

APPENDIX I: TRAIL DESIGN GUIDELINES

TRAIL DESIGN GUIDELINES

The regional trail system will run through several unique environments and attract a variety of different users. This appendix presents the design guidelines for regional trails (multi-use, urban and unpaved), regional trailheads (urban and equestrian), a street crossing (major arterial) and a variety of trail amenities. These guidelines are intended to serve as a menu– or palate–for trail design and are based on the most recent versions of widely accepted regulatory guidelines that are amended and supplemented throughout this section¹. These guidelines may be amended from time to time by published changes found on the Pierce County website. Construction of the trails envisioned in this plan are based on the specifications and provisions described in the call for bids for any given trail project. The specifics of landscaping and vegetation are addressed in Title 18J, Development Regulations – Design Standards and Guidelines².

Pierce County’s Parks and Recreation Department recognizes that trail development must comply with county, state and federal regulations that may result in conflicts with the guidelines presented in this chapter. In such a case, the final design of a trail project must comply with the regulatory requirements. In addition, some trail sections that are currently owned by Pierce County may not meet these design guidelines. Therefore, Pierce County trail sections constructed prior to the adoption of this plan will be retro-fitted to meet these new guidelines only when it is practical and on a case-by-case basis to do so.

REGIONAL TRAIL CROSS-SECTIONS

Trail cross-sections provide graphic illustrations of how each type of trail might be designed to accommodate a variety of trail users. The cross-sections provide specifications related to trail width, shoulders, vertical clearance, and relation to other trail amenities.

Multi-use Trail

The Foothills Trail is a popular example of a multi-use trail. Multi-use trails are generally suitable for most trail corridors; however the width may not fit within some corridors such as areas adjacent to critical areas that are environmentally sensitive lands. The multi-use trail

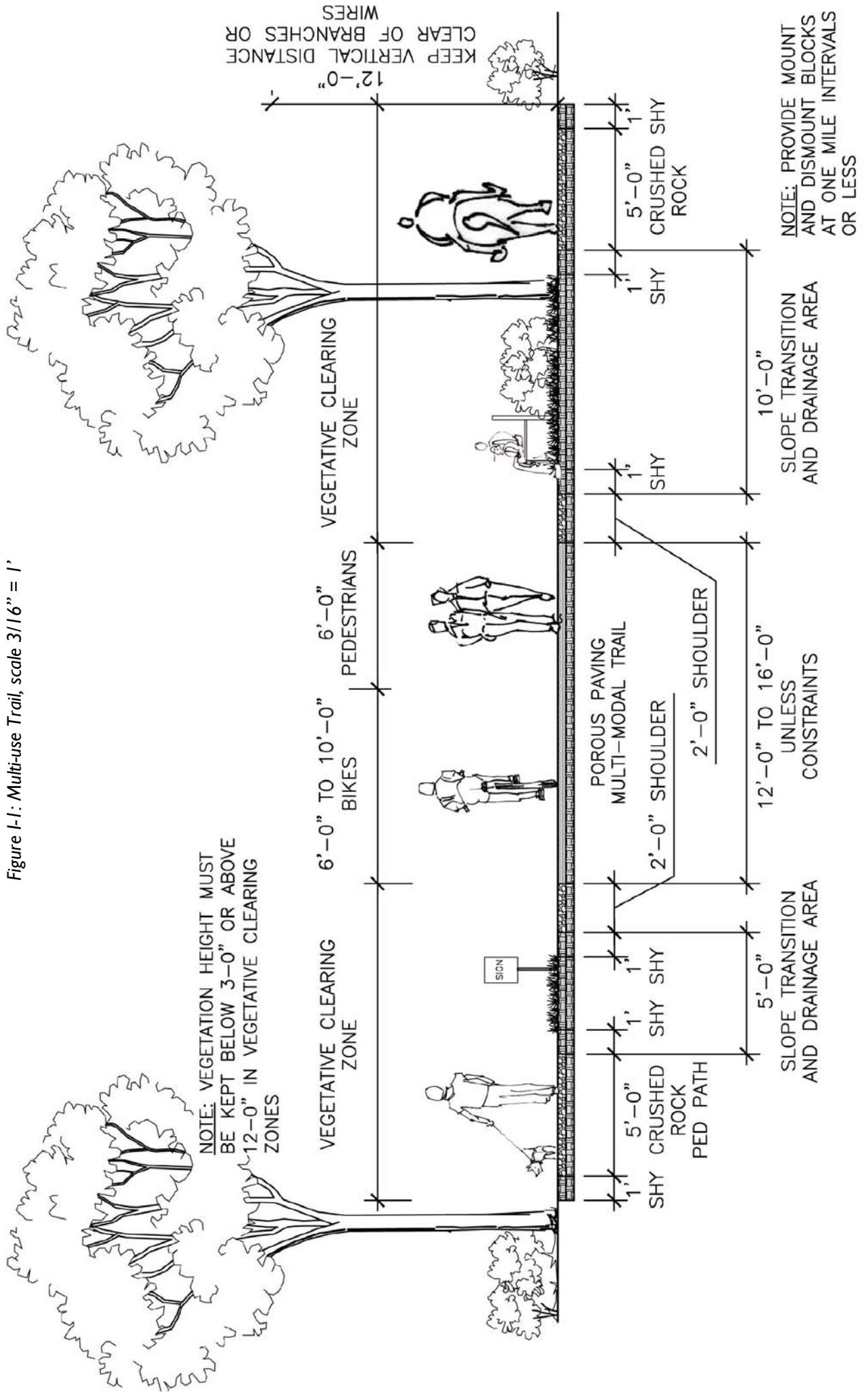
¹ Guide for the Development of Bicycle Facilities; Pedestrian Facilities Guidebook, Toolkit 4; Architectural Barriers Act (ABA) Accessibility Guidelines for Outdoor Developed Areas: Proposed Rule; Traffic Controls for Bicycle Facilities.

