

# B. Gardner Trail System Design Guidelines

## Introduction

The City of Gardner recognizes the importance of multi-use or shared-use pathways for their recreational value and as an alternative mode of transportation to the motor vehicle. In response, this document's purpose is to define the design criteria and level of expectations for the City of Gardner's Greenway Trail System. Although appropriate variances from the criteria stated in this document may be considered, future developers should use this document as a tool to meet the design expectations of the City.

These guidelines shall apply to all trail systems initiated by individual land developers as well as greenway trail systems indicated in the City of Gardner's planning documents.

## GOALS

The design guidelines stated below are a product of the functional and aesthetic goals established for the trail system. Trail design decisions should be based on the following goals:

- Provide a safe and functional environment for pedestrians, bicyclists, and other non-motorized modes of travel
- Establish a consistent trail design for the City both in appearance and in long-term maintenance
- Enhance the image of the adjacent neighborhoods and roadway
- Preserve the existing features, such as existing plant material and rock outcroppings, to reflect the inherent natural environment
- Identify and protect environmentally sensitive areas for the future
- Use simple, classical furnishings made of durable materials to insure a long lifetime of use.

## Reference Design Standards

The Gardner Parks and Recreation Department directs the planning, construction and maintenance of all the off-street trail system, in conjunction with other City departments. Off-street trails provide recreational opportunities and supplement the transportation opportunities in the City's roadway framework. Gardner's trails are multi-purpose trails serving a variety of trail users.

Trails should conform to the most recent publications of:

- Americans with Disabilities Act (ADA): Proposed ADA Guidelines for Outdoor Developed Areas. <http://www.access-board.gov/outdoor/nprm/>
- American Association of State Highway and Transportation Officials (AASHTO) Guide for the Development of Bicycle Facilities. AASHTO guidelines are typically the requirements of federally funded trail projects. <http://www.transportation.org/>
- American Public Works Association Bicycle Guidelines. <http://www.apwa.net/>

and other pertinent information as may be required by the City Engineer and Parks and Recreation Administrator in completing a review of the proposed improvements.

## Construction Drawings and Details

Construction drawings for all trail construction shall be submitted to and approved by the City Engineer and Parks and Recreation Administrator prior to construction work on any trail segment. Drawings shall be prepared by a registered professional engineer or landscape architect and shall clearly show horizontal alignment, proposed grades, storm drainage facilities, pavement details, retaining walls, railings, signs, site amenities, plantings,

# General Path Requirements

## Trail Hierarchy

**REGIONAL TRAILS** – The Johnson County system of streamway parks such as Kill Creek and Bull Creek.

**CITY TRAILS** – City greenways, and trail routes which connect the County’s regional parks and greenways through the City of Gardner. Example: Gardner Greenway Trail

**NEIGHBORHOOD TRAILS** – recreational loops through a neighborhood or neighborhood connections to the City or regional system

## Trail Location Criteria

The placement of off-street trails is dictated by undeveloped parcels, drainage and utility corridors or open space, City ownership or maintenance responsibility and connectivity to existing trails or public facilities such as parks, schools, libraries and community centers. (See Potential Future Trail Locations map page 55)

The Potential Future Trail Locations map generally depicts the preferred side of the road where future trails should be placed when located parallel to collector and arterial roadways. This location factors into consideration the planned land uses, topography and potential connections to other park elements, schools and community amenities. Final determination will be made with the development of construction plans.

Trails should be located to avoid crossing streets at-grade where possible. Trails should also be placed to avoid frequent or diagonal street crossings. Where trails do cross streets at grade, provide adequate sight distance for trail users. Taking into consideration AASHTO’s calculated stopping distance of 127 feet for a bicyclist on wet pavement, the trail intersection sight distance should be a minimum 130 feet.

When planning future arterials and collectors that cross drainage-ways, the roadway’s vertical design should include enough clearance for a separated grade trail crossing. If a separated grade crossing is not possible, provide ample median width to serve as a refuge island for trail users.

