrete trail.
- Stabilize the ground for the trail.

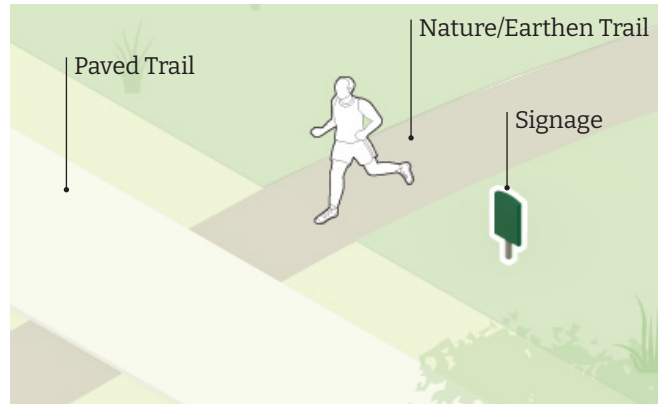


## Signage

In this condition, the following standards apply in addition to the standards described under General Greenway Elements "Signage" on p. 11.

### TYPICAL

- When nature/earthen trails meet a main trail, install appropriate wayfinding signage.
- For distance markers with emergency signage, use a post-mounted type rather than the typical concrete-mounted type.



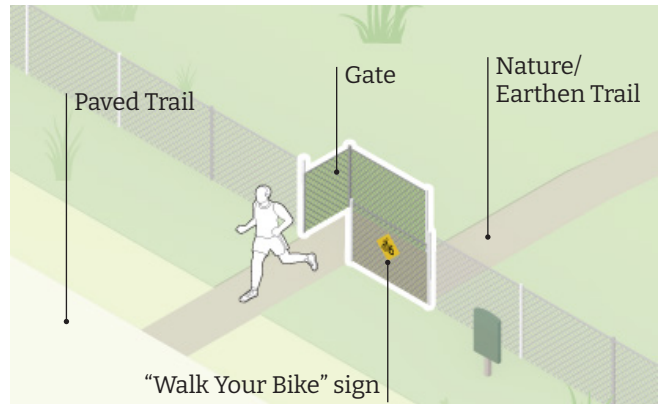
## Optional Elements

### Gates

In this condition, the following standards apply in addition to the standards described under General Greenway Elements "Gates" on p. 31.

### RECOMMENDED

- Gates can be installed to prevent vehicles, including ATVs, from entering the trail. This may require adding fencing to prevent vehicles from going around the gate.
- If the existing fence is chain link, a Z-shape chain-link fence entry can be used.
- Mount a "Walk Your Bike" warning sign on the gate or fence.

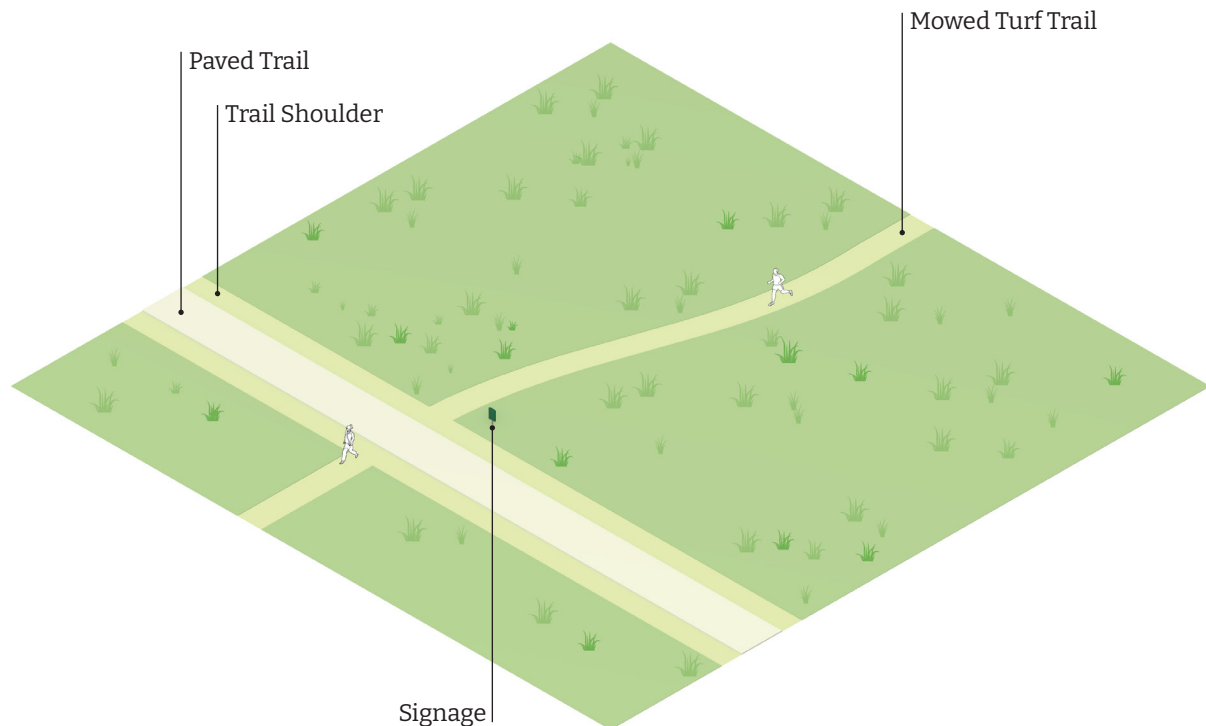


# GENERAL GREENWAY ELEMENTS

## Mowed Turf Trail

Mowed turf trails are unpaved trails, often through grassy natural areas. They are “paved” with grass that is mowed to be traversable and to contrast with the surrounding vegetation. These trails are usually used as secondary paths since they are not ADA-accessible. They may be considered as an option for trails that go through sensitive habitats, or where paved trails are not allowed to be constructed, but should not be used as a main trail.

The standards in this section apply in addition to the standards listed in General Greenway Elements “[Typical Conditions](#)” on p. 6.

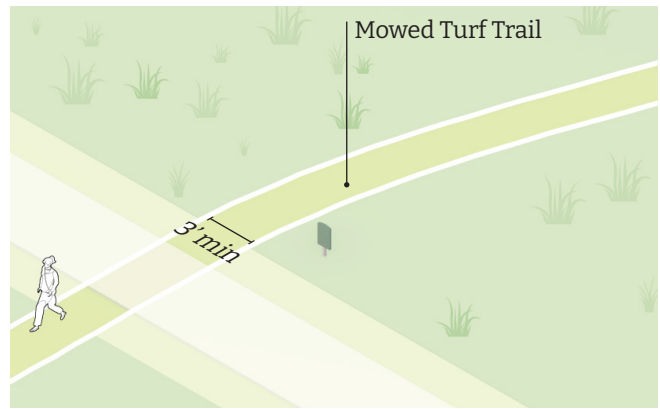


## Mowed Turf Trails

Mowed turf trails are unpaved trails that have grass that is mowed down to a traversable level that contrasts with the surrounding vegetation. They are pedestrian-only paths and should not be used as main trails because they are not ADA-accessible.

### TYPICAL

- Design the trail to be at least 3 feet wide.
- May be used in areas that are environmentally sensitive or do not allow for the construction of a concrete trail.

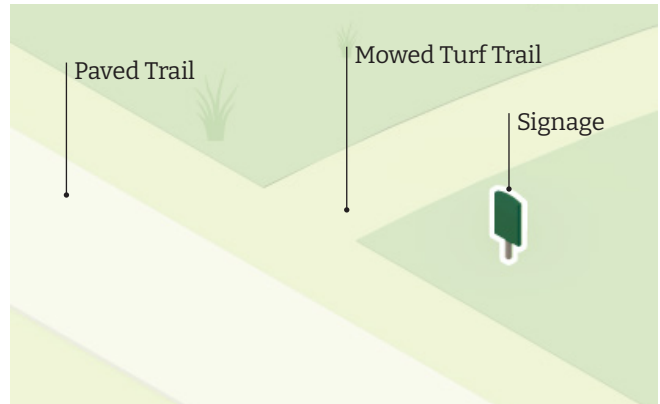


## Signage

In this condition, the following standards apply in addition to the standards described under General Greenway Elements "[Signage](#)" on p. 11.

### TYPICAL

- When mowed turf trails meet a main trail, install appropriate wayfinding signage to let trail-users know that the mowed turf path is a public trail.
- For distance markers with emergency signage, use a post-mounted type rather than the typical concrete-mounted type.

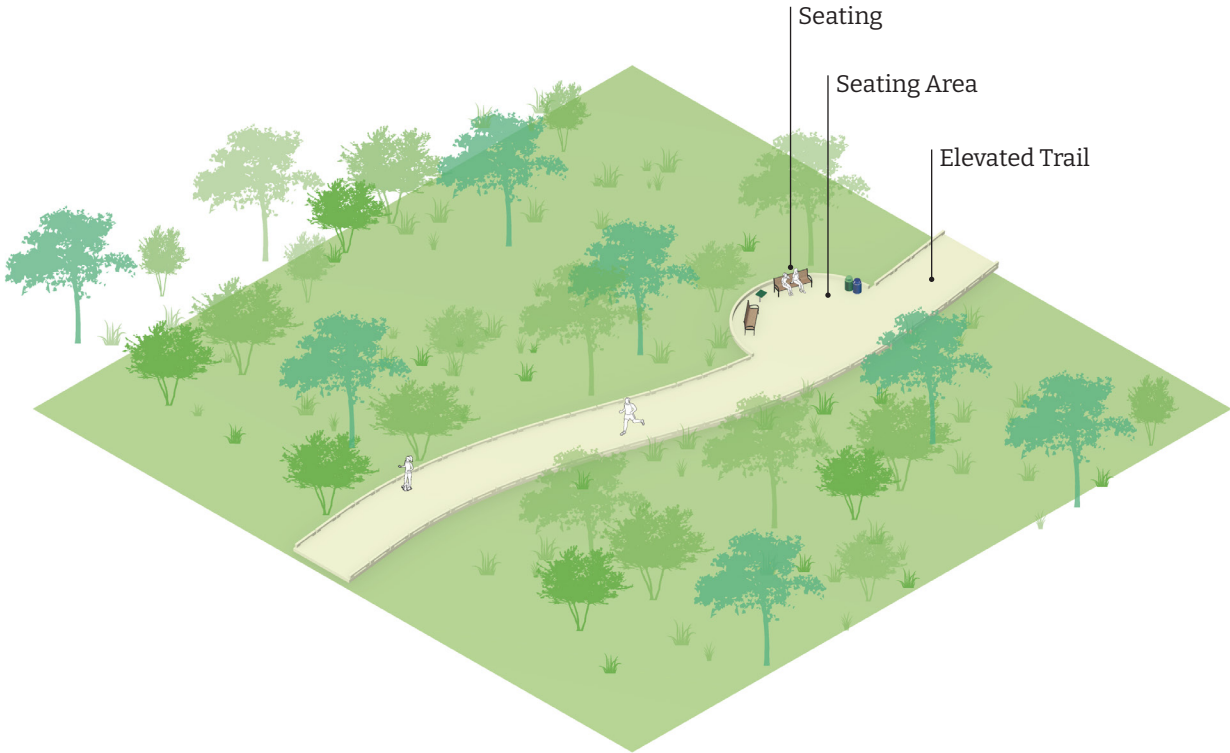


# GENERAL GREENWAY ELEMENTS

## Elevated Trails

Elevated trails are trails that are elevated above the natural ground level, often for the purpose of reducing the footprint of human infrastructure on sensitive ecosystems and preserving natural habitats.

The standards in this section apply in addition to the standards listed in General Greenway Elements “Typical Conditions” on p. 6.



## Elevated Trails

In this condition, the following standards apply in addition to the standards described under General Greenway Elements [“Trails”](#) on p. 7.

### TYPICAL

- Design trail to be ADA accessible.
- Construct the trail with PermaTrack, concrete, or wood.

### RECOMMENDED

- Use PermaTrack or concrete instead of wood for durability and maintenance.
- When constructing the trail, use a build-as-you-go method (build in front of equipment and use constructed trail segment for access) to preserve the natural habitat as much as possible.

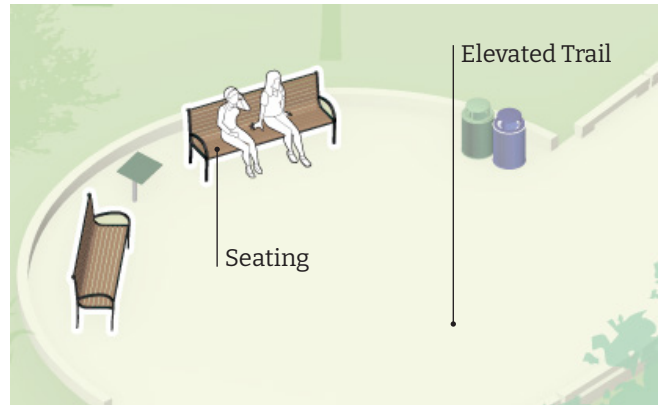


## Seating

In this condition, the following standards apply in addition to the standards described under General Greenway Elements [“Seating”](#) on p. 9.

### TYPICAL

- Seating areas should be elevated with, and level with, the rest of the trail.
- If interpretive areas are included, consolidate them with the seating areas to minimize the impact on the landscape.



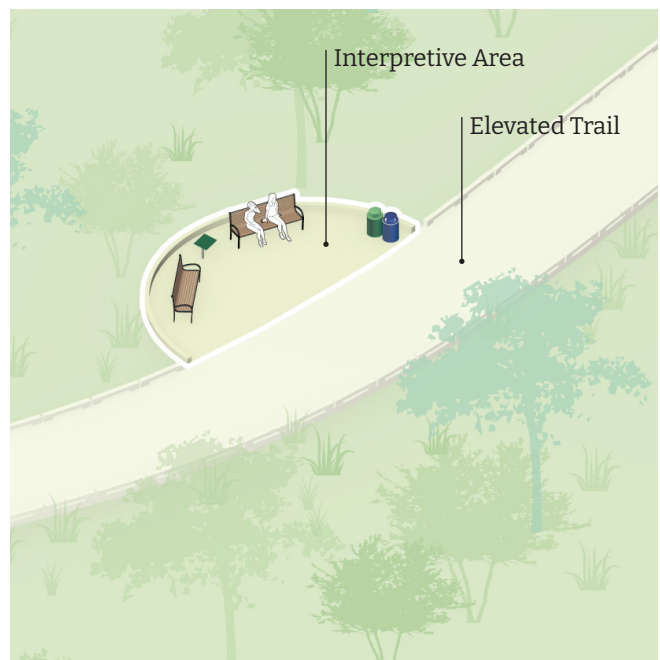
## Optional Elements

### Seating Areas

In this condition, the following standards apply in addition to the standards described under General Greenway Elements [“Seating Areas”](#) on p. 15.

### TYPICAL

- Seating areas should be elevated with, and level with, the rest of the trail.
- When possible, consolidate amenities like seating, signage, trash, recycling receptacles, etc. that require additional horizontal space beyond the trail to minimize the impact on the landscape.