² Section 18J.15.030

should provide for a range of trail users with a wide surface and separated or extended shoulders for pedestrians and equestrians. Figure I-1 on the following page illustrates a trail design that would accommodate the widest variety of users. This trail design is intended for trails outside of urban growth areas.

- Multi-use trail surface should be no less than 12' wide with 2 x 2' shoulders, 2 x 1' shy distance next to the shoulders and include additional area needed for slope and fill maintenance;
- Minimum clearance is 12' in height to the first tree-limb, guy-wire or other object;
- When hard-surfacing is used the trail should be constructed of porous paving with soft surface unpaved shoulders; in some instances porous paving may not be suitable and the use of impervious surfacing should be considered;
- Signs, mileage markers, equestrian mount/demount blocks, fence, benches and other placed features must be located outside of the shoulders;
- Trails that include equestrians users should provide at least one shoulder that is no less than 5' in width with mount/demount blocks at no less than one mile apart;
- Unless otherwise required by regulation, shoulders should allow for machine maintenance of the vegetation;
- Placement of benches, trash receptacles, drinking fountains and other trail amenities should allow for machine maintenance of the vegetation with at least 8' of clearance around any feature and not interfere with equestrian users when applicable; and
- Limited sight-distance at curves should be striped for two-way travel lanes.

Figure 1-1: Multi-use Trail, scale 3/16" = 1'



Urban Trail

The urban trail (Figure I-2) is a slightly narrower version of the multi-modal trail design and is designed to run parallel to streets in urban areas. The design is suitable for most trail corridor types and is most common within street rights-of-way. These trails, as with multi-use trails, should be designed to accommodate a range of users. Urban trails are also suitable for sub-regional and connector trails.

- Urban trail surface should be no less than 10' wide with 2 x 2' shoulders, 2 x 1' shy distance next to the shoulders and include additional area needed for slope and fill maintenance;
- Minimum clearance is 12' in height to the first tree-limb, guy-wire or other object;
- When hard-surfacing is used the trail should be constructed of porous or impervious paving with soft surface unpaved shoulders;
- Limited sight-distance at curves should be striped for two-way travel lanes;
- A 1' safety clearance and 5' landscaping buffer is preferable;
- Unless otherwise required by regulation, shoulders should allow for machine maintenance of the vegetation; and
- Placement of benches, trash receptacles, drinking fountains and other trail amenities should allow for machine maintenance of the vegetation with at least 8' of clearance around any feature.

Unpaved Trail

The unpaved trail (Figure I-3) is suitable for segments of the regional system that are located in rural areas, within parks or are located in critical areas. Unpaved trails are suitable for most trail corridor types but because the trail is unpaved, this trail is not preferable for certain users that enjoy or require a hard smoother surface, such as skaters and some cyclists.

- Unpaved trail surface should be no less than 10' wide with 2 x 1' shoulders, 2 x 1' shy distance next to the shoulders and include additional area needed for slope and fill maintenance;
- Minimum clearance is 12' in height to the first tree-limb, guy-wire or other object;
- Trail surface should be constructed of crushed gravel or similar material;
- Unless otherwise required by regulation, shoulders should allow for machine maintenance of the vegetation; and

- Placement of benches and other trail amenities should allow for machine maintenance of the vegetation with at least 8' of clearance around any feature and not interfere with equestrian users when applicable.

Figure I-2: Urban Trail, scale 3/16" = 1'