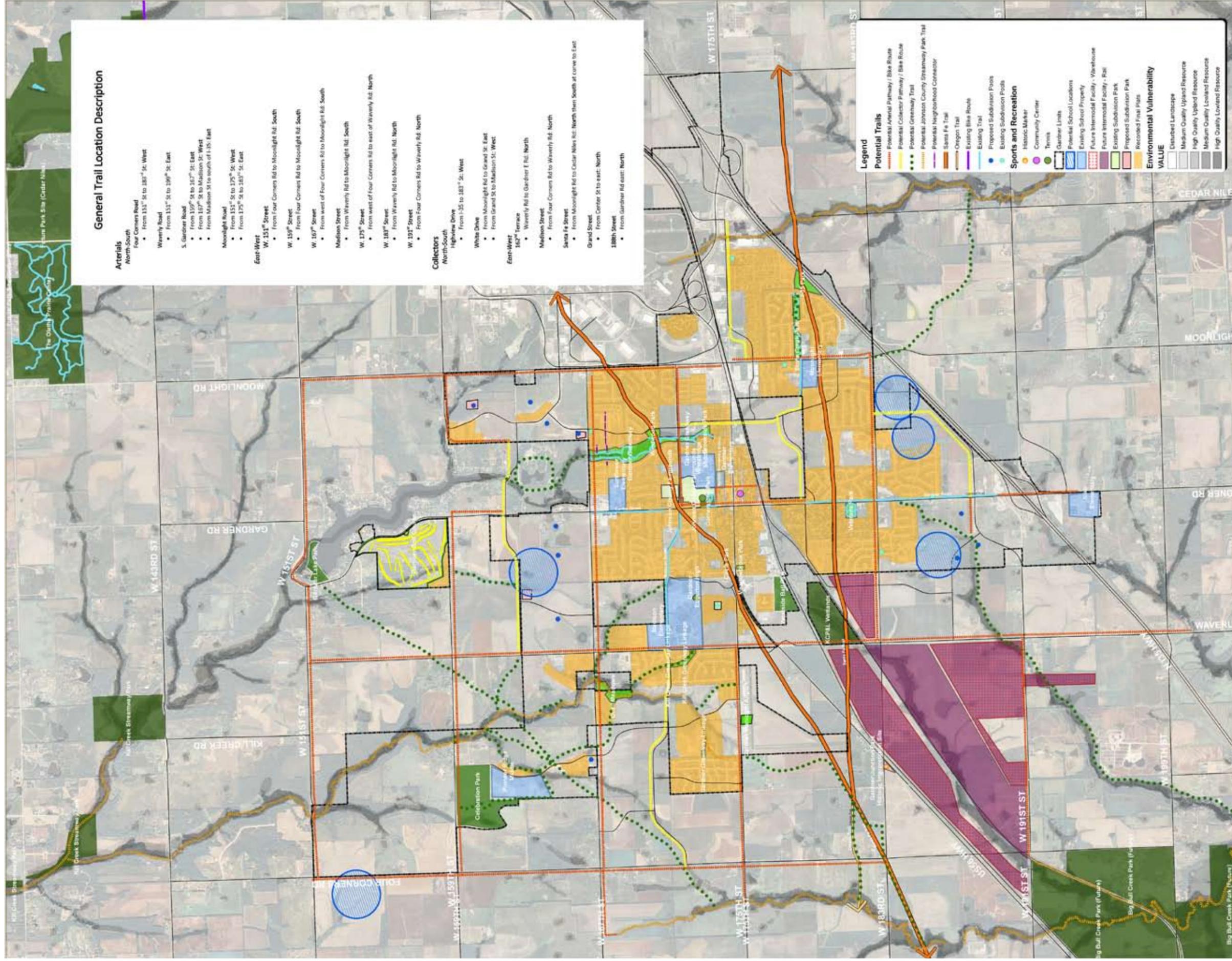
In residential areas when trail conflict points (driveways, intersections, alleys) exceed 12 per mile, consider placing the trail elsewhere. In commercial areas, consider re-routing the trails when conflict points exceed 6 per mile. Avoid areas where a trail may cross the driveway of a major retail center.