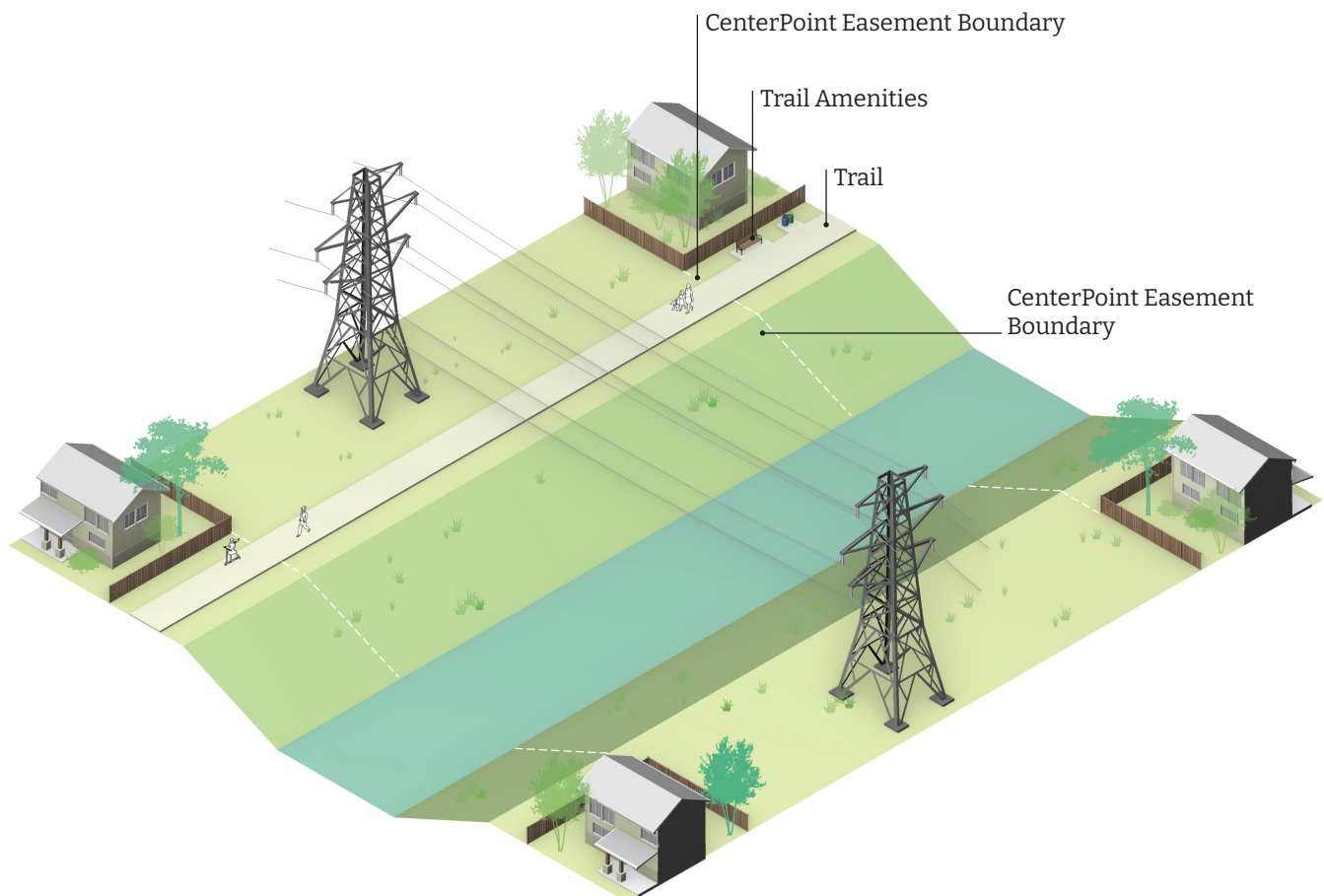


# GENERAL GREENWAY ELEMENTS

## CenterPoint Easement crossing

Greenways trails often cross CenterPoint easements. CenterPoint has specific requirements for trails on their easements that differ from other types of crossings.

The standards in this section apply in addition to the standards listed in General Greenway Elements "Typical Conditions" on p. 6.

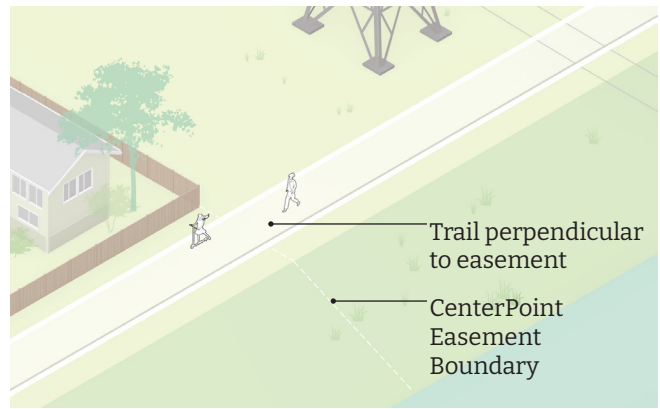


## Trails

In this condition, the following standards apply in addition to the standards described under General Greenway Elements [“Trails” on p. 7.](#)

### RECOMMENDED

- Wherever possible, design the CenterPoint easement crossing to be perpendicular to the easement.
- Design trail to cross the easement at only one location.

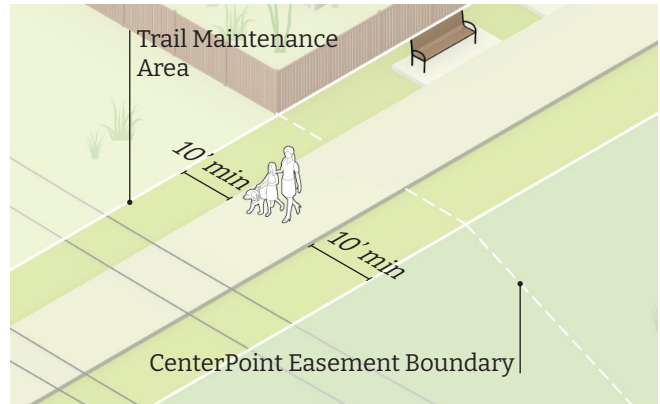


## Trail Shoulder

In this condition, the following standards apply in addition to the requirements described under [“Trail Shoulder” on p. 8.](#)

### TYPICAL

- Maintain at least 10-foot clear width on either side of the trail. This cannot include drainage areas.

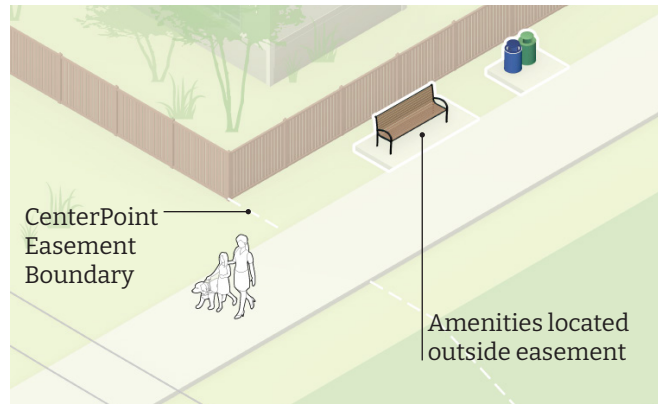


## Amenities

Trees, seating, trash and recycling receptacles, signage, and other amenities are not allowed in CenterPoint easements.

### TYPICAL

- If amenities are needed, provide them outside of the easement boundary. For additional details, see General Greenway Elements [“Typical Conditions” on p. 6.](#)



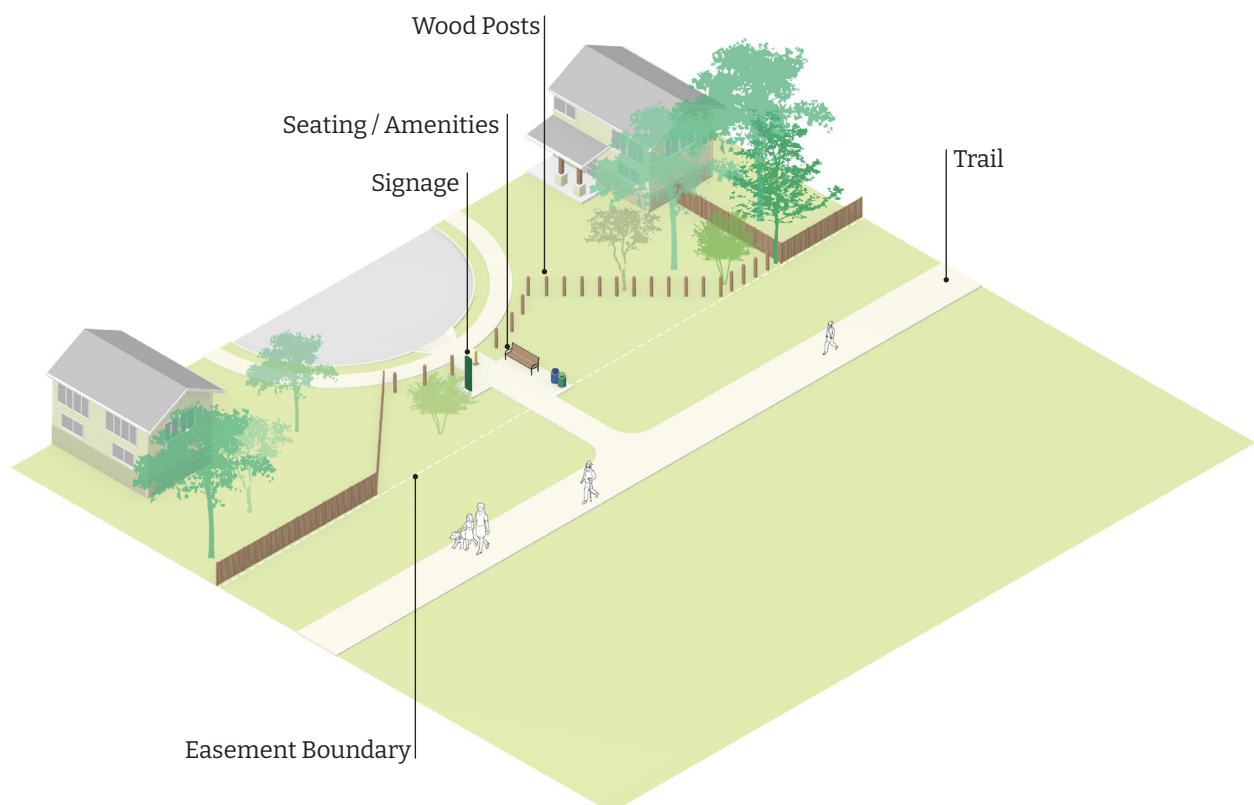
# GENERAL GREENWAY ELEMENTS

## Neighborhood Gateway

Neighborhood Gateways are trail entrances or access points that do not include a parking lot and therefore only serve people arriving by other modes, like walking or biking. They typically give neighborhoods access to the bayou greenway trail system. They can be either primary or secondary entrances to the trail depending on how many people they serve.

Neighborhoods Gateways are provided on a case-by-case basis, depending on whether the location is appropriate, the neighborhood wants trail access, and if the trail access walkshed does not already cover the neighborhood.

The standards in this section apply in addition to the standards listed in General Greenway Elements "Typical Conditions" on p. 6.





## Trails

In this condition, the following standards apply in addition to and supersede the requirements described under [“Trails” on p. 7.](#)

### TYPICAL

- Neighborhood Gateway trails on bayou greenways, and the trails they connect to should be at the top of the maintenance berm.



## Wood Posts

In this condition, the following standards apply in addition to the requirements described under [“Wood Posts” on p. 29.](#)

### TYPICAL

- Place along the street edge at 3 feet on center.

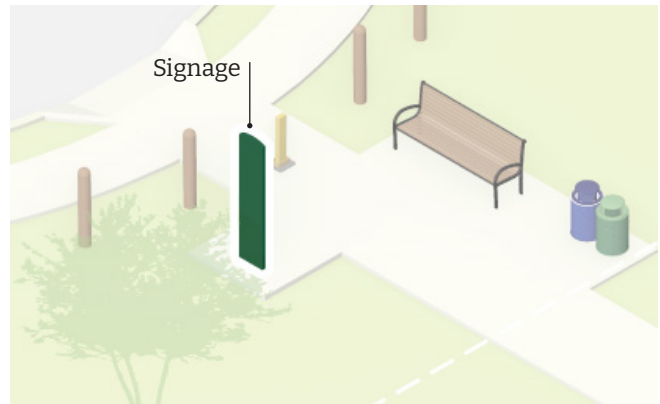


## Signage

In this condition, the following standards apply in addition to the requirements described under [“Signage” on p. 11.](#)

### TYPICAL

- Install gateway signage at neighborhood gateways.



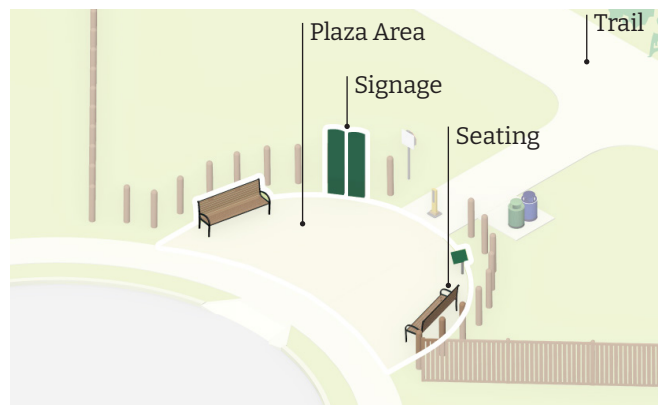
## Optional Elements

### Seating Area

In this condition, the following standards apply in addition to the requirements described under [“Seating Areas” on p. 15.](#)

### RECOMMENDED

- If the seating area is centered around a trail entrance, ensure that amenities like benches, signage, etc. are not located within the trail shoulder.
- Gateway seating areas are most appropriate for primary trail entrances off of more traveled streets rather than quiet neighborhood streets or cul-de-sacs.

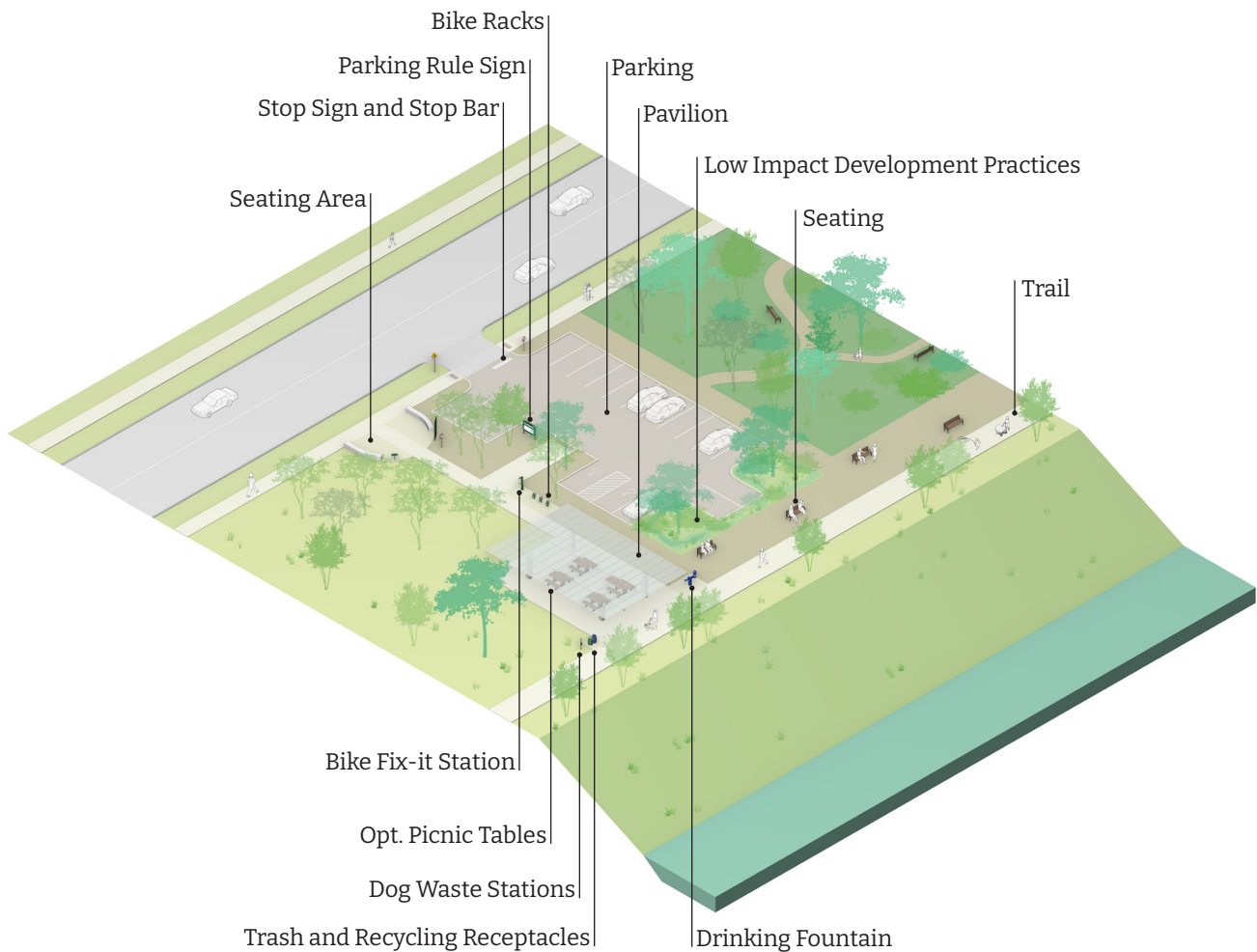


# GENERAL GREENWAY ELEMENTS

## Trailhead

Trailheads are access points that include parking lots. Trail entrances that do not offer parking are considered by Houston Parks Board to be Neighborhood Gateways (See "Neighborhood Gateway" on p. 54). Trailheads are most commonly used for bayou greenway trails.