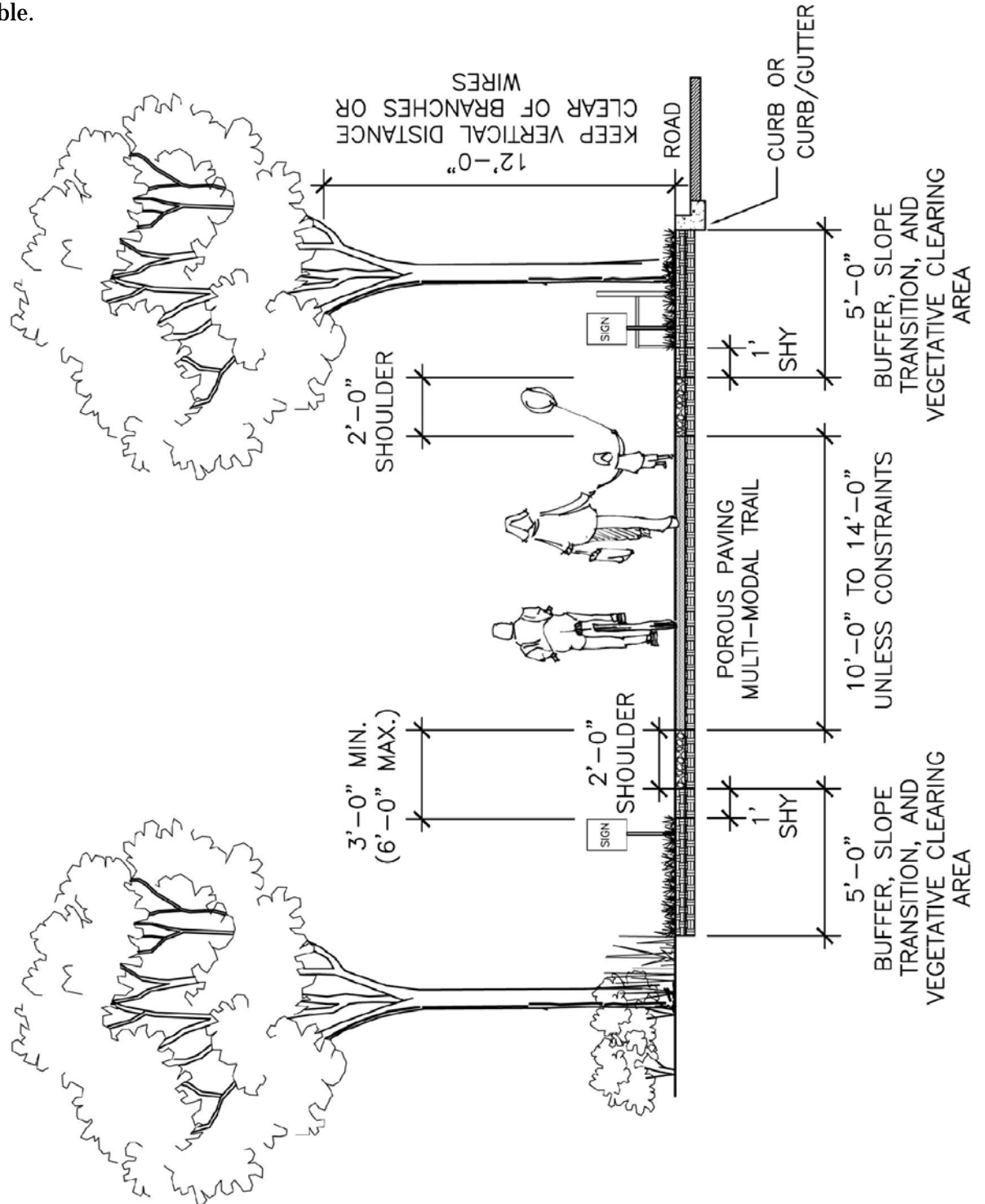
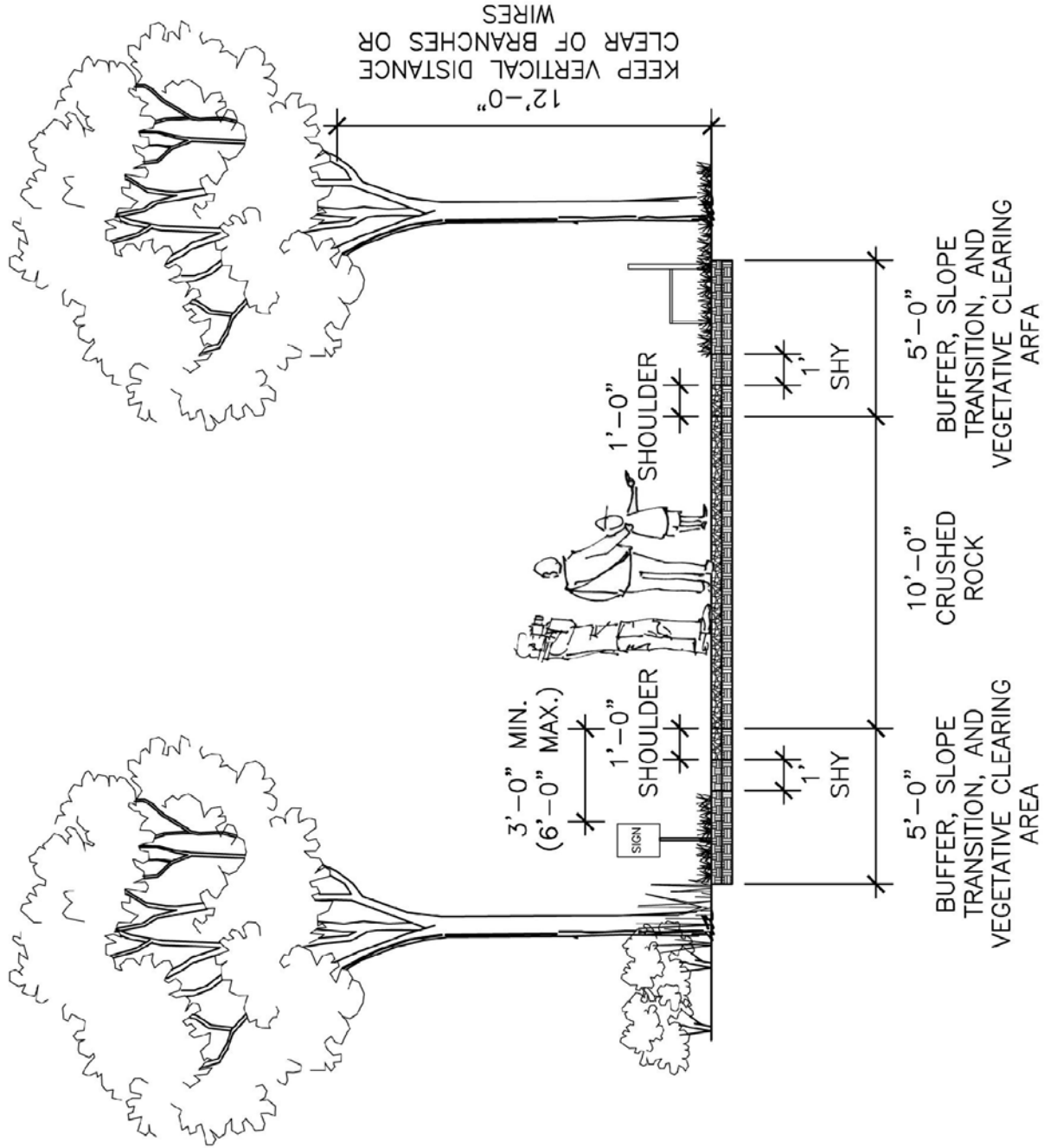