## **Trail Access Points**

Certain instances may occur where the trail might follow along a drainage-way or between rows of housing, breaking the visual connection between the trail and public streets. Although the sense of seclusion may add to the experience of the trail user, it also restricts the user's ability to access or depart from the trail. Therefore, it is necessary that access points are provided regularly allowing the user to leave the trail quickly if desired. The frequency for access points to a public road where the trail runs through a residential area is one access for every 600 linear feet of trail. For natural wooded areas, such as drainage-ways, access points will be provided every ½ mile (2640 linear feet) of trail.



This page intentionally left blank



Potential Future Trail Locations  
 Gardner Park System Master Plan - 2009 Update

This page intentionally left blank

## Trail Design

Most shared use paths operate with two-way traffic because users will often use one-way paths as two-way unless effective measures are taken to limit the use to one-way. This guide recommends no paths are designed for one-way only traffic.

AASHTO (1999) recommends 10 feet as the optimal width of a two-way shared-use path (under the most common circumstances). The width can be reduced to 8 feet if bicycle traffic is expected to be low, pedestrian use is occasional and the horizontal and vertical design of the trail offers conditions in which users may safely pass one another.

### Cross Slope

Paths should be constructed with a maximum cross slope of 2% as required by ADA. This cross slope direction should match the slope direction of the hillside to prevent ponding of water.

### Clear Zone

Obstructions, defined as physical elements from ground level to 8'-0" in height, can be dangerous to trail users. These include, but are not limited to: benches, trash receptacles, light standards, tree branches and utility structures.

AASHTO recommends a 3 foot (2 foot minimum) clear zone from the edge of the trail to obstructions on each side. The clear zone should have a maximum grade of 6:1 (16.67%) outside of the nominal trail surface and shoulder widths. Within this recommended 16 foot clear zone width, vertical clearance should be maintained at a minimum height of 10 feet.

### Shoulders

Trail shoulders, provided as a part of the clear zone, shall have a minimum width of 2 feet with a recommended slope of 50:1 (2%).

In locations where the trail runs parallel to steep slopes, wider shoulder widths (minimum 5 feet, but wider widths are desirable) are necessary. Depending on the height of the adjacent embankment and the condition at

the bottom, dense shrubbery, a guardrail or a fence may need to be installed.

At culvert crossings, shoulders shall extend 4 feet from the edge of trail. A culvert's end section shall not daylight within this 4 foot shoulder. Dense shrubbery, a guardrail or a fence must be installed within an area between the 2 foot minimum clear zone and the top of the culvert end.

## Design Speed

AASHTO recommends a design speed of 20 mph for paved multi-use paths. Most bicycles can travel at higher speeds, but given the mix of users on the trail, those higher speeds are inappropriate. Bicyclists who wish to travel at faster speeds will be encouraged to use on-street facilities. Lower design speeds should not be selected as they may decrease safety for bicyclists.

## Horizontal

A meandering trail is more inviting to the user and enhances the overall experience. Trails within the Gardner system should meander unless the site conditions do not allow enough room to safely curve the path according to AASHTO standards.

The minimum centerline horizontal curve radius AASHTO recommends based on the design speed of 20 mph is 90 feet. This minimum curvature applies where the cross slope of the path is 2% and the assumed lean angle of the bicyclist is 20 degrees. At trail intersections and access ramps, the minimum recommended radius is 20 feet to accommodate maintenance vehicles.

## Stopping Sight Distance

The safety of all users depends on the ability to see and avoid possible collisions with either obstructions or other users. AASHTO sets forth minimum site distances for consideration in trail design and should be referenced for multi-use path design in Gardner.

In areas where a trail's stopping sight distance doesn't meet AASHTO standards, signage in accordance with the MUTCD shall be provided to warn of the stop ahead.

## Vertical

Steep grades can encourage quick descents and difficult climbs for an average user. It is important to note that there are different maximum slope requirements between the two sets of guidelines, ADA and AASHTO, with ADA being the more confining (and more universally accessible) of the two. Trail construction funding and City code requirements often dictate which standard is to be used and where.

## Pavement and Surfacing

The surface material for the trail shall be 4 inch thick BM2 asphaltic concrete and conform to requirements for mix designation BM-2 of the Standard Kansas Specifications (1973 Edition). This layer of asphalt is to be supported by a 6" layer of compacted AB3 over compacted subgrade at 95% of Standard Maximum Density – ASTM D692. Compacted subgrade and base material is to extend 1 foot beyond the edge of trail on both sides.