The standards in this section apply in addition to the standards listed in General Greenway Elements "Typical Conditions" on p. 6.



## Trails

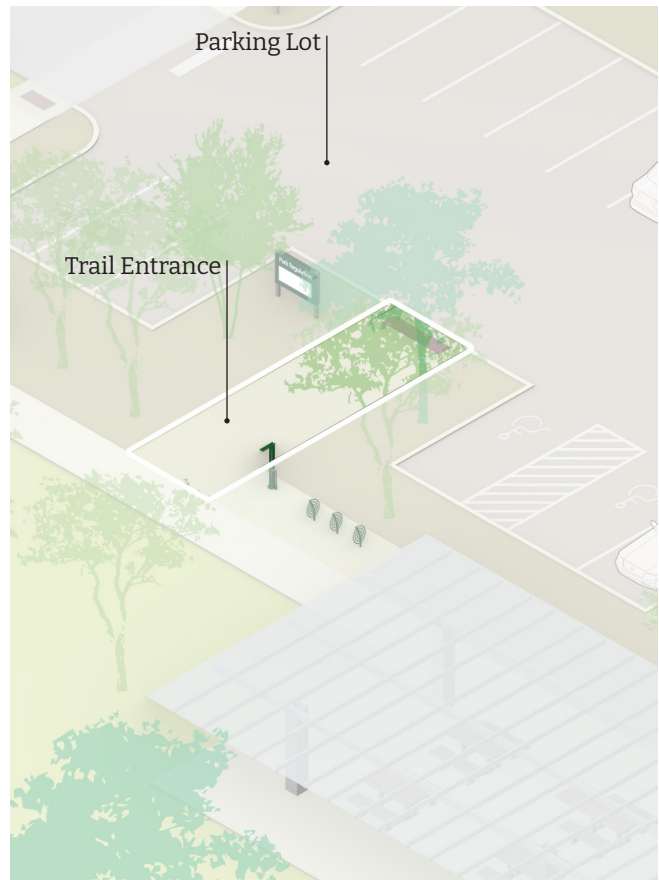
In this condition, the following standards apply in addition to the standards described under General Greenway Elements “Trails” on p. 7.

### TYPICAL

- Trail entrance from the parking lot should be located in a way that allows unobstructed access to the trail by trail-users as well as maintenance vehicles.

### RECOMMENDED

- Provide buffer space between the trail entrance and parking spaces so that car doors do not hit trail-users.



## Parking

Although the bayou greenway trails are primarily for pedestrians and people on wheels, it is still important to provide parking spaces so that people who live further away or have mobility concerns can still drive to the bayou, park, and use the trails.

### TYPICAL

- Refer to City or County code to determine the number of parking spaces necessary, including the number of accessible parking spaces.
- ADA parking space and loading zone must be paved, preferably in concrete, even if the rest of the parking lot uses compressed decomposed granite or other non-paved surfaces.
- Locate ADA parking spaces to have easy, direct, and paved access to curb ramps or paved trails.
- Provide concrete wheel stops, bollards, or curbs to restrict vehicles from entering pedestrian spaces. If bollards are used, install them at 3 feet on-center. Landscaping can also be used. All elements used for vehicle restriction should be part of a cohesive plan.
- Provide 1 ADA-accessible parking space for each picnic table at a park pavilion provided at the trailhead.

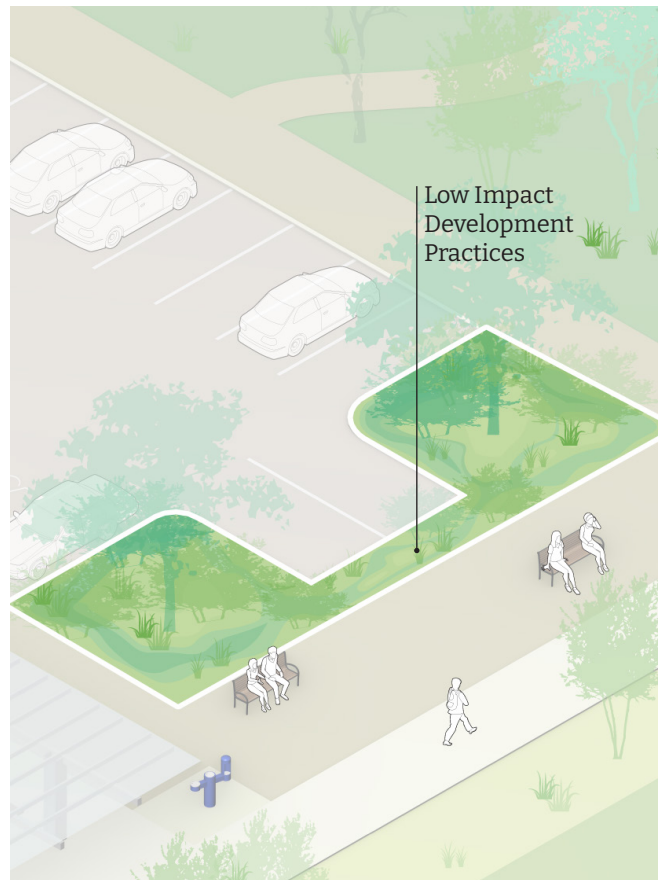


## Low Impact Development Practices

Low Impact Development practices use or mimic natural processes that result in the infiltration, evapotranspiration or use of stormwater in order to protect water quality and associated aquatic habitat. These should be used for parking lots, when possible, in order to manage and reduce the stormwater runoff from these spaces. For additional details, see Appendix A: “Trailheads” on p. A20 and the Harris County Low Impact Development & Green Infrastructure Design Criteria for Storm Water Management.

### TYPICAL

- Locate as close to the source of impact as possible.
- Permeable paving, bioswales, and rain gardens are acceptable solutions, but should not be located on HCFCF right-of-way without an approved variance and maintenance by Houston Parks Board.
- Design to be fully integrated into the site-specific landscape and planting design.

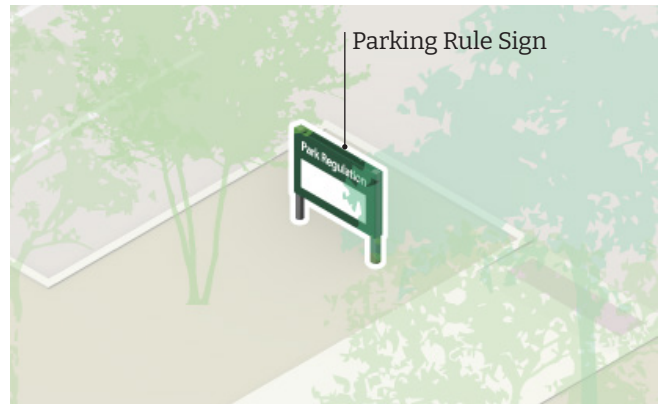


## Parking Rule Sign

Parking signs contain important information about parking for drivers to be aware of, such as hours and liability.

### TYPICAL

- Locate in a place that is easily visible to cars driving through the parking lot.

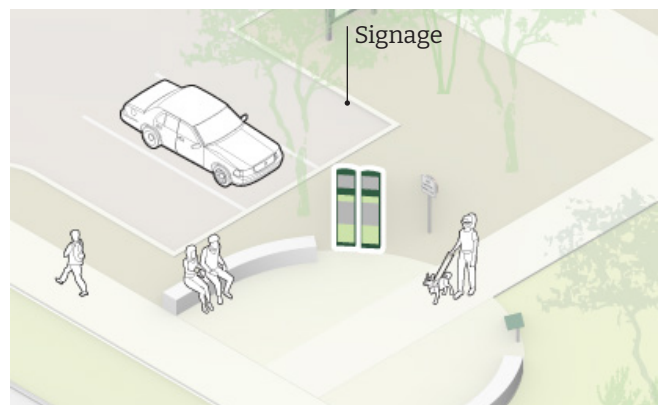


## Signage

In this condition, the following standards apply in addition to the requirements described under “Signage” on p. 11.

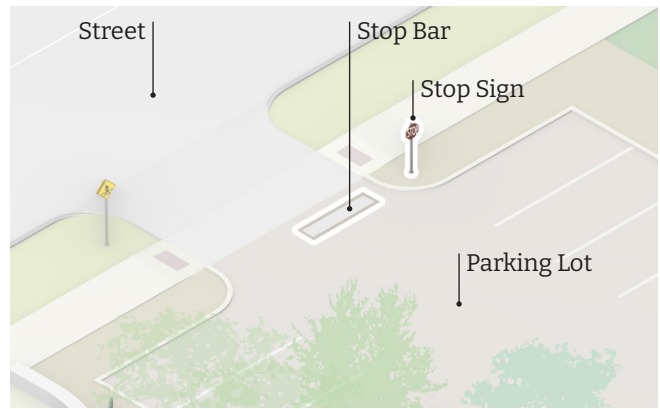
### TYPICAL

- Install gateway signage at trailheads.
- Work with the City of Houston or Harris County to install public works wayfinding signs leading up to the trailhead to direct visitors.



## Stop Sign and Stop Bar

Stop signs and stop bars should be used at parking lot exits. For stop bar standards refer to General Greenway Elements "[Stop Bar](#)" on p. 21.



## Seating

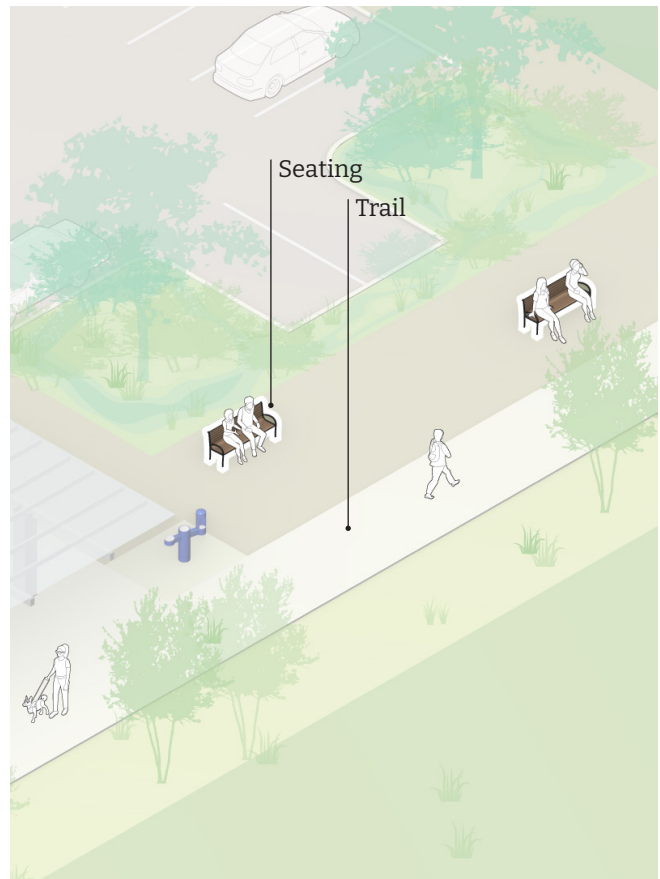
In this condition, the following standards apply in addition to the standards described under General Greenway Elements "[Seating](#)" on p. 9.

### TYPICAL

- If seating is provided at the trailhead, locate in an area accessible by the paved trail.
- Seating in or near a pavilion can be picnic-style benches or stylistically matched to the character of the pavilion but must meet ADA standards for seating.

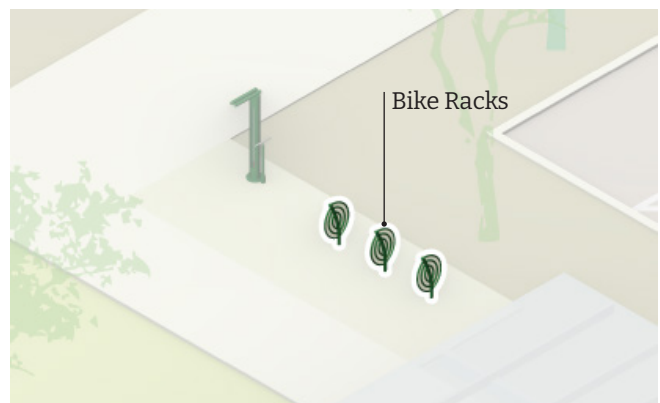
### RECOMMENDED

- Face benches away from the parking lot, and orient toward a view, if possible. If there is a gathering area, locate seating where it will be shaded by trees or pavilion structures.



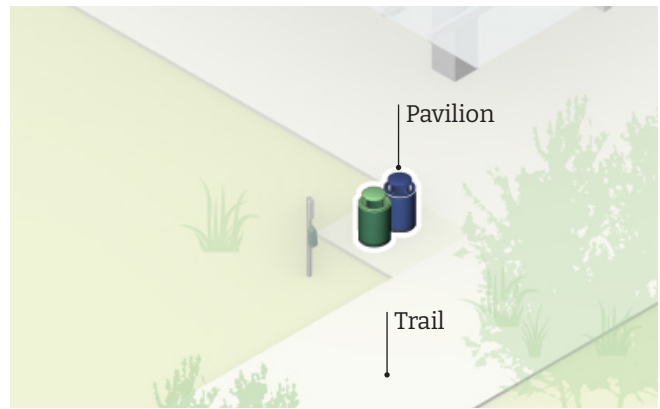
## Bike Racks

Provide bike parking at trailheads. For the bike rack standards refer to General Greenway Elements "[Bike Racks](#)" on p. 14.



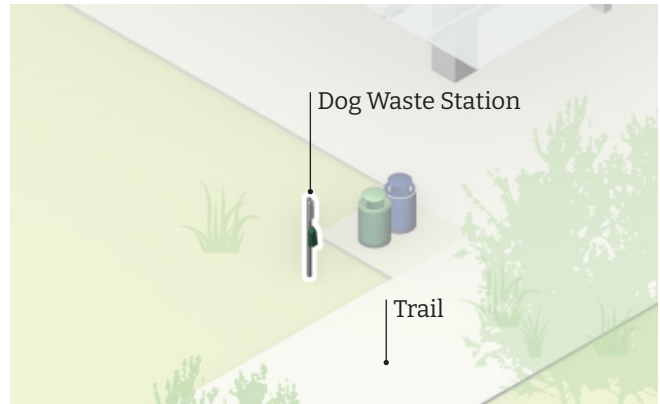
## Trash and Recycling Receptacles

Provide trash and recycling receptacles at trailheads. For dog waste station standards, refer to General Greenway Elements "[Dog Waste Stations](#)" on p. 13.