Figure I-3: Unpaved Trail, scale 3/16" = 1'



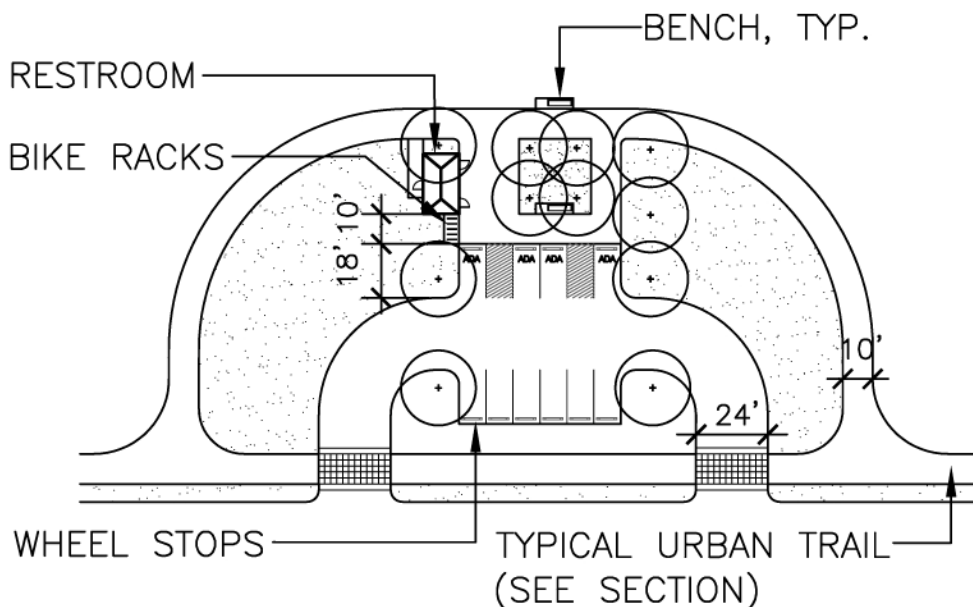
TRAILHEADS

There are two trailhead designs provided in this section: the urban and equestrian trailheads. The majority of trail users will access the regional trail at one of many formal trailheads. Trailheads let users know they have entered or exited the trail system with clearly marked signage and other visual cues such as information kiosks. These facilities provide users with places for vehicle or bicycle parking, may provide staging areas for equestrians, and can provide other amenities such as seating and restrooms. Law enforcement, emergency vehicles, and maintenance crews also require sufficient trail openings at trailheads designed to allow for occasional vehicle access.

Urban Trailhead

The urban trailhead (Figure I-4) accommodates trail users locally and throughout the region. While some users will live close enough to access the trail on foot or by bike, the trail system's regional draw will require sufficient parking for users traveling by car. The urban trailhead design allows for parking where the regional trail is adjacent to a street. These trailheads should be built at easy to find locations that offer safe and convenient access, near major roadways, transit stops, and services such as shops selling food and drinks.

Figure I-4: Urban Trailhead, scale 3/16" = 1'