The trail may be constructed of Portland cement concrete at the City's discretion. In this case, the surface material for the

trail shall be 4 inch thick ASTM C150,  
Type II concrete with a 4000 psi 28 day  
compressive strength over a 4 inch compacted  
CA5 base and subgrade compacted at  
95% of Standard Maximum Density.

Saw-cut joints are preferred over tooled joints.

This page intentionally left blank

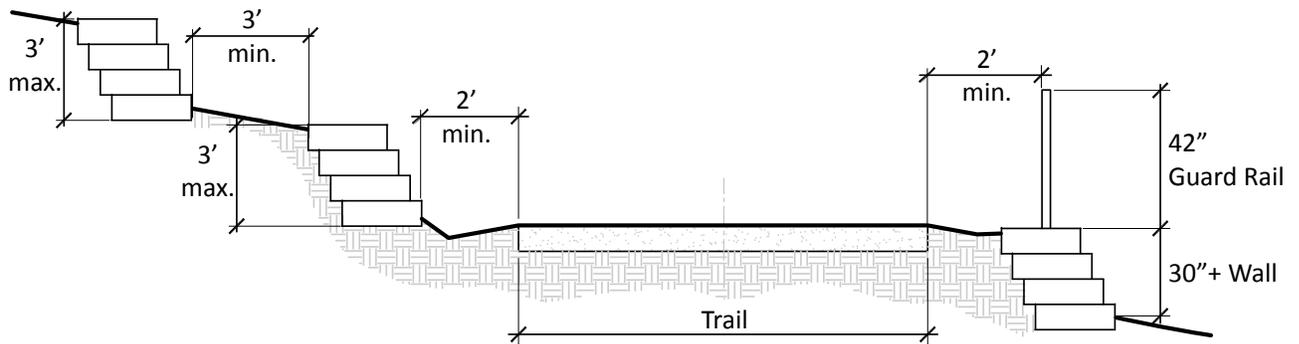


Figure B-1.  
Retaining  
Walls and  
Railings

## Important Trail Considerations

### Retaining Walls and Railings

The maximum slope allowed for areas adjacent to a trail's clear zone is 3:1. Steeper slopes within the trail easement are prohibited. However, certain situations may arise where this cross slope adjacent to the path exceeds a 3:1 rate. In order to create an area suitable for placement of the trail surface and to insure the stability of the hillside, a retaining wall may be required. The following are recommended systems of retaining walls for the trails system.

Flat-stacking limestone boulders enhance the natural image of the trail and therefore are the recommended materials for the implementation of retaining walls within the trail system corridor. Use of other materials, such as modular concrete blocks, shall be reviewed by the City engineer for approval on a case by case basis.

At any point where the trail is on the elevated side of a retaining wall that exceeds 30", a

42" railing is required

(unless otherwise

stated by AASHTO). Rails shall be made of 2" round tubular steel and finished with red oxide primer (dip coat) and black enamel paint (dip coat). All weld spots are to be wire-brushed, re-primed and painted.

Where retaining walls with a height greater than 36" are necessary to allow implementation of the trail system, the recommended alternative shall be to step back a second retaining wall behind the first so that no one segment of retaining wall is more than 36" in height. The higher retaining wall section shall be setback a minimum of 36" behind the lower section. The purpose of this requirement is to avoid excessive and dangerous vertical drops as well as improve the visual character of the walls.

### Drainage

Concentrated flows across the trail surface are prohibited. All concentrated flows shall be collected and piped under the trail surface. Sheet flow across the trail surface is generally acceptable; however, all stormwater management systems will

be reviewed and addressed by the City engineer during the plan review process.

In areas where culverts are used to convey water under the trail, pipes shall be extended a minimum 4 feet from the edge of the trail, both sides, before daylighting.