## Dog Waste Stations

Provide dog waste stations at trailheads. For dog waste station standards, refer to General Greenway Elements "[Dog Waste Stations](#)" on p. 13.



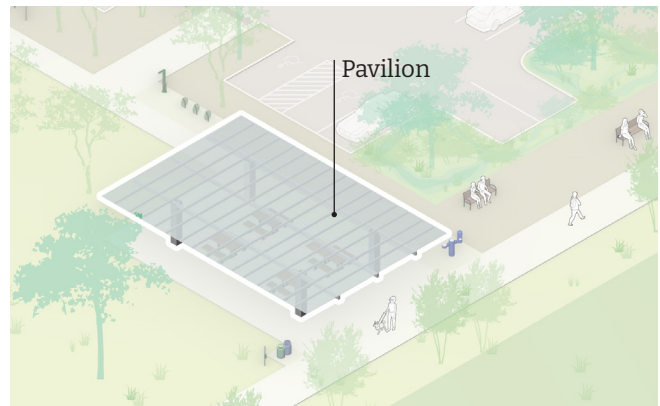
## Optional Elements

### Pavilion

Pavilions are open-air roofed structures used for group gatherings or shaded seating areas. Pavilions are most appropriate in places where there are no pavilions provided in parks nearby and in places with little shade.

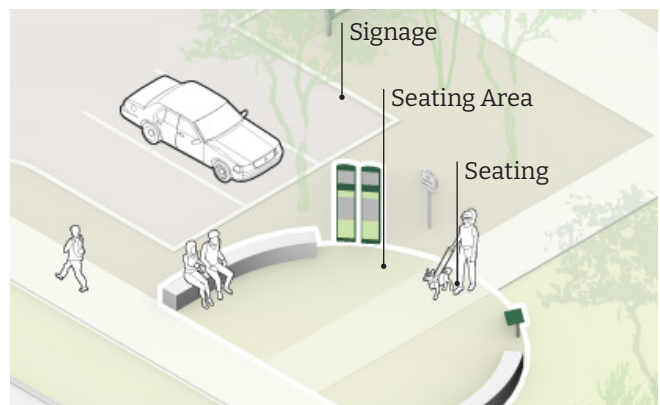
#### TYPICAL

- If there is a park near a proposed pavilion, coordinate with HPARD to provide them at the park instead.
- Acquire special funding for pavilions.
- If pavilions are provided, they are a good place to add picnic tables.



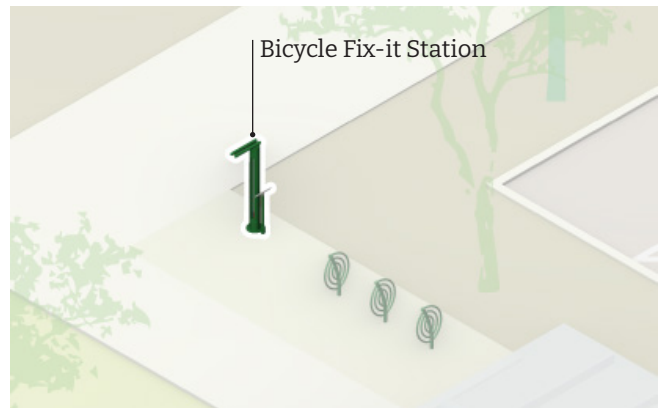
### Seating Area

Trailheads can be good places to include plaza areas. For plaza standards, refer to General Greenway Elements "[Seating Area](#)" on p. 55.



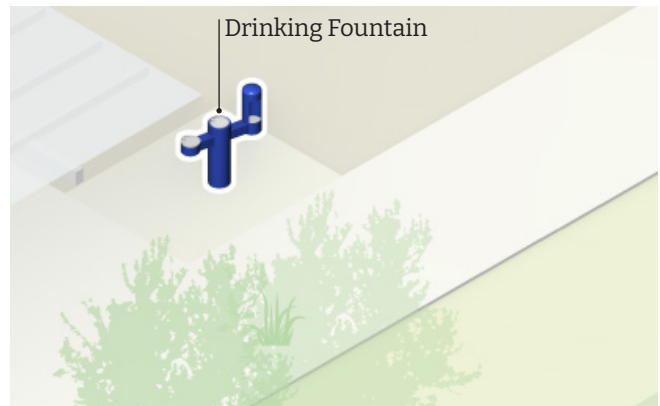
### Bicycle Fix-it Stations

Trailheads can be good places to include bicycle fix-it stations. For fix-it station standards, refer to General Greenway Elements "[Bicycle Fix-it Stations](#)" on p. 13.



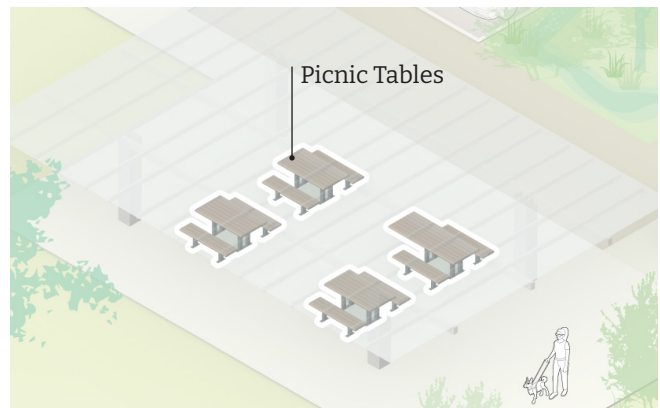
### Drinking Fountains

Trailheads can be good places to include drinking fountains. For drinking fountain standards, refer to General Greenway Elements "[Drinking Fountains](#)" on p. 12.



### Picnic Tables

Trailheads can be good places to include picnic tables. These can be included in a pavilion or on their own, ideally near shade trees. For standards, refer to General Greenway Elements "[Picnic Tables](#)" on p. 16.

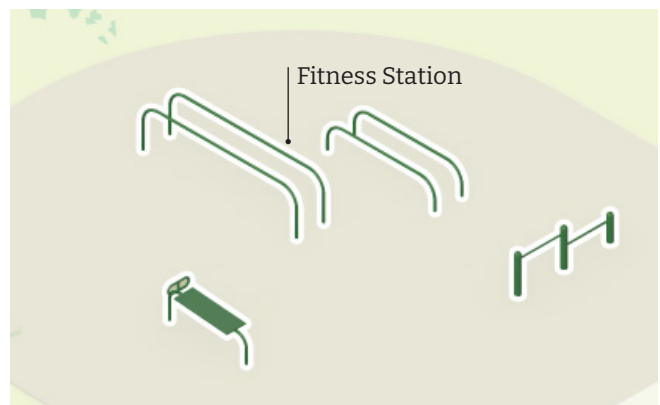


### Fitness Stations

Trailheads can be good places to include fitness stations. For fitness station standards, refer to General Greenway Elements "[Fitness Stations](#)" on p. 15.

### Art

Trailheads can be good places to incorporate art along greenway trails. For standards, refer to General Greenway Elements "[Art](#)" on p. 17.



# GREENWAYS ALONG BAYOUS

Bayou greenways offer continuous hike and bike trails that are separated from traffic, shaded, and surrounded by nature—flowers, wildlife, the sound of water—and provide impressive views of the city. Few other bike routes in Houston and Harris County offer the same level of safety, connections, easy navigation, and retreat from the city as the bayou greenways.

These high-comfort trails span the entire Houston region and are easy places for beginner and infrequent bike riders to enjoy because they are separate from car traffic, accessible, well maintained, and connect many neighborhoods and destinations. They serve a wide variety of people and activities; some have integrated park spaces with places to rest and linger, and many have connections to parks, playgrounds, and sports fields, which further broaden the types of outdoor and recreational activities they support.

Bayous and drainage channels are controlled by HCFCD and have their own easements and sets of restrictions. Any design that is within HCFCD right-of-way must be approved and permitted by HCFCD.



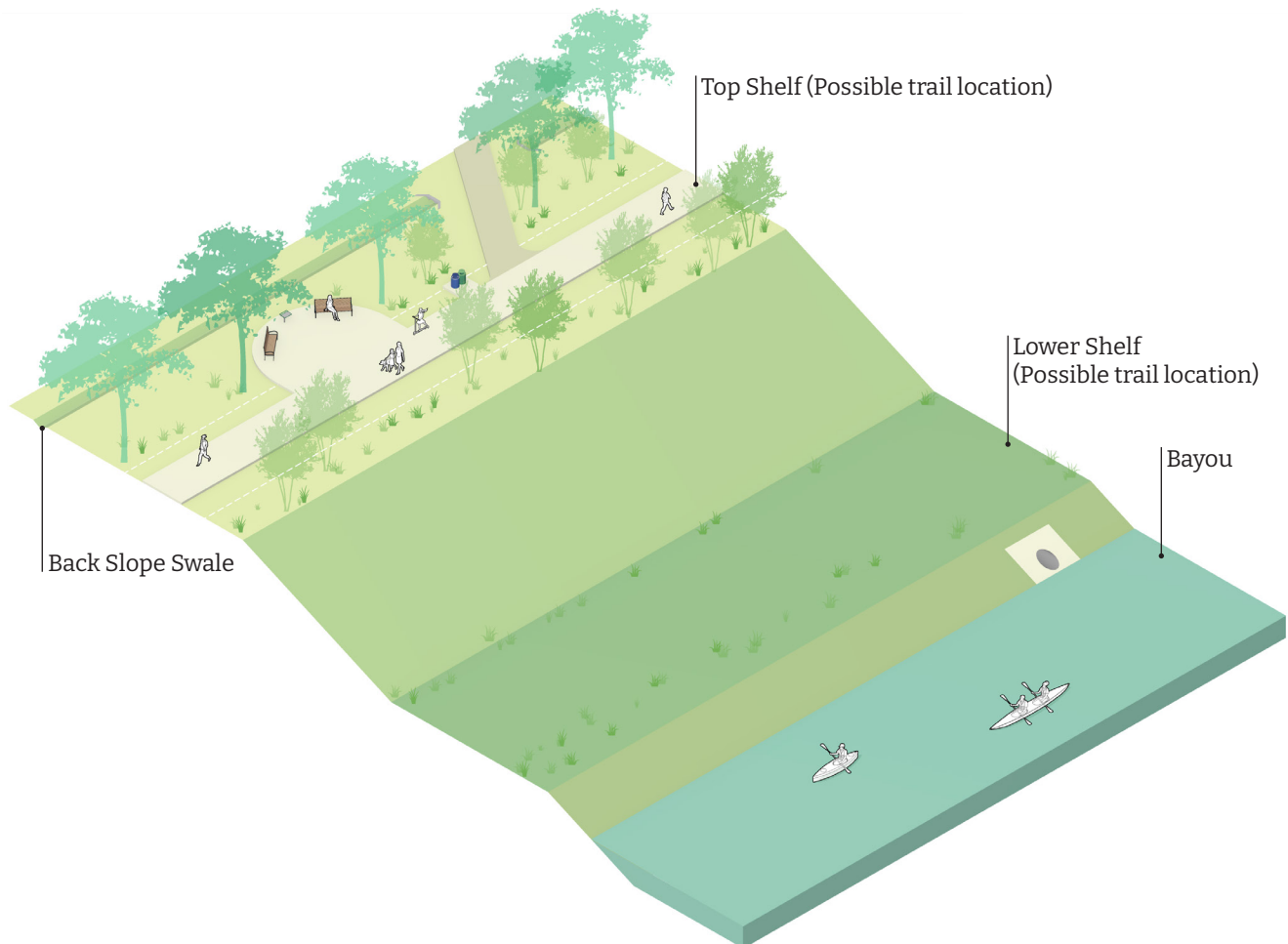


# GREENWAYS ALONG BAYOUS

## Typical Condition

Bayou greenways are linear park systems with trails that are constructed along bayous. Houston Parks Board built on the existing network of bayou trails to develop 150 miles of trails along nine of Houston's major bayous as part of the Bayou Greenways initiative and is working to expand the bayou greenway system even further. Bayous and drainage channels are controlled by HCFCD and have their own easements and sets of restrictions. Any design that is within HCFCD right-of-way must be approved and permitted by HCFCD.

The standards in this section apply in addition to the standards listed in General Greenway Elements "Typical Conditions" on p. 6.

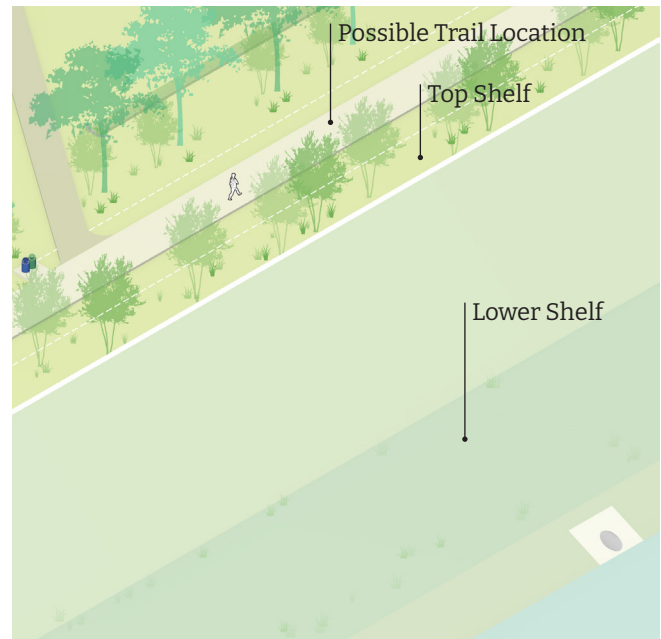


## Top Shelf

The top shelf (also called street level, or the maintenance berm) is the level area at the top of the bank. This is the preferred location area for trails and maintenance access. If a trail is located on the maintenance berm, in this condition, the following standards apply in addition to the standards described under General Greenway Elements [“Trails” on p. 7](#).

### TYPICAL

- If the bank is highly erosive or steeper than 3:1 and is not being stabilized, provide at least 15 feet of clear space between the slope and trail, wherever possible.

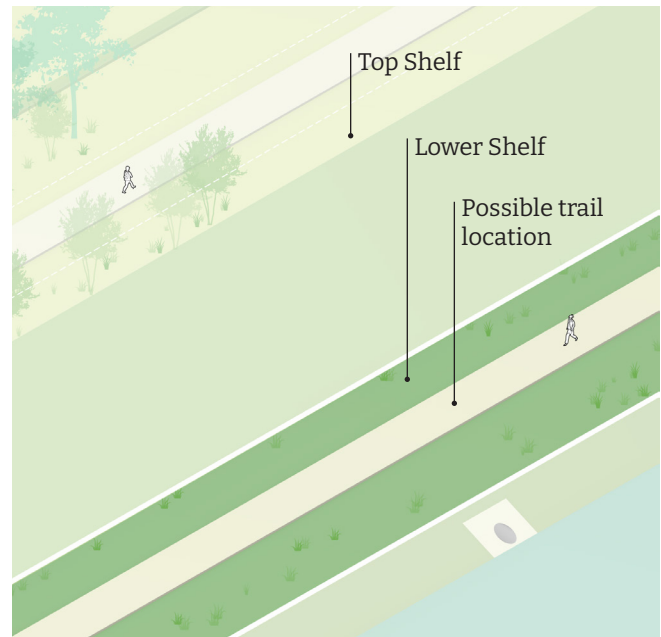


## Lower Shelf

The lower shelf (also called the bench) is a secondary level area below the top bank that can be a potential trail location, especially when a trail goes under bridges or when a top shelf does not exist. If a trail is located on the lower shelf, the following standards apply in addition to the standards described under General Greenway Elements [“Trails” on p. 7](#).