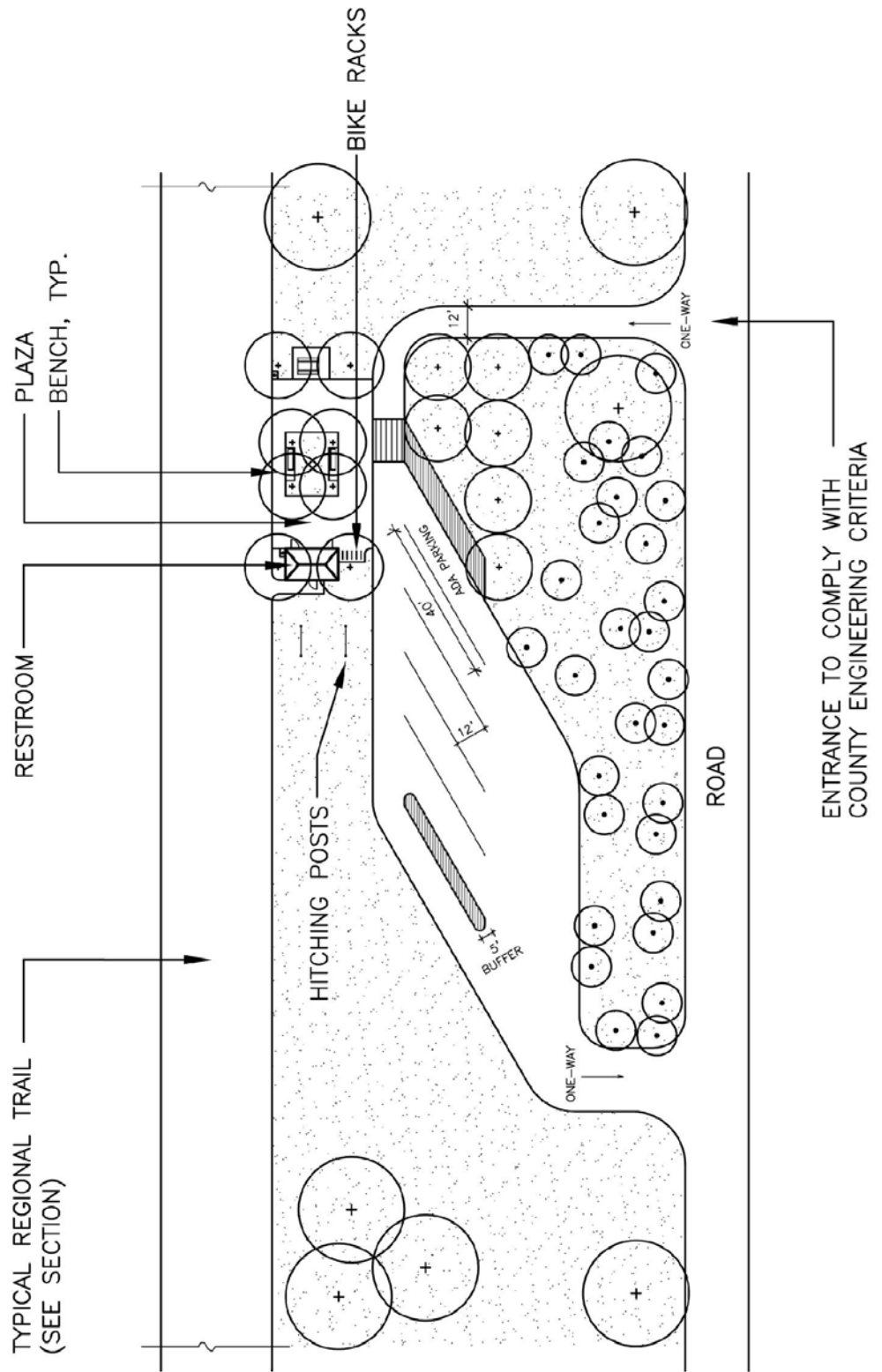
The full service trailhead features ample parking, with ADA designated spaces, and a two-way, circular drive aisle. Two trail spurs provide an option for users to access the trailhead plaza and for safe access to the parking area. The configuration also allows through access to continue on the regional trail. The full service trailhead plaza features a restroom and landscaped seating area, as well a bike rack for secure parking.

Equestrian Trailhead

The equestrian trailhead (Figure I-5 on the following page) is a full service trailhead design. The design allows parking where the regional trail is separated from the street. This trailhead is more suitable for locations outside urban areas that will receive more use from equestrians. These trailheads should be placed near smaller rural communities, or near sections of trail that offer a separated equestrian trail or wide shoulders.

Unique to the equestrian trailhead parking area are the 40' long parking isles to accommodate horse trailers. The spaces can be striped to provide parking for standard length vehicles as well. The design also features ADA access and a one-way drive isle that accommodates trailers. A crosswalk from the parking area leads users to the trailhead plaza which includes a restroom and seating area. Bicycle racks are also sited in this area creating a secure space to lock bikes. The full service trailhead can also include hitching posts, providing a staging area for equestrians.

Figure I-5: Equestrian Trailhead, scale 3/16" = 1'



REGIONAL TRAIL PROPERTY, EASEMENTS AND RIGHT-OF-WAY

Identifying possible trail alignments and trail design are just two of many steps that must be taken to develop a functional trail. After mapping the general location of the trail, the next step is to identify property ownership along the trail alignment. Property acquisition for trail development and maintenance is best explored on a case-by-case basis. However, where state or federal funds might be involved in any portion of the trail project, past or present, proper right-of-way acquisition procedures outlined by Washington State Department of Transportation (WSDOT) shall be followed³.