## Structures

### *Bridge Crossings*

Bridges are required over water ways or other terrain that would disrupt trail traffic. Many factors should be considered when choosing the location of a bridge including:

- The required span of the bridge
- Soil suitability for foundations
- Vertical clearance from flooding
- Accessibility for construction and emergency services vehicles
- Aesthetic value

Guidelines for bridge crossings include the following:

- Bridges shall measure a minimum 12 feet clear, inside rail to inside rail and be designed with a vehicle load rating of 15,000 pounds to accommodate maintenance and emergency vehicles
- The bottom of the bridge structure shall be at minimum above the 25-year flood event elevation
- Guard rails with a 42" height must be provided on both sides of the bridge.
- Deck and railings shall be wood members whenever possible. All steel members used in the bridge shall be painted black in color, or be provided in a weathered steel finish.
- All bridges must be reviewed and approved by the City of Gardner.

### *Below Grade Crossings*

Instances may occur due to heavily traveled streets or grade problems that trail crossings of roads or railroad tracks would best be accomplished by means of a below grade crossing.

Below grade crossings have a recommended clearance height of 10 feet per AASHTO, but may meet instead a required minimum clearance height of 8 feet. If the recommended AASHTO clearance height cannot be achieved, signs should be posted alerting trail users of the constructed clearance height. A lighting level of 5 foot candles is required through a below grade crossing. Entrances and curves within a below grade crossing require 10 foot candles. A uniform ratio of 4:1 shall be applied for the lighting design.

Dedicated pedestrian tunnels (example: box culverts) are the preferred method of below grade crossing. The width of a pedestrian tunnel should be at least as wide as the path it is accommodating. Additional width for shoulders/clear zone is recommended.

To direct base drainage flows, and reduce ice and algae formation that may occur in a box culvert, a 6 inch wide by 2 inch deep gutter shall be provided at the low edge of the path. Drainage gutters should slope at a minimum 1% and direct water off of the trail.

Where dedicated pedestrian tunnels cannot be provided, existing storm water box culverts are viable alternatives. Other forms will be considered by the City on a "per project" basis. Existing box culverts can possibly be used when a portion of the bottom of a culvert can be raised to keep daily flows off of the trail. Although these

facilities will generally be unusable during storm events, they will be useable when the storm water flows have receded.

In instances where new roadway overpasses are constructed crossing drainage corridors, the overall length can be extended to accommodate a below-grade trail crossing that follows an earthen bench under the roadway bridge structure.

The tread surface of any below grade crossing shall conform to the surfacing and materials standards previously stated within these design guidelines.

Appropriate warning signs for flood potential, if applicable, should be posted before these crossings.

## **Intersections**

Careful attention must be given when the trail system intersects vehicular traffic corridors. Appropriate identifications and provisions to both the trail user and the motorist can prevent tragic accidents.

These general provisions include:

- Intersections between the trail and streets will intersect at an angle from 70 to 90 degrees.
- Semi-level areas sloped no greater than 2% in any direction, shall be provided for a minimum distance of 10 feet from the back of curb for the full width of the path.
- Minimum sight distances within the trail and at street intersections must be maintained.
- Handicap ramps must be provided at every intersection where the street is curbed.

## ***Site Triangles***

In addition, a sight triangle must be provided at all intersections. The term sight triangle signifies the area void of any obstacles that would obstruct the vision of either the trail user or the motorist. The perimeter of the triangle begins at the intersection of the outside edge of the path and the back of curb and extends a minimum distance of 10 feet perpendicular and 275 feet parallel to the street. The height of this triangle begins 2 feet above finish grade and extends to 8 feet above finish grade. A sight triangle is required on both sides of the path.

## ***Handicap Ramps***

The Gardner trail system shall provide handicap ramps at any point where the path intersects a street curb. Concrete for handicap ramps shall be 4000 psi minimum acceptable 28-day compressive strength (AE). Curb ramps shall be constructed in accordance with ADA guidelines.

## ***Crosswalks***

Crosswalks will be provided where trail and street intersect. Crosswalks will also be provided at street intersections to provide access to the trail for surrounding neighborhoods. Crosswalks will be signalized at the City's discretion.

## ***Required Signs at Intersections***

Where trails and greenways intersect streets and roads, access control and informational signage will be provided as described in the following section "Signing".

## Signing

Signs are a vital element in any trail system. By regulating the use of the trail and warning users of potential dangers, the trail is safer and more enjoyable for all users.