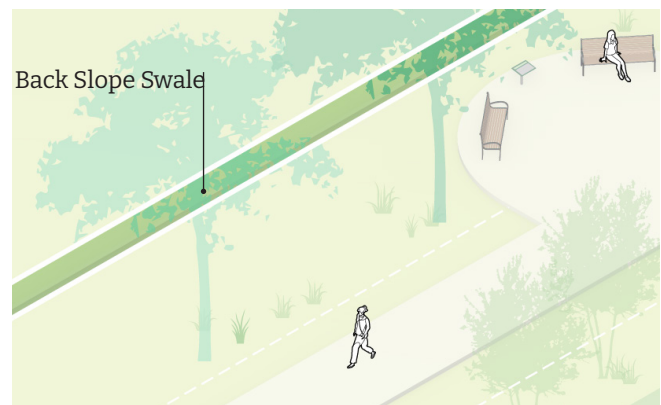
### TYPICAL

- If the bank is highly erosive or steeper than 3:1 and is not being stabilized, provide at least 15 feet of clear space between the slope and trail, wherever possible.



## Back Slope Swale

A back slope swale is a drainage system, like a small ditch, that is used at the tops of water channel banks to reduce erosion by catching water runoff before it enters the larger channel. The back slope swale then funnels the water into the larger channel through pipes.

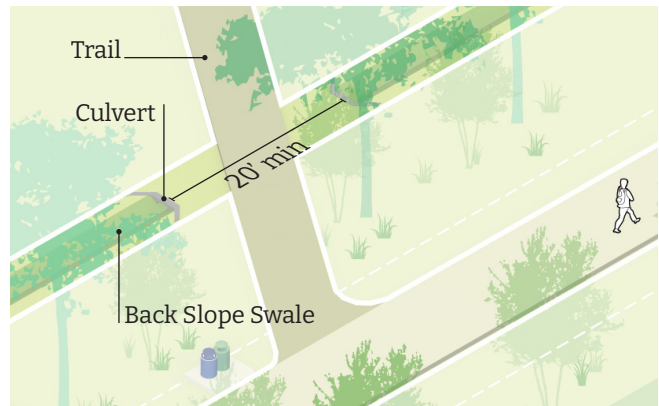
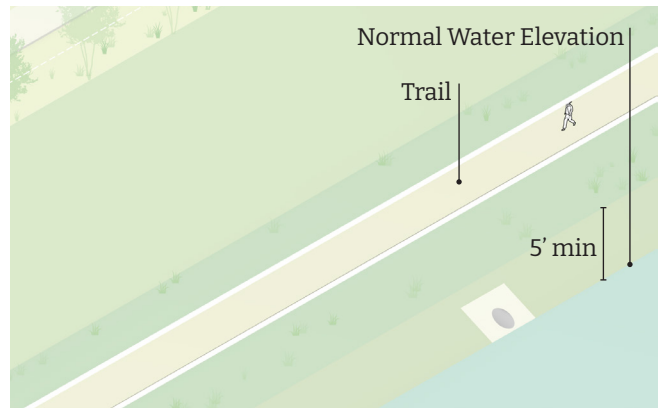


## Trails

For bayou greenways, the following standards apply in addition to the standards described under General Greenway [“Trails” on p. 7](#).

### TYPICAL

- Locate trail surface at least 5 feet above normal water elevation.
- If the trail crosses over the back slope swale, use a culvert under the entire 20-foot maintenance area.
- No striping or banding along the trail is needed except to show the extent of the trail in areas that exceed 10 feet in width.



## Trail Shoulder

For bayou greenways, the following standards apply in addition to and supersede the standards described under General Greenway [“Trails” on p. 7](#).

### TYPICAL

- Provide the standard HCFCD 20-foot clear area wherever possible on trails within HCFCD easements.

### RECOMMENDED MINIMUM

- When a trail is located on the lower shelf if the 20-foot clear area cannot be accommodated, provide a minimum 17-foot clear area to allow for 5 feet from the top-of-bank to the trail, a 10-foot trail, and 2 feet from the trail to the retaining wall or slope paving.

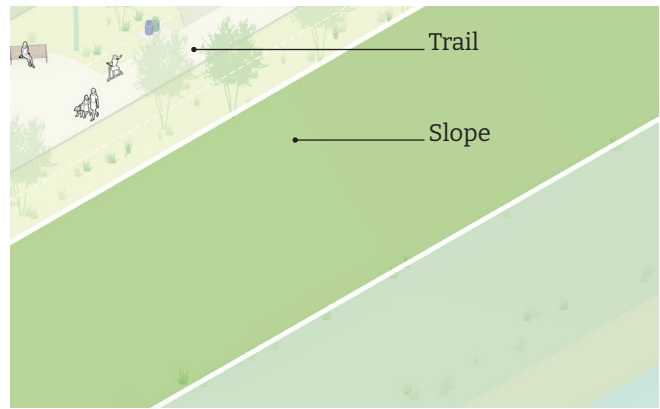


## Slopes

It is common for the slopes near bayou trails to have turf or other vegetation that is designed to be mowed regularly.

### TYPICAL

- Grade sloped areas that are designed to be mowed frequently so that they will be navigable with a typical zero-turn mower.



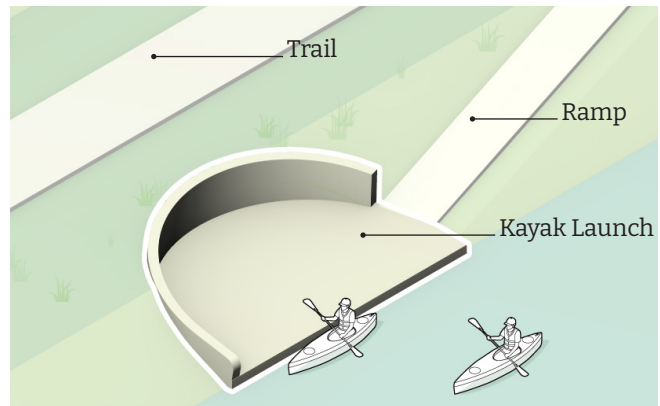
## Optional Elements

### Kayak Launch

Kayaking and canoeing are fun activities to do on the bayou. Bayou greenways can include kayak and canoe launches that allow easier access to the water for these activities.

### TYPICAL

- Locate in high-visibility areas with high traffic and easy access to parking, such as near trailheads.
- Provide paved ramp access to the kayak launch. Adhere to ADA guidelines.



### Lighting

Light poles within the floodway are a concern because they can impede flow/debris and because they require electrical wiring to be installed in the floodway.

### RECOMMENDED

- Consider installing solar lighting outside of the floodway if feasible within the design and maintenance budget of the trail.

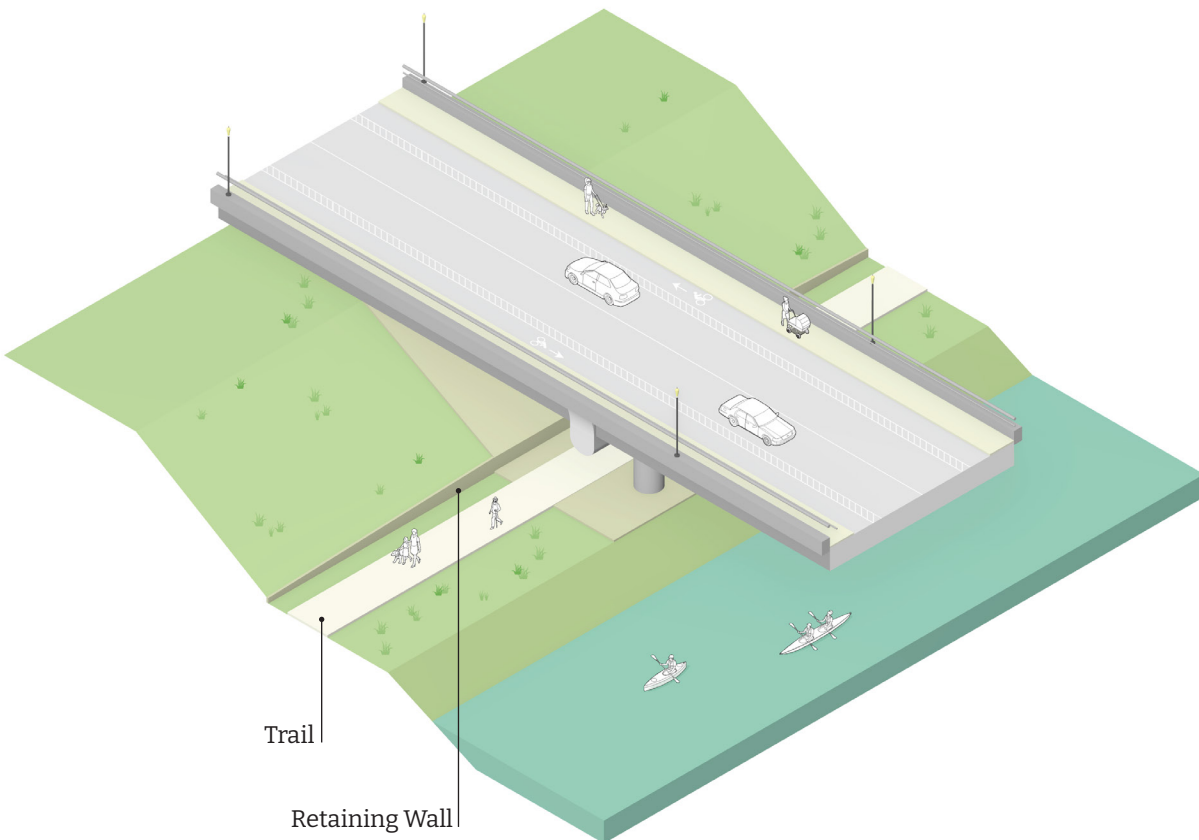
# GREENWAYS ALONG BAYOUS

## Street Underpass

Bayou greenway trails often pass under street bridges or freeways that cross the bayou. Trails that are already located on the lower shelf of the bayou will typically cross under street bridges if there is space under the bridge. Trails on the top shelf of the bayou can also ramp down to the lower shelf level temporarily in order to avoid an at-grade street crossing. Trails should cross under streets and freeways whenever possible because under-crossings are safer and more comfortable for trail-users, especially for crossing major thoroughfares.

Any undercrossing that is within HCFCF right-of-way must be approved and permitted by HCFCF. Approval and permitting is also required when the undercrossing runs under a TxDOT roadway.

The standards in this section apply in addition to the standards listed in General Greenway Elements "Typical Conditions" on p. 6.



## Trails

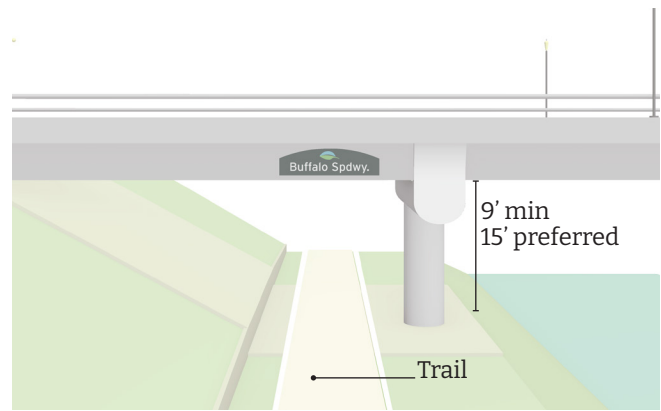
In this condition, the following standards apply in addition to the standards described under General Greenway Elements [“Trails” on p. 7](#).

### TYPICAL

- Where trails cross under bridges maintain at least 15' clearance for HCFCFCD maintenance routes. If the undercrossing is not part of the HCFCFCD maintenance route, maintain at least 9 feet of clearance.
- When the space under a street or a freeway is already paved, stripe the edge of the trail to clearly show the trail extent.
- Coordinate with owning entity.

### RECOMMENDED

- If horse riders are expected to use the trail, consider a higher clearance.

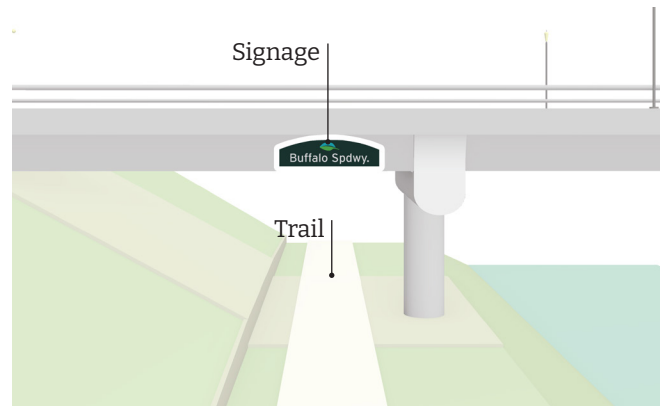


## Signage

Signage is required on bridge overpasses, to let trail-users know which street they are crossing under, and if necessary, any clearance restrictions. For additional details, see [“Appendix B” on p. B1](#).

### TYPICAL

- If clearance under a bridge is less than 15 feet, provide clearance warnings.

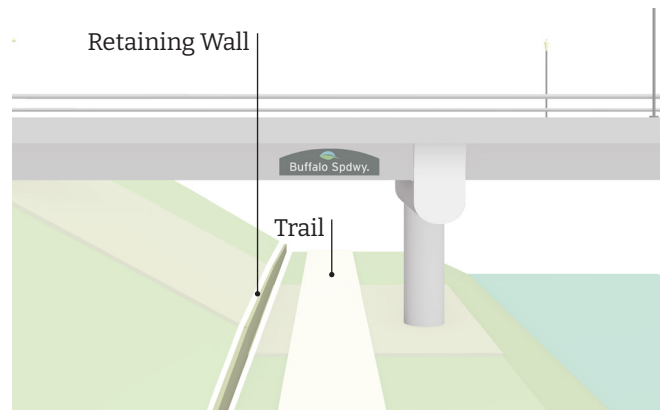


## Retaining Walls

Sometimes the slope under a road or freeway does not allow enough room for a trail and trail shoulder. In these cases, retaining walls are used to stop the slope short and make space for the trail and necessary clear space. For additional details, see Appendix A: “Retaining Walls” on p. A13.

### TYPICAL

- Avoid using, if possible.
- Minimize the height of the wall.
- Ensure the wall does not impede on the 20-foot HCFCD clear zone.
- If walls exceed 1,000 feet in length, provide a 20-foot break in the wall for maintenance access. The 20-foot break should be at a slope that a vehicle could traverse or navigate down.
- Can be cast-in-place concrete or block construction.
- Do not use railings below the top-of-bank.
- Ensure that a drainage system is included in the design of the wall so that water does not collect behind the wall.



## Lighting

Lighting is important for pedestrian safety, especially in places that are often dark, like underpasses and tunnels. Lighting is not a standard amenity along Houston Parks Board trails but should be included on underpasses, whenever possible. However, light poles within the floodway are a concern because they can impede flow/debris and because they require electrical wiring to be installed in the floodway.

### RECOMMENDED

- Coordinate with owning entity (typically TxDOT or Houston Public Works) to install lighting on the underside of where the trail crosses under wide sections of roadway.



## Optional Elements

### Art

Underpasses can be good places to incorporate art along greenway trails. Art can make the experience of crossing underneath a street bridge much more inviting, lively, and interesting. Art can be as simple as painting columns in a single color or can be done by a contracted artist. In this condition, the following standards apply in addition to the standards described under General Greenway Elements “Art” on p. 17.

#### TYPICAL

- If paint is used, apply a graffiti-proof top coat layer.
- Artwork should not include vertical obstacles within 2 feet of the trail, as identified in the trail maintenance area standards.