Road Crossing

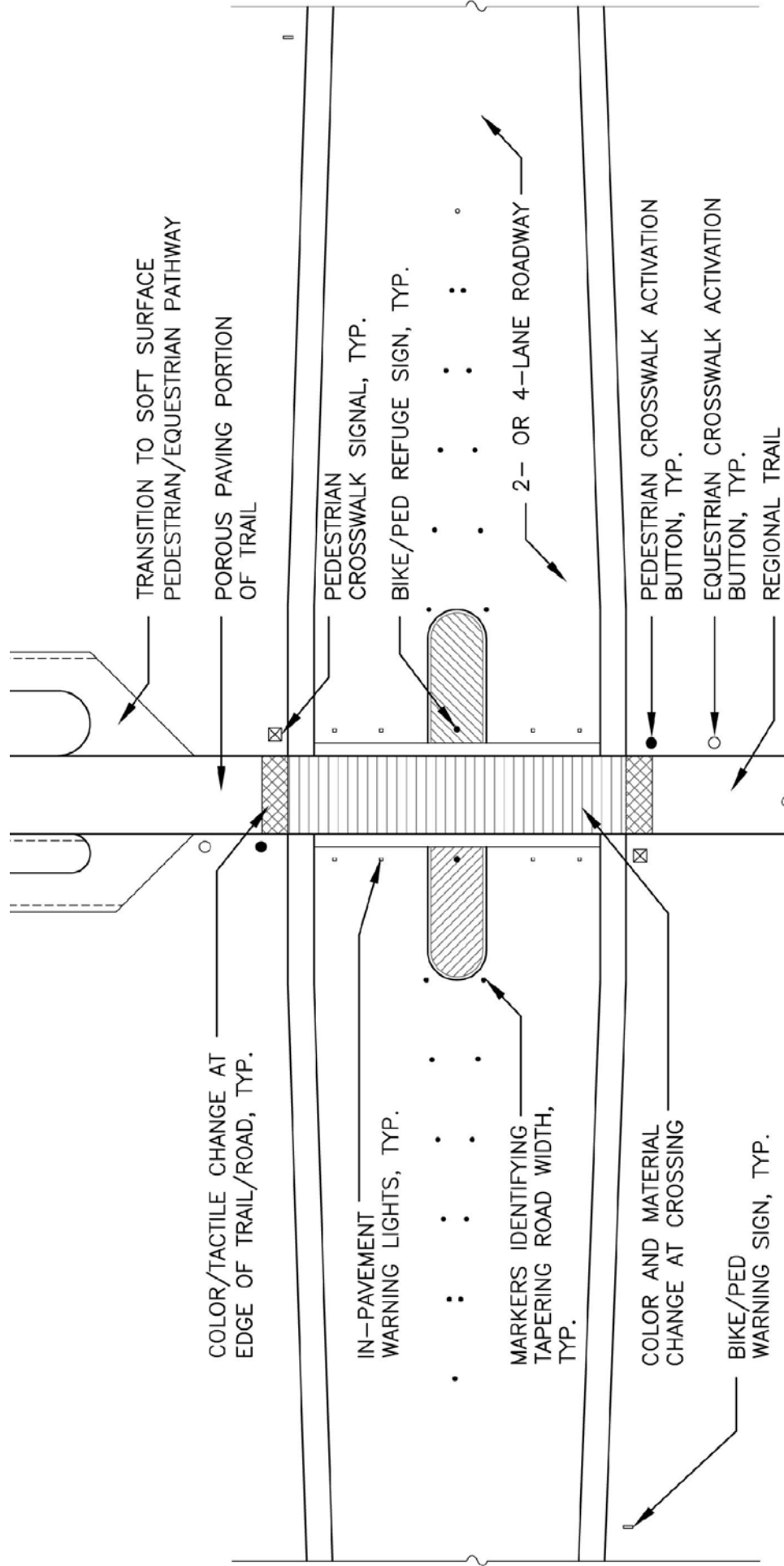
Regional trails will intersect in some places with busy streets. Proper design will allow for safe street crossings for trail users. Crossing design treatments can also give drivers a visual warning to slow and stop for trail users. Figure I-6 is a standard design detail for street crossings that warrant signalization.

Street Crossing (Major Arterial)

The design for crossing street that require signalization should provide a visual cue to slow or stop for both trail users and drivers. The intersection location should be based on AASHTO and WSDOT requirements for sight and stopping distance and other applicable design requirements. As the trail reaches the street the trail material should change or be marked to denote the street crossing. The design includes a pedestrian crosswalk signal that provides light controlled access to safely cross the street. The crossing features in-pavement warning lights and contrasting colors and material. The center of the street features a pedestrian refuge, while also narrowing the street to slow traffic. Streets that do not warrant signals should have similar crossing treatments without the electrical requirements.

³ "Local Agency Guidelines" WSDOT, Highways and Local Programs, April 2009, Chapter 25 "Right-of-Way Procedures".

Figure I-6: Road Crossing (Major Arterial), scale 1/2" = 1'



NOTE: BIKE/PED REFUGE LAYOUT AND STRIPING TO BE DESIGNED PER THE MANUAL ON TRAFFIC CONTROL DEVICES & THE GUIDE FOR THE DEVELOPMENT OF BICYCLE FACILITIES

Private Crossing (Driveways and Private Roads)

Unlike public roads and intersections, a private driveway or private road that crosses the trail presents a number of different issues. Because a private trail crossing can create a danger to trail users as well as drivers, these crossings should be avoided. However, when a private crossing can not be avoided the following need to be explored:

- Both trail users and vehicles must be warned of the potential danger by control signs that are conspicuously posted and maintained⁴;
- Trail pavement at the crossing must withstand existing and new vehicle traffic that will be crossing the trail by placing limits to the weight of the vehicles that will cross or through engineering the crossing to accommodate the expected loads; and
- The proposed crossing must not create a violation of the County's property interest in the trail, or violate any existing easements.

TRAIL AMENITIES

Trail amenities encourage trail use by providing an experience that is safe, comfortable, and convenient. Amenities should be accessible to all users and placed in safe, visible, and convenient locations and be vandal resistant. There are a variety of products and designs, made with different materials, all at different price ranges. However, it is important to balance the up-front costs of trail amenities with long-term maintenance needs. That is, some products or materials may be more expensive than others, but will last longer, and require less maintenance saving money in the long-run. Trail amenities should also have a consistent design throughout individual trail corridors. Sign design, lighting, and even benches should all have similar colors, materials, and overall design theme to evoke a nearby or notable local element such as Puget Sound and Mt. Rainier. This section provides a description of several trail amenities, including specific design guidelines and examples

⁴ RCW 4.24.210(4)

Benches

Benches provide people of all ages and abilities a place to sit and rest along the trail. When designing or purchasing a bench, consider user comfort, simplicity of form and detail, ease of maintenance, durability of finish, and resistance to vandalism. Above all else, benches should accommodate all users and should include back rests and arms. Typically, a bench's seat is located between 16" and 18" above the ground, with handrails at the end between 6" and 12" above the seat. The depth of the seat ranges from 18" to 20". Usually a width of 24" to 30" is allotted per person. Benches and other furniture should be placed away from pedestrian and bicycle circulation paths, at least 3' from the trail edge, to allow adequate room for people's outstretched legs. There must be a clear level space where a person using a wheelchair can rest adjacent to seated people. This area must be at least 30" by 48" and should be located adjacent to the benches. Benches must be positioned on an accessible surface with an accessible walk to the seating area.



Existing bench example



Accessible bench.



*Metal vertical slats bench
Source: Barco Products*

Bollards

Bollards are short, vertical posts that are used to obstruct, control and/or direct vehicle traffic from trail traffic. Bollards can be located at trailheads to limit public vehicle traffic, and can be designed to be removable if needed. Bollards should only be used if operational problems demand them; for instance, if there is a need to indicate that a particular part of the trail is open only to non-motorized users. Bollards can be internally illuminated and should be well marked and visible during day and night. Where it is considered safe to do so, only one centrally located bollard that can be removed should be used. Alternatively a split entry way for the last 10' to 30' before the intersection into two 5' sections, approximately 5' apart can be used with low landscaping separating the pathways⁵.



Removable bollard Source: TrafficGuard™



Lighted bollard (solar powered)
Source: Buy Green Energy



Split entry way Springwater Corridor,
Oregon, Source: GoogleEarth™

⁵ Chapter 4: Bikeway and Walkway Planning and Design Guidelines, FHWA.

Tables

Tables should be provided at critical points along the pathways, especially at trailheads. The table should be made of durable materials, such as vinyl coated, expanded metal or concrete which require minimal maintenance. They should be secured to a paved, accessible surface so they are universally accessible. Tables design can be a traditional rectangle to slightly octagonal. The height of the bench should be about 18" to 20" high with the table top at 30" high. The paved surface below the table should not have a slope greater than 2% in any direction and have an accessible path to the trail.



Existing table example



46" ADA accessible octagonal table

Source: Wabash Valley



ADA accessible pedestal table

Source: Wabash Valley

Bike Racks

Bicycle racks allow recreational users to safely park their bikes if they wish to stop along the way or have arrived at a destination. Three criteria should be considered when choosing bike racks for a multi-use trail: location, type of rack, and bike dimensions. Bike racks should be located at trailheads, parking areas, commercial uses and as close as possible to destinations without interfering with traffic flow; this includes the space needed for a locked bicycle. The stationary u-shaped rack and post rack are the most common and the most affordable option. These devices allow cyclists to lock both the wheels and the frame as well as move bicycles into and out of the racks with minimal effort and damage. Racks also prevent users from locking to undesirable locations such as light poles or benches. The location of a rack should be well lit and visible to prevent theft, and be protected from the elements with a roof if possible.



Existing 'U-shaped' bike rack



*Ribbon bike rack
Source: Barco Products*



*Post-style bike rack
Source: Barco Products*

Fencing

Fencing is used to protect users from potential hazards such as steep slopes or restrict access to and from the trail. The style of fence should reflect the character of the site in addition to functioning as a barrier. Coated, black or forest green chain-link is less visually impacting, while wood gives the impression of a more natural setting. Often, fencing can be as low as 4' and still be effective while being less visually obtrusive. Materials should be chosen for their durability as well as design. A wooden fence will require more maintenance than a metal or composite material. Poorly maintained fencing promotes a negative image and should be avoided. Landscaping should be considered to soften the appearance of fencing at trailheads and along trails.



Existing fencing



*Black coated chain-link fencing
Source: Precision Vinyl System*



Green coated chain-link fencing

Drinking Fountains

Drinking fountains provide water for people and pets. Fountains should be installed near restrooms to get the most out of utility access. The design of drinking fountains should incorporate the needs of all potential users. Spigot heights should be 42" and 36" above the ground for ADA access. To accommodate all needs, provide both standard and accessible-height spigots and install steps to the side of the standard spout to accommodate children. An additional spigot at the base allows people to fill water bottles and basins for uses other than drinking. As with any outdoor public amenity, durability is important. The best materials are treated steel and precast concrete. Fountains can also be integrated with buildings to help with winterization.



Existing water fountain



Accessible drinking fountain



*Multi-spigot drinking fountain
with pet fountain*

Ramps & Handrails

An accessible trail gradient should not exceed 5%. If it does, it will be necessary to provide a ramp to accommodate all users. Although Uniform Federal Accessibility Standards requires a maximum ramp grade of 8%, a 6% maximum is strongly recommended. Ramps should have a level landing for every 30" of vertical rise, and must have a hard, slip-resistant surface. Design should include a minimum width of 44" with 32" high hand railings on all ramps. Edges should be protected with 6" tall curbs.



Existing ramp along trail



Ramp and handrail
Source: City of Manhattan, KS



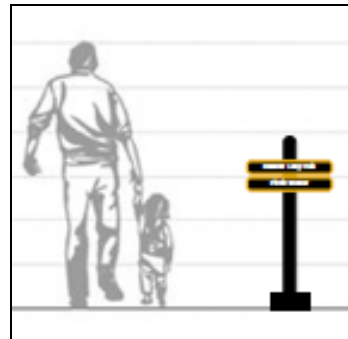
Boardwalk ramp Source:
Alaska Travel Gram

Directional Signage

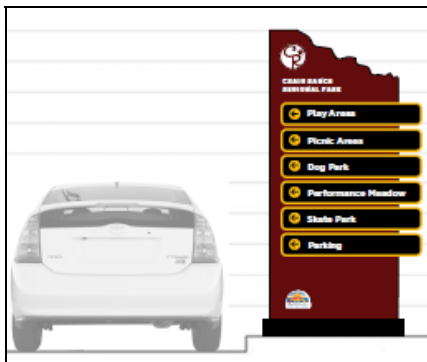
Directional and way-finding signs help users find their way to trailheads, destinations and trail amenities. Signs should provide important safety and location information including intersection warnings, trail and user restrictions and other right-of-way information, mileage and proximity to other destinations along the trail. These signs should have a consistent design theme as they will be placed throughout the trail system. The design should also be chosen based on long term maintenance needs, and have a design theme consistent with other trail amenities. Sign text should be easy to read with contrasting colors and universal symbols to indicate the direction of important amenities. When choosing materials and design, graffiti removal and vandalism control should be a key consideration. The location for directional signs should be based on an analysis of circulation routes and decision points, or trail intersections and turnouts. Sign installation should meet ADA design guidelines including a 42" minimum space between other protruding objects. Signage located at crossings with motorized roadways should comply with AASHTO and MUTCD guidelines.