#### RECOMMENDED

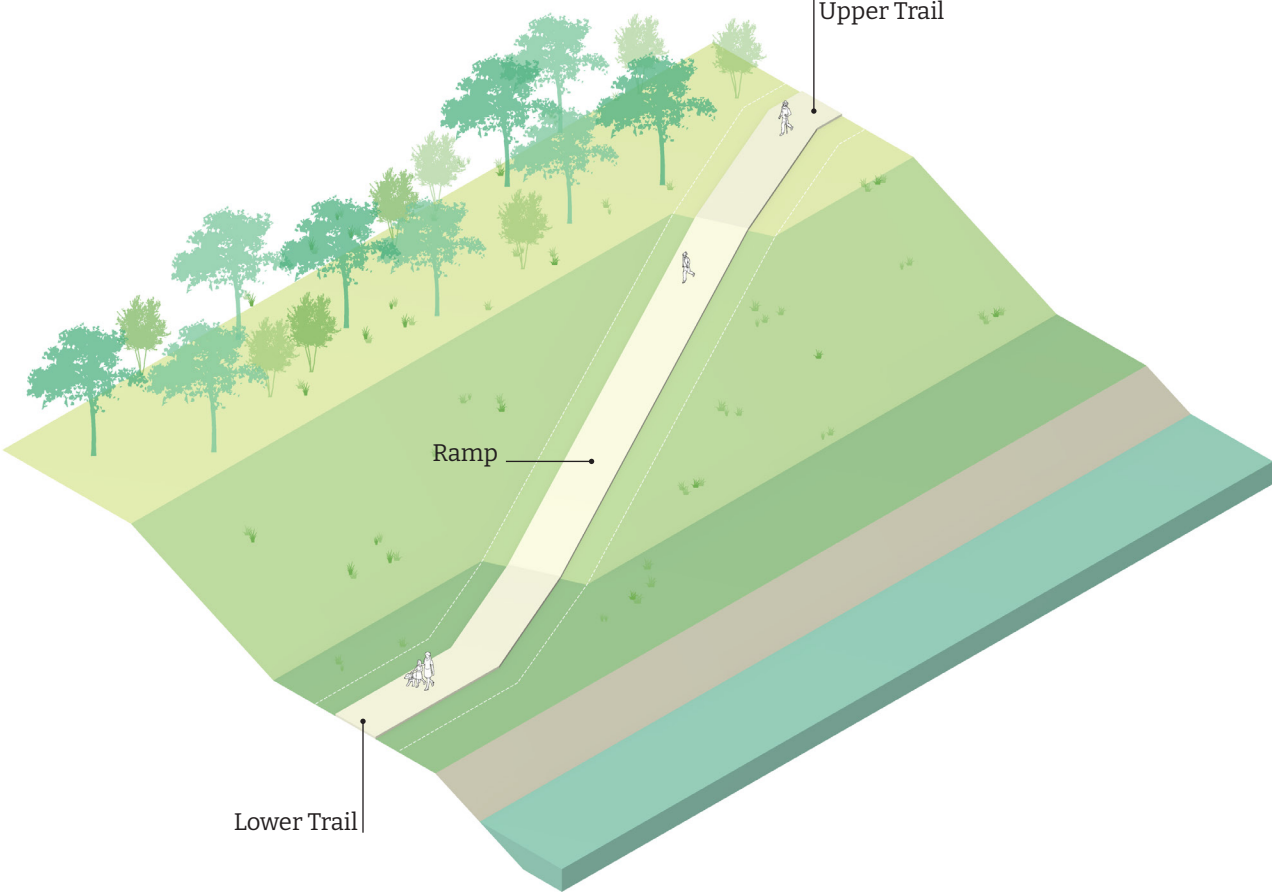
- Paint can be used on the retaining walls under bridges.
- Art installations may include seating but must respect all standards for the trail maintenance area and must meet all applicable ADA standards for seating areas and seating access.

# GREENWAYS ALONG BAYOUS

## Trail Ramp

Trails along bayous can be located either on top of the top shelf or on the lower shelf. Sometimes it is necessary to transition from one level to another.

The standards in this section apply in addition to the standards listed in General Greenway Elements "Typical Conditions" on p. 6.



## Ramp

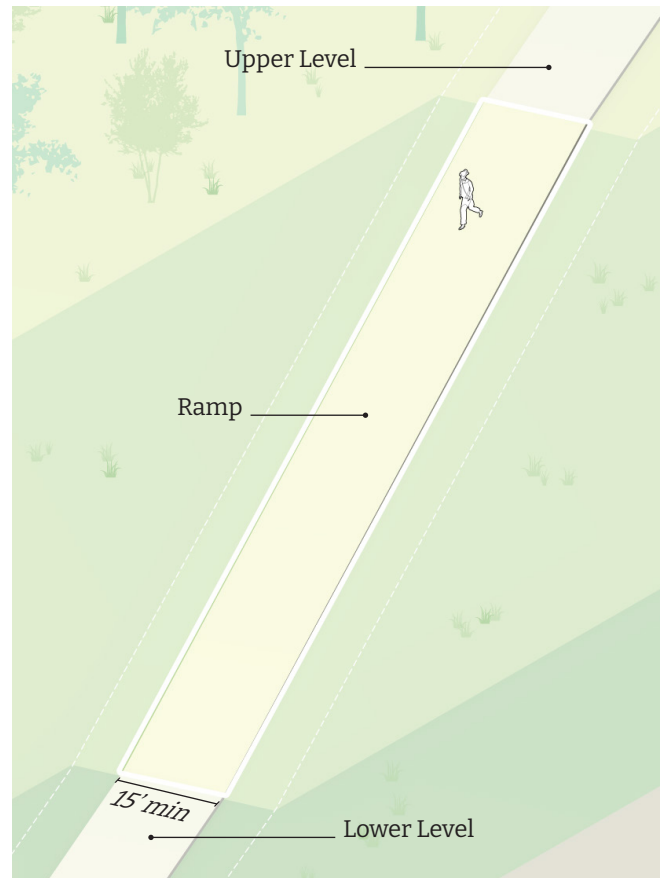
Ramps allow trails to transition from the lower shelf of a bayou to the top shelf. Transitions from one level to another may be necessary for several reasons, such as space constraints or going under a street bridge. Trail standards apply for ramps. Refer to General Greenway Elements “[Trails](#)” on p. 7.

### TYPICAL

- Design ramps to be at least 15 feet wide.
- Keep ramp slopes below 5 percent slope to reduce the need for landings and railings. When possible, grade into the slope to avoid using retaining walls.

### RECOMMENDED MINIMUM

- If ramp slopes must be steeper enough to require landings, refer to ADA standards.



## Retaining Walls

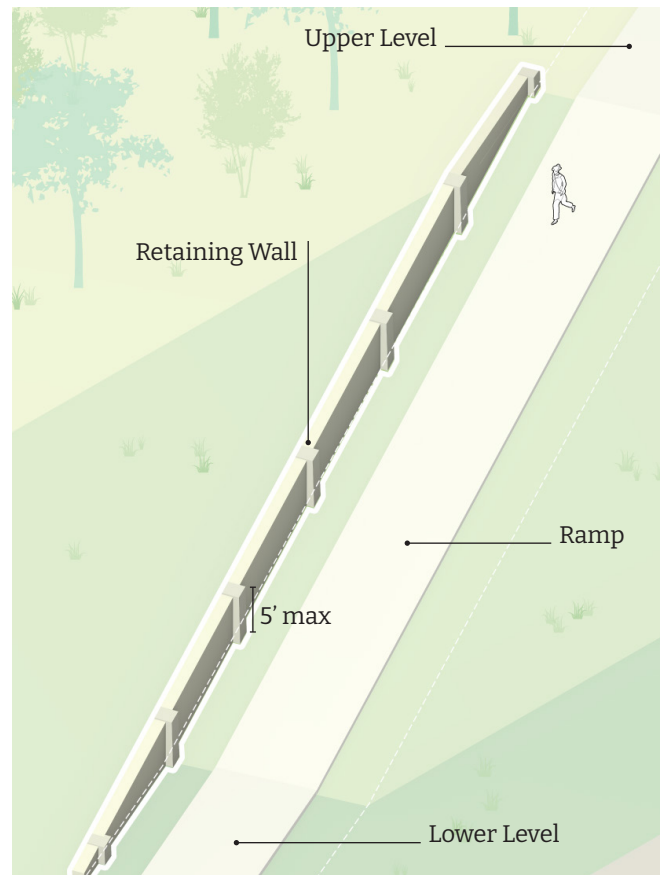
In this condition, the following standards apply in addition to the standards described under General Greenway Elements “[Retaining Walls](#)” on p. 70.

### TYPICAL

- Use terracing if the wall height would exceed 5 feet if space is available.
- Make allowance for maintenance access when locating retaining walls.

### RECOMMENDED

- Use uphill walls rather than downhill walls, where it is possible.

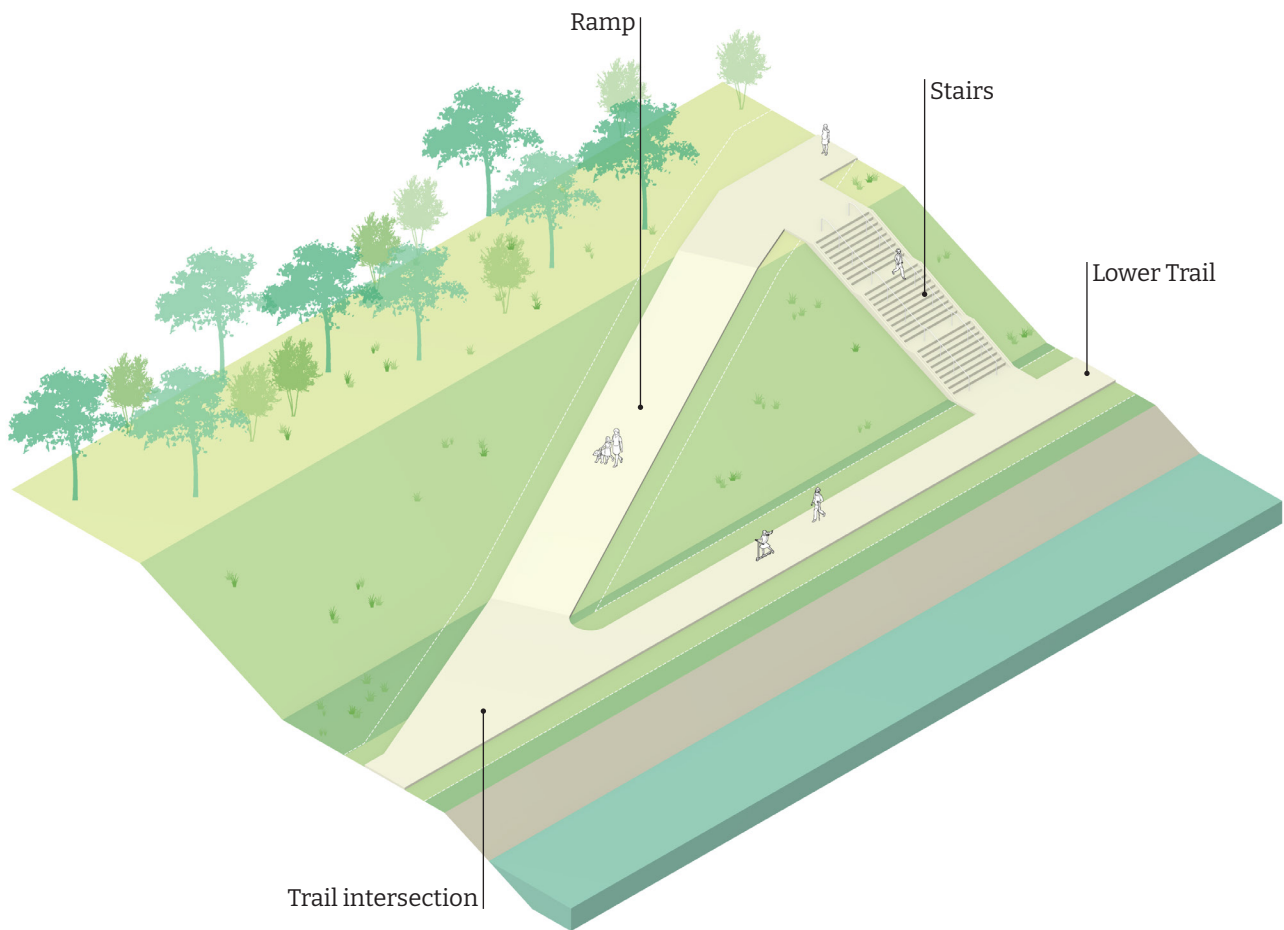


# GREENWAYS ALONG BAYOUS

## Vertical Connectors

Trails along bayous can be located either on the top shelf or on the lower shelf. Sometimes it is necessary to connect the two, or to allow access from the lower shelf level to the street level.

The standards in this section apply in addition to the standards listed in General Greenway Elements "Typical Conditions" on p. 6.

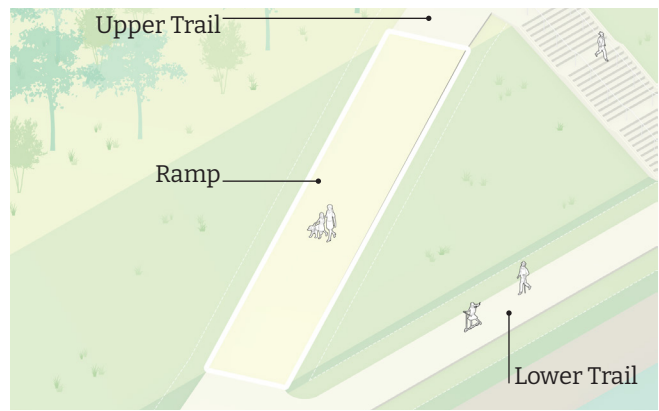


## Ramp

In this condition, the following standards apply in addition to the standards described under Greenways Along Bayous “Ramp” on p. 73.

### TYPICAL

- Locate ADA-accessible ramps anywhere where stairs are provided.

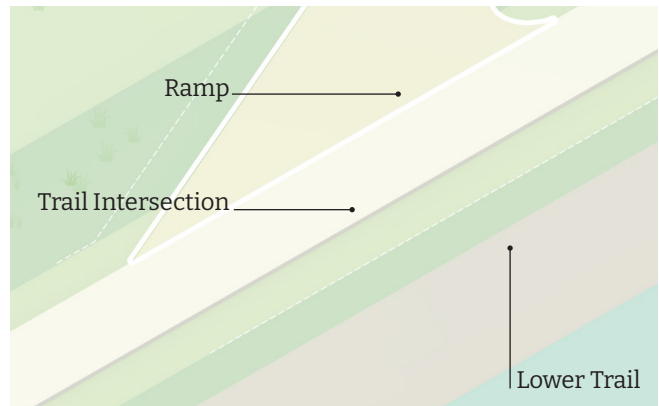


## Trail Intersection

The intersection where ramps and trails meet are important places to design well. If designed poorly, they can result in uncomfortable or dangerous conditions.

### TYPICAL

- Round the inside corner where the trails meet with a 5 to 10-foot radius when possible.