Existing Adam Tallman Trail sign.



Pedestrian directional signage



Vehicle directional signage

Curb Stops

Trailhead and parking areas should have minimum development, yet some control for vehicular roads and parking. Where possible for a more sustainable design, delineation of these edges and parking separation should be accomplished to allow water to drain into natural water quality systems and not storm pipes systems. To assist with this design concept, curb stops can be used to control vehicular movement yet allow water to surface drain through the area. The material for the curb stops are premade units of recycled rubber/plastic or concrete and can be colored to add to their visibility. The curb stops are usually secured to the pavement with rods and adhesives.



Open curb stop



Existing curb stop



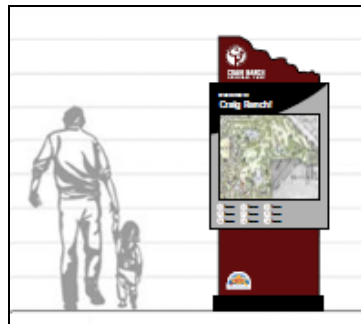
Curb stop

Informational Signage

Informational signage can provide users with objective information about trails, such as trail symbols, trail length, trail direction, GPS coordinates, trail rules, trail surface type and accessibility. Information about trail conditions can help users determine whether the trail meets their own needs and abilities. In cases where more extensive trail information is provided such as maps, the history of the area, or environmental information, a profile of the trail's grade and surface should also be included so that users can identify accessible trail segments. The design of signage should be chosen based on long term maintenance needs, and have a design theme consistent with other trail amenities and signs. When choosing materials and design, graffiti removal and vandalism control should be a key consideration. Like directional signs, informational signage must meet the most current ADA design guidelines including a 42" minimum space between other protruding objects.



Existing informational signage



Pedestrian informational signage



Example of informational trailhead kiosk

Restrooms

Restroom design and amenities vary depending on local ordinance standards and accessibility codes. The number of stalls required will also vary depending on the predicted number of trail users. These and other requirements should be considered during the early stages of design. Full-service restrooms that include running water and flushing toilets must be located near existing utilities. If existing utilities are inconveniently located, restroom design should include portable toilets with holding, septic or composting tanks. Standard toilet facilities for a single stall require a minimum of 3' by 9 ½' with a sink and 3' by 8' without a sink. Wheelchair-accessible single-stall toilets require a minimum of 5' by 10' with a sink and 5' by 8' without a sink.



Existing restroom



Public restroom

Source: Natchez Trace Parkway



Public restroom

Source: Lake Forest, CA

Trash/Recycling Receptacles

Although the County's preferred policy is "pack it in and pack it out" with regards to trash, providing trash and recycling receptacles near other trail amenities such as benches, restrooms, water fountains, and bike racks, helps keep the trail clean and discourages littering. Interpretive signage should encourage the use of trash and recycling bins. Trash cans require a 30" to 48" clear space, with ADA accessible lids and an opening height of 15" to 36". Lids must be hinged, and tamper resistant. Removable tops should be lockable.



Existing trash receptacle



Garbage & Recycling
Source: MegaBin™



Solar Trash Compactor Source: BigBelly

Lighting

Lights provide visibility at night and safety for trail users. Lights should be installed at trailheads and major road crossings or activity areas. The design and material of lighting should be consistent with the design of other site amenities, and be scaled for pedestrian users. Lighting levels should comply with local ordinances, and should have cut-offs to shield light from adjacent properties. Solar-powered lighting is a good option that is ultimately less expensive to operate. As with other site amenities, lighting should be tamper resistant and be made to withstand vandalism.



Existing lamp at Foothills Trail



Pedestrian scale LED Lamp
Source: Stresscrete Group



Solar pedestrian scale light
Source: Sol Systems

Pin-pile Boardwalk and Bridge

In some cases trails may have to go through sensitive environmental areas. At these sites boardwalks or bridges should be used to minimize or eliminate any environmental impacts which also reduce or eliminate permitting and mitigation requirements. There are a few foundation systems that can accomplish this goal. The primary one used is called a “pin pile” foundation, which is a local county product and adds to a project’s sustainability goals. To minimize the impact of such systems a surface hub is secured to the ground through the use of several pipe piles that are hammered into the ground without any excavation or disturbance of the surface soil. The top of the hub becomes the base to attach structural posts and then the rest of the structural membrane is assembled to create the boardwalk or bridge. After the structure has been built a sustainable decking material, kick rail and railing as necessary can be added to complete the structure. Railings are needed if the drop off at the edge of the deck is over 30” to the surface below. The railing should be a barrier style with no openings greater than 4” in diameter and a minimum height of 42”.



Existing bridge



Pin-pile boardwalk



Tualatin Greenway Pin-pile boardwalk