## Stairs

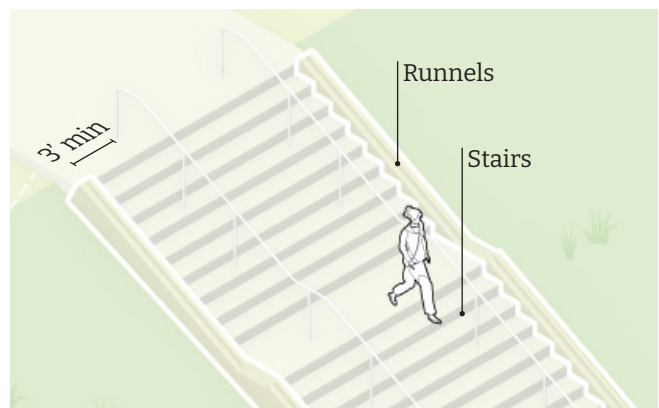
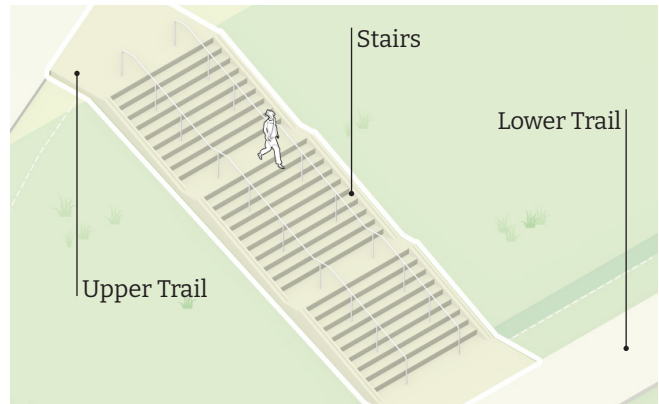
Stairs are important vertical connectors. Ramps provide ADA access between different levels of trails, but stairs are also easier for some people than ramps. They are also often more direct connections than ramps since they are shorter and require less space. For additional details, see Appendix D: “Stairs” on p. D146.

### TYPICAL

- Follow ADA guidelines for stair and railing design.
- Locate stairs so that neither the stairs nor the guardrails encroach on the trail shoulder area or clear zone requirements.
- For railing requirements, see “Guardrails” on p. 37.
- Locate the runnel away from guardrails and handrails so that it can easily be used by bikes. Preferred setup is to place the runnel at least 1.5 feet away from the railings so that they do not conflict with handlebars. If the runnel is on the outside of the railing, provide at least 3 feet between the runnel and the railing.
- Ensure that approaches to stairs are visible and apparent from the main trail so that people on wheels do not accidentally end up on a stair.

### RECOMMENDED

- Provide bike runnels on stairs unless there is a ramp nearby that is easily navigable by people on wheels.



# GREENWAYS IN UTILITY EASEMENTS

Power line easement trails offer relatively uninterrupted off-street hike and bike trails along easements for power lines, like CenterPoint Energy corridors. These easements often bisect the city in straight or close-to-straight lines that make it easy to cross large sections of the city quickly. Because of the relatively east-west nature of bayous in Houston, north-south-oriented easement trails make it easy to connect between bayous without taking circuitous routes.

Power line easement trails can be short or can span the entire Houston and Harris County region and serve a wide variety of people from pedestrians to cyclists. They are easy places for beginner/infrequent bike riders to enjoy because they are separate from car traffic, accessible, well maintained, and connect many neighborhoods and destinations. Because of regulations along some of the easements, these trails cannot always offer the same kind of shade, natural vegetation, and park amenities that the bayous can provide, but are nonetheless pleasant, safe, and easy to walk, bike, or roll on.

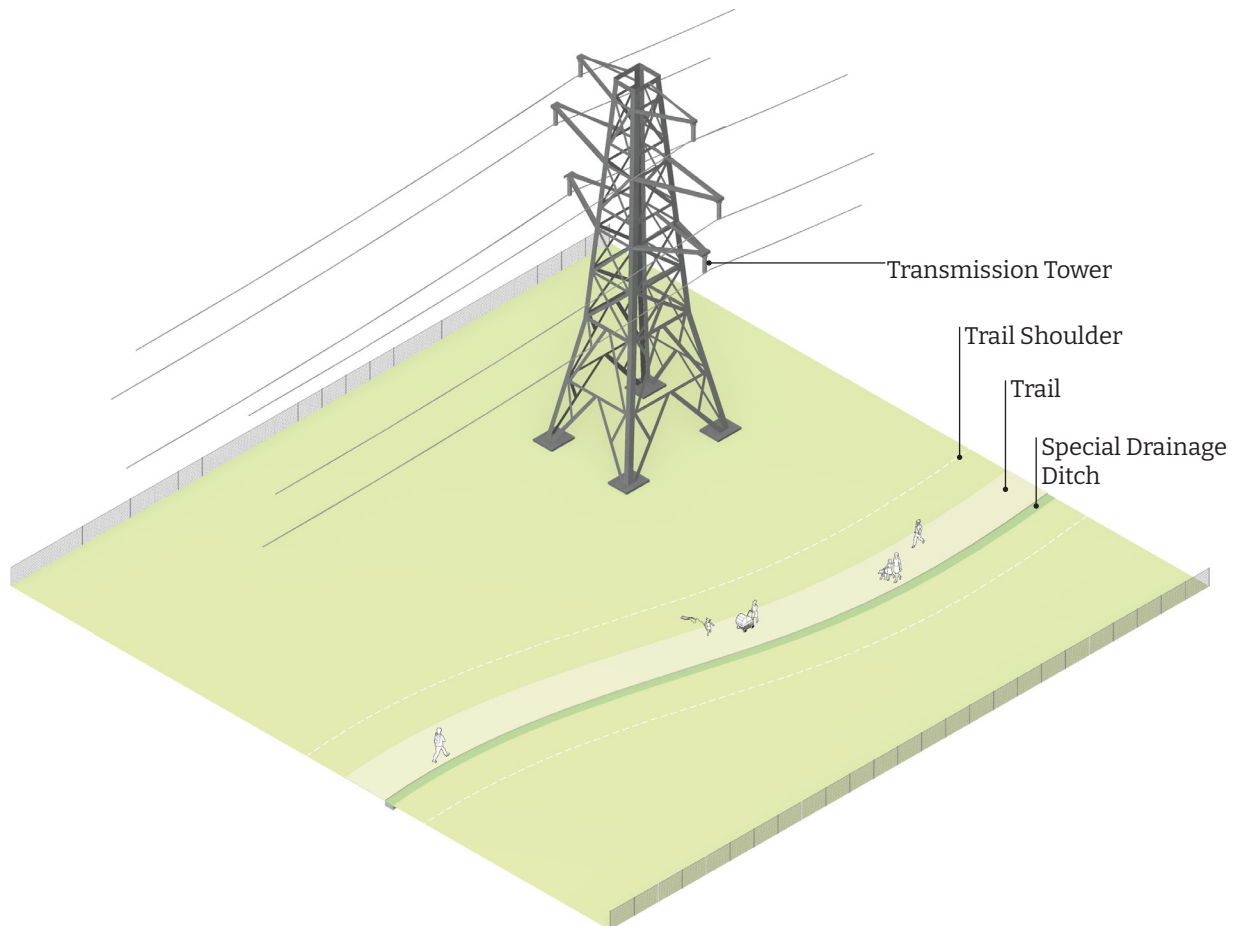


# GREENWAYS IN UTILITY EASEMENTS

## Power Line Easements

Power line easement trails are trails that are constructed in power line utility easements (like CenterPoint Energy corridors). Any design that is within a CenterPoint easement right-of-way must be approved and permitted by CenterPoint. Refer to the Master License Agreement for Hike and Bike Trails between CenterPoint and the City of Houston or Harris County (depending on the proposed trail location).

The standards in this section apply in addition to the standards listed in General Greenway Elements "Typical Conditions" on p. 6.



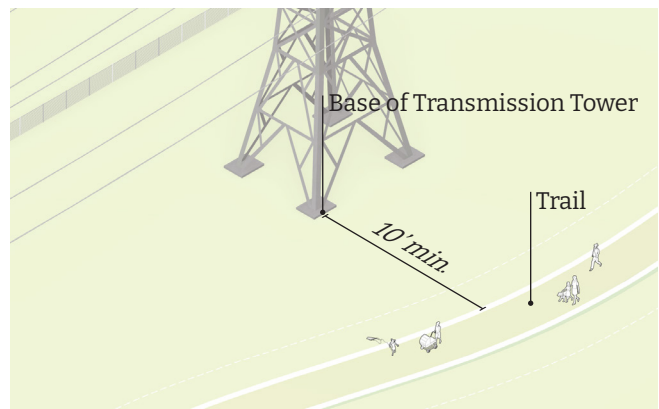


## Trails

In certain conditions, like CenterPoint easements, there are specifications for where trails can be located. For trail standards, refer to General Greenway Elements [“Trails”](#) on p. 7.

### TYPICAL

- Maintain at least 10 feet of distance from transmission towers.
- Do not place trails within the outer 10 feet of a CenterPoint easement, since they reserve this space for utilities.

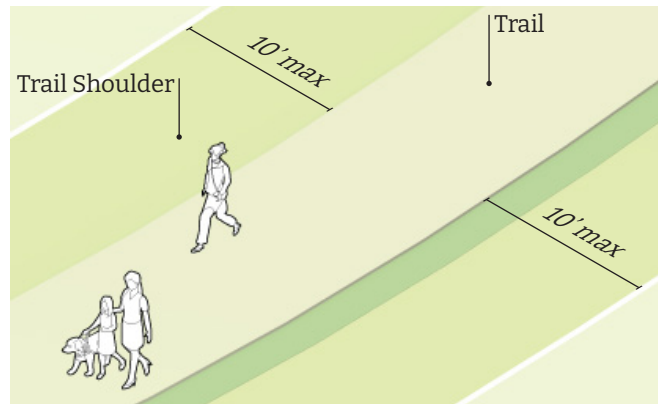


## Trail Shoulder

For CenterPoint easement trails, the following standards apply in addition to the standards described under General Greenway Elements [“Trail Shoulder”](#) on p. 8.

### TYPICAL

- Maintain at least 10-foot clear width on either side of the trail. This cannot include drainage areas.

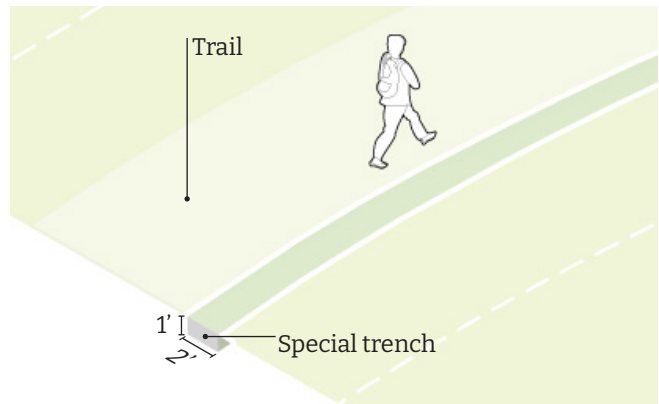


## Special Drainage Trench

Detention is not allowed on CenterPoint easements, but it is still important to deal with the increase in water runoff as a result of the trail. CenterPoint has very specific standards for trenches within their easements. For additional details, see [“Appendix C”](#) on p. C2.

### RECOMMENDED

- Design the trench to be 2 feet wide by 1 foot deep on the downhill side of the trail.
- Fill the trench with rocks or sand and cover it in sod.



## Vertical Amenities

Vertical elements like trees, seating, trash and recycling receptacles, signage and lighting are not allowed within CenterPoint easements, except where the trail is within the street right-of-way. For vertical element standards, refer to General Greenway Elements [“Typical Conditions”](#) on p. 6.

### RECOMMENDED

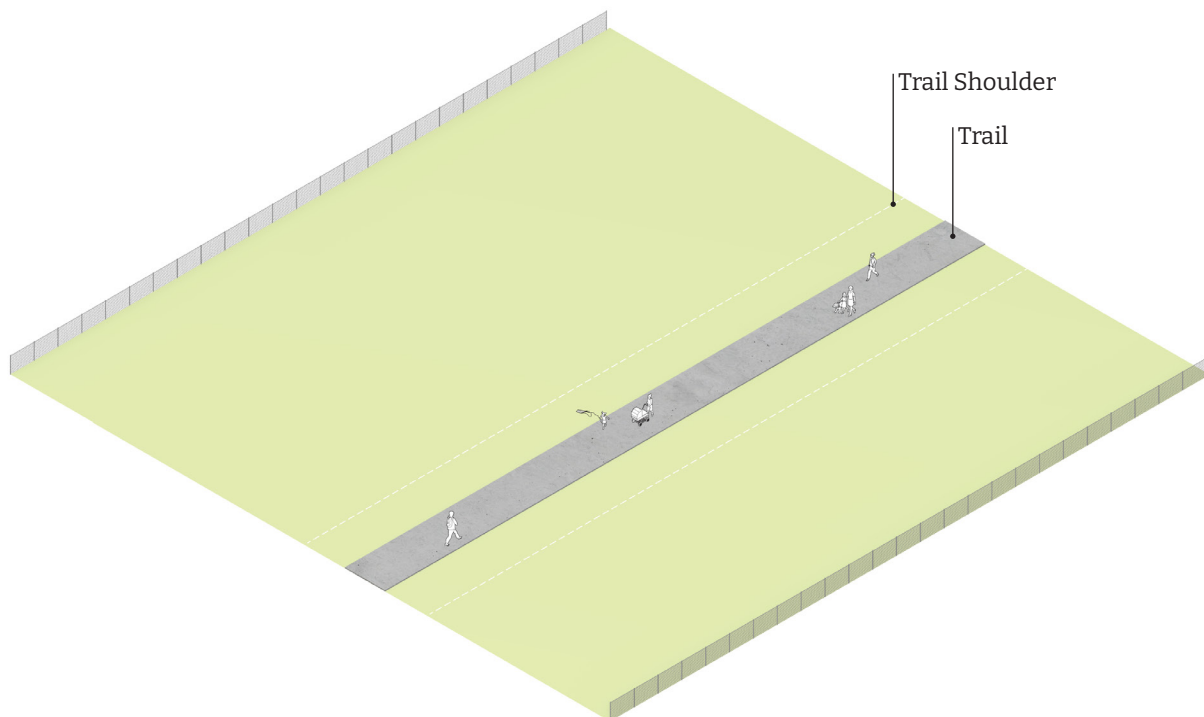
- Locate these elements within the street right-of-way.
- Install in-grade signage for wayfinding where vertical signage isn't allowed.

# GREENWAYS IN UTILITY EASEMENTS

## Pipeline Easements

Pipeline easement trails are trails that are constructed in pipeline utility easements. A typical Houston Parks Board easement trail may include the following features.

The standards in this section apply in addition to the standards listed in General Greenway Elements "Typical Conditions" on p. 6.

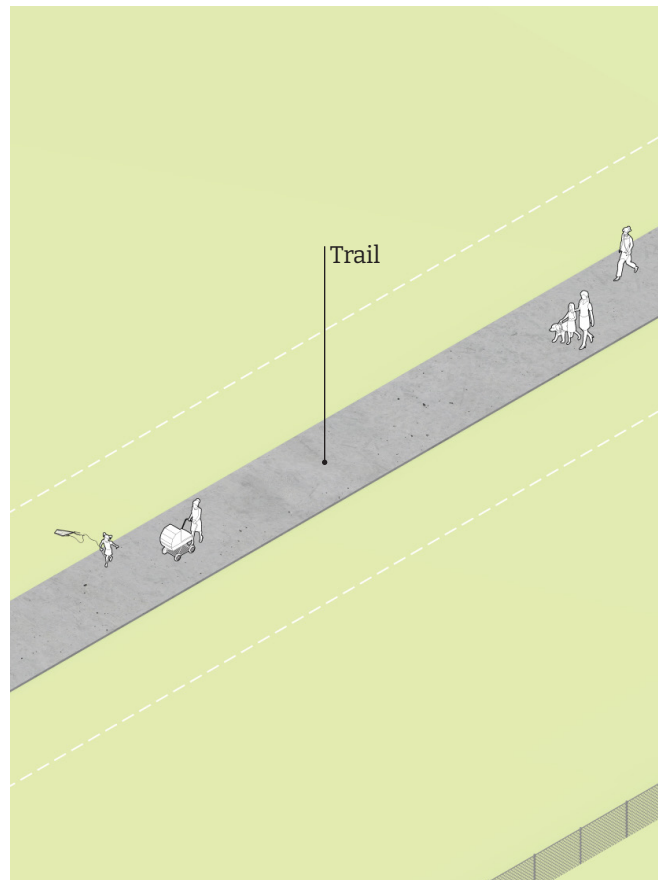


## Trails

In certain utility easements, there are specifications for where trails can be located. For trail standards, refer to General Greenway Elements [“Trails” on p. 7](#).

### TYPICAL

- Coordinate with the easement owner to obtain a Letter of No Objection (LONO).
- Do not use concrete for trails in pipeline easements. Use asphalt.
- Avoid crossing the pipes too much.
- Maintain a 5-foot rule-of-thumb clearance between top of pipe and trail/wall.
- Depending on how deep the pipelines are, heavy machinery or vehicles may not be allowed on the easement, which may impact the construction of the trail.
- Coordinate with owning agency to determine if seal slabs are necessary.



## Vertical Amenities

Vertical elements like trees, seating, trash and recycling receptacles, signage and lighting may not be allowed within utility easements, except where the trail is within the street right-of-way. For vertical element standards, refer to General Greenway Elements [“Typical Conditions” on p. 6](#).

### RECOMMENDED

- Locate these elements within the street right-of-way.
- Install in-grade signage for wayfinding where vertical signage isn't allowed.

# GREENWAYS IN STREET RIGHT-OF-WAY

Greenways in street right-of-ways are hike and bike trails located along streets, within the street right-of-way, separated from the street by landscaping and trees and provide more comfort and amenities than sidepaths or sidewalks. They are less continuous than bayou greenways or easement trails because they are crossed by the same crossing streets as the streets they run parallel to, but still offer wide, well-maintained, off-street hike and bike facilities that feel like greenways, and are convenient for reaching destinations. They are elevated from a typical sidewalk or sidepath because of the landscaping and amenities they provide.

Greenways in street right-of-ways can be short or can span the entire Houston and Harris County region and serve a wide variety of people from pedestrians to cyclists. They are less separate from other types due to all of the street crossings, but are still designed to be easy places for beginner/infrequent bike riders to enjoy because they are mostly separated from car traffic, accessible, well maintained, and connect neighborhoods and destinations. Because of the space available, these trails cannot always offer the same kind of larger park amenities that bayou greenways can provide, but are nonetheless pleasant, safe, and easy to walk, bike, or roll on.



# GREENWAYS IN STREET RIGHT-OF-WAY

## Typical Condition

Greenways in street right-of-ways are off-street shared-use paths that are within the street right-of-way, but are separated from traffic by a landscaped buffer, lined with trees and vegetation, with additional amenities. They are not the same as sidepaths, which are becoming more popular in the region.

Although greenways-in-street-right-of-ways do not provide quite the same comforts as bayou greenways or easement trails, they are upgrades from non-greenway ped/bike infrastructure like sidewalks, high-comfort bikeways, and sidepaths; they require additional right-of-way to accommodate more buffer space for trees, vegetation, amenities (such as benches, trash cans, and signage), and additional safety measures. They are important connectors between other greenways, and must feel like a part of the greenway system.

When designing a greenway in a street right-of-way there may not always be space to meet the guidelines laid out in this section. They may require street reconstruction, and Houston Parks Board may have to use provisional workarounds until the street can be reconstructed. However, these guidelines represent the ideal greenway design for when the road is reconstructed.

The standards in this section apply in addition to the standards listed in General Greenway Elements [“Typical Conditions”](#) on p. 6.



## Trails

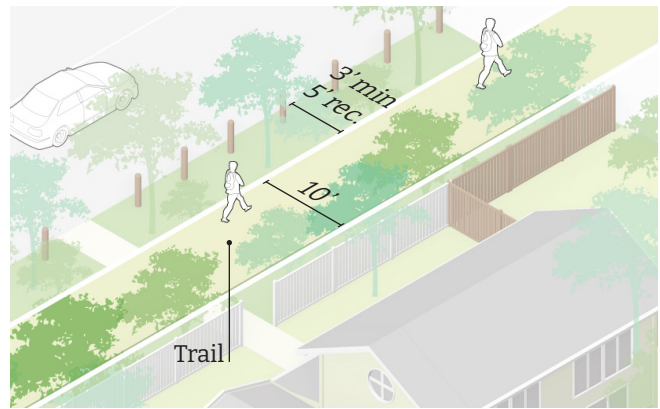
In certain conditions, there are specifications for where trails can be located. For trail standards, refer to General Greenway Elements “Trails” on p. 7.

### TYPICAL

- Design trail to be at sidewalk level, buffered from the street edge of pavement or curb face by at least 3 feet of landscaping.

### RECOMMENDED

- Provide at least 5 feet of landscaped buffer between the trail and the street curb, including shade trees.



## Driveway Crossings

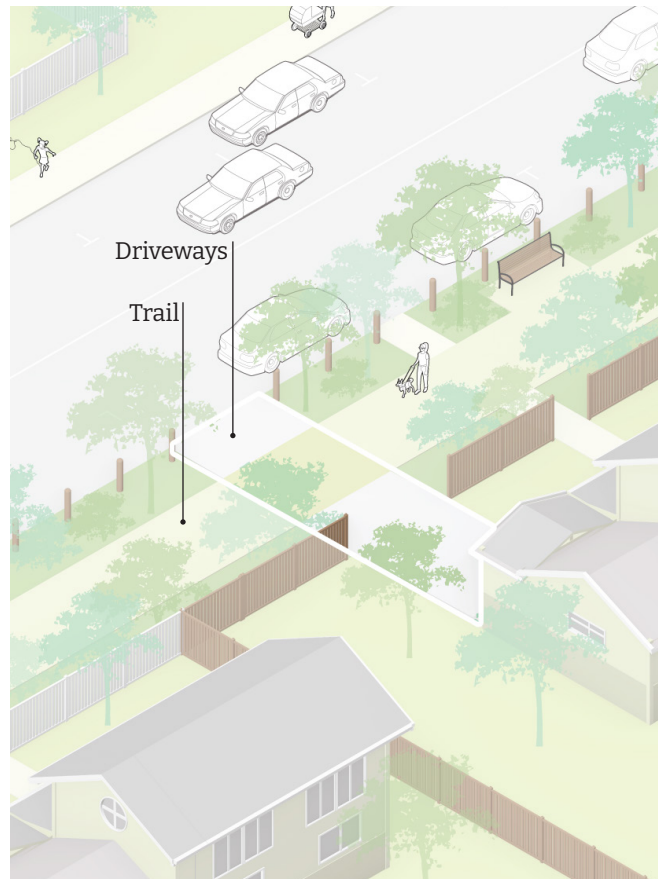
Greenways in street right-of-ways will often parallel neighborhood streets and will need to be crossed by driveways in a way that is safe for trail-users.

### TYPICAL

- Design trail to cross driveways at 90 degrees (perpendicular to the driveway), if possible, or consider rebuilding the driveway to cross at a 90 degree angle.
- Provide a gap in the wood posts to allow cars to turn into the driveway.
- Continue trail pavement through the driveways so that the trail pavement is continuous.
- If necessary, rebuild driveway entry slopes when buffer space is constructed. Minimum 5 feet of buffer space will allow for enough space for driveway slopes.

### RECOMMENDED

- Consider providing signage oriented toward the street to signal the driveway is a private drive, if the house is not clearly visible.
- Consider providing signage oriented toward oncoming trail-users to yield to crossing cars and to pedestrians.

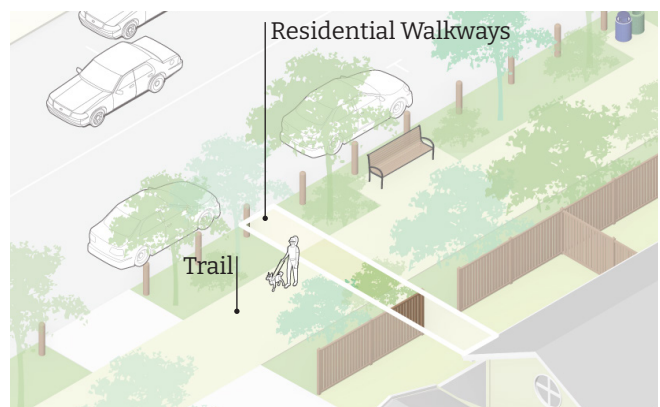


## Residential Walkway Crossings

Greenways in street right-of-ways will often parallel neighborhood streets and will need to be crossed by residential walkways in a way that is safe for trail-users.

### RECOMMENDED

- Continue trail pavement through the residential walkways so that the trail pavement is continuous.



## Trees

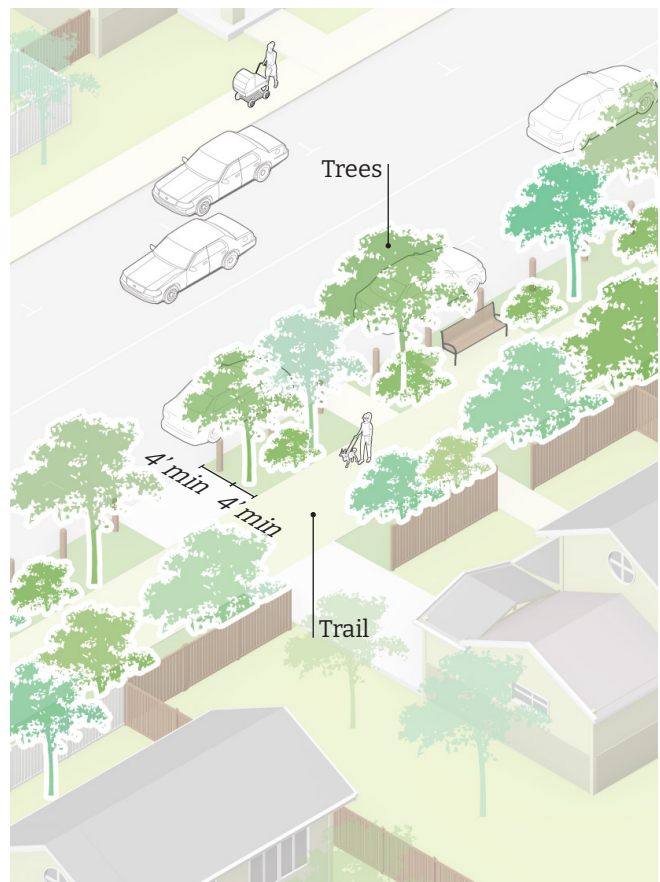
Trees are important for shade and aesthetic appeal and are particularly important for a greenway in a street right-of-way; they help set this type of greenway apart from other sidewalks and create protected space away from the streets they parallel. In this condition, the following standards apply in addition to the standards described under General Greenway Elements [“Trees” on p. 10](#).

### TYPICAL

- Locate trees at least 4 feet away from the edge of the trail.
- Locate trees at least 4 feet away from the curb face.
- Ensure tree canopies will allow for 15-foot of vertical clearance within the 20-foot maintenance area.

### RECOMMENDED MINIMUM

- Locate trees at least 2 feet away from the edge of the trail.
- Locate trees at least 3 feet away from the curb face.



## Optional Elements

### Low Impact Development Practices

Greenways in street right-of-ways can be good places to implement Low impact Development practices (LID). The following standards apply in addition to the standards described under General Greenway Elements [“Low Impact Development Practices” on p. 58](#).

### RECOMMENDED

- Consider adding LID elements along the trail such as vegetated filter strips, tree box filters, or bioswales. Refer to the Harris County Low Impact Development & Green Infrastructure Design Criteria for Storm Water Management for details.
- Ensure that LID practices do not encroach on the required trail shoulder.





## **Pedestrian Lighting**

Pedestrian-scale lighting is important for making trail-users feel safe while using the trail. Lighting is easy to provide along most roadways since most roadways are lit and already have the required utilities. Pedestrian lighting differs from street lighting by being lower to the ground and more frequent so that the pedestrian path is evenly lit.

### **TYPICAL**

- Determine whether adding pedestrian lighting is appropriate based on field conditions. Lighting for streets is not always adequate for pedestrians.

# CONNECTING PED/BIKE INFRASTRUCTURE

There are several types of pedestrian and bike infrastructure that connect to greenways but are not greenways. These include things like sidewalks, sidepaths, bike lanes, and temporary trails in the street.

Unlike greenways, these ped/bike infrastructure elements do not always include much vegetation, shade, or amenities. They may be in the street, or separated from the street by only a few feet and can sometimes feel uncomfortable to walk or roll on. They do, however, play critical roles in helping to connect people and destinations to the greenway network.



# CONNECTING PED/BIKE INFRASTRUCTURE

## Sidewalk

Sidewalks are paved paths for pedestrians along the side of a road. These are the most common type of ped/bike infrastructure, but usually exclusively serve pedestrians.

Sidewalks can vary greatly in terms of the width and presence of trees, buffer space, vegetation, and other amenities. They don't need to feel like part of a greenway and can vary from a 4-foot wide path directly abutting the street to an 8-foot path buffered from the street by grass and street trees to a 12-foot wide paved space between a building and a street with street trees in tree wells.

What makes even the widest of sidewalks different from greenways in street right-of-ways is the amount of vegetation, consistency of wayfinding and signage, and additional amenities like benches, drinking fountains, etc. that contribute to the greenway feeling like part of the connected network of greenways in the Houston region.



# Sidepath

Sidepaths are not greenways. Sidepaths are very similar to sidewalks but are wide enough to also accommodate wheelchair users, bike riders, and other people on wheels. They are generally 10 to 12 feet wide. Sidepaths are a safer, more comfortable type of bike infrastructure than bike lanes for most people on wheels since they are separated from the street, usually with a landscaped or turf buffer.

What differentiates greenways in street right-of-ways from sidepaths is the amount of vegetation, the width of the buffer between the edge of pavement or curb and the trail, consistency of wayfinding and signage, and additional amenities like benches, drinking fountains, etc. that contribute to the greenway feeling like part of the connected network of greenways in the Houston region.



# CONNECTING PED/BIKE INFRASTRUCTURE

## Bike Lanes

Bike lanes are in-street bike infrastructure that can come in several forms. The most basic form is a painted bike lane, with typical white lane markings delineating a 3-6 foot bike lane outside of the traffic lanes. This does not meet current City of Houston or Harris County standards, which require an all-ages and abilities high-comfort buffered bike lane, and are no longer being implemented. Additional levels of protection can be added, such as painted buffers between the bike lane and traffic lane, which can also include flex posts, planters, and extended curbs. Note that armadillos have been tested and are no longer being used by Harris County because they have not proven to be effective.

However, despite these protection measures, most bike lanes are generally not as safe as sidepaths.

Bike lanes are easily differentiated from greenways in street right-of-ways by the fact that they are in the street at street level rather than separated from the street by a landscaped buffer and the height of the curb. They also do not include vegetation or amenities like benches and drinking fountains.



# Temporary Trail in the Street

Greenways in street right-of-ways are off-street pedestrian and bike facilities that are within the street right-of-way but are separated from traffic by a landscaped buffer, lined with trees and vegetation, with additional amenities. This is very similar to the City of Houston’s standards for high-comfort bikeways, except that they are also intended to be used for pedestrians and ideally have more vegetation around the trail.

When designing a greenway in a street right-of-way, there may not always be space to meet the guidelines laid out in this document. In order to meet those standards, additional right of way may need to be acquired or the street may require reconstruction.

Trails in street right-of-ways are temporary solutions for providing pedestrian and bike connections in the street until the city or county is ready to rebuild the street or an agreement is able to be reached with homeowners who refuses to sell.

These temporary trails in the street look like wide protected bike lanes. They are level with the roadway, separated from traffic by more than a painted buffer. The buffer space between the traffic lane and the trail should include physical protection from cars like solar bollards, concrete barriers, or planters.





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Photo by Anthony Rathbun,  
courtesy of Houston Parks Board



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