The following materials requirements apply to all sign installations:

- All concrete footings shall be 3000 psi minimum acceptable 28-day compressive strength, (AE)
- Finishes for all steel members shall be red oxide primer (dip coat) and black enamel paint (dip coat). All weld spots to be wire brushed, reprimed and painted.
- All signs shall be screen printed on 3/16" aluminum panels (Alloy 6061-T6).
- All sign provision types and locations not specified in this guideline manual shall conform to the regulatory standards set forth by AASHTO as appropriate.

The signs proposed for Gardner trails can be divided into three types: rules, informational, and regulatory/warning signs.

### Rules Signs

The role of a rules sign is to inform the users of the trail expectations creating a more suitable recreational environment. Rules signs are typically provided at trailhead locations.

Below is a list of recommended rules for the trail system:

- Bicyclists and inline skaters must yield to pedestrians.
- Bicyclists and inline skaters should alert pedestrians when passing.

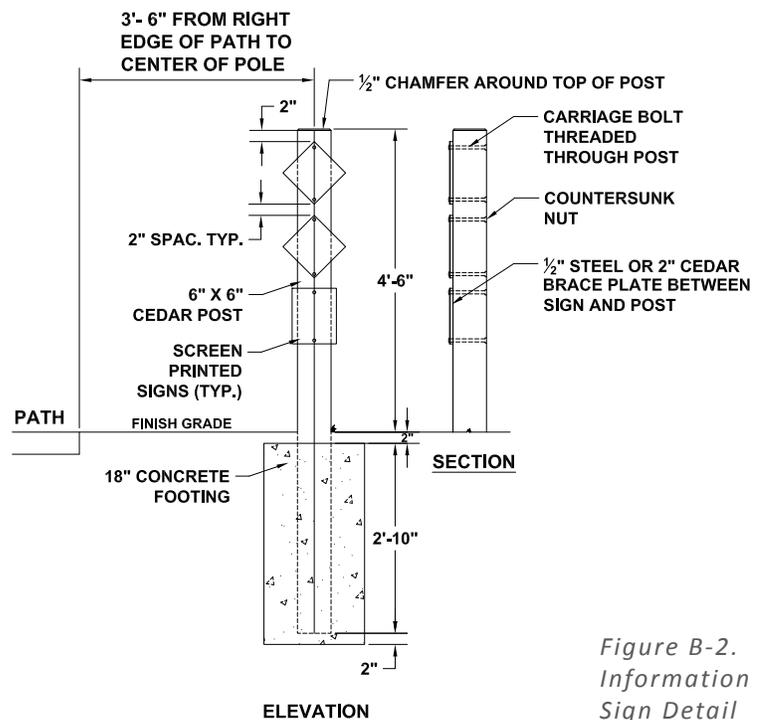


Figure B-2.  
Information  
Sign Detail

- Alcoholic beverages are prohibited.
- All motorized vehicles and horses are prohibited
- All pets must be leashed.
- Show pride in our trails. Report any cases of vandalism or littering to the police.

### Informational Signs

All signing shall follow the standards set forth in the Manual of Uniform Traffic Control Devices (MUTCD).

“No Motorized Vehicles” (MUTCD R5-3) signs shall be provided at all at-grade intersections between trails and roadways. These will be affixed to the opposite side of the post as the trail user’s “stop” sign, and provided in the same dimensional size as the stop sign.

Informational signs will be mounted together on a 6” square cedar post where the trail

intersects a collector or residential street. However, no more than one information sign per ¼ mile is required. The posts shall be installed outside of the clear zone at the edge and perpendicular to the centerline of the trail. A cedar block or steel plate matching the dimensions of the signs will be installed between the sign and post to prevent vandalism.

### **Regulatory/Warning Signs**

Due to the nature of the information displayed on the regulatory and warning signs, only one sign shall be affixed to each 2" square tubular steel pole. These signs shall be installed outside of the required clear zone to the right of the right edge of the path and perpendicular to the trail centerline. Each regulatory and warning sign shall have a minimum sight distance as set by AASHTO to allow adequate time for the bicyclist to respond to the situation.

In addition, roadside signs warning motorists of pedestrian and bicycle crossings should be placed adequately to insure the safety

of the trail users. The location of these warning signs should be determined by the City Engineer based on vehicular traffic speed and street characteristics.

### **Painted Trail Markings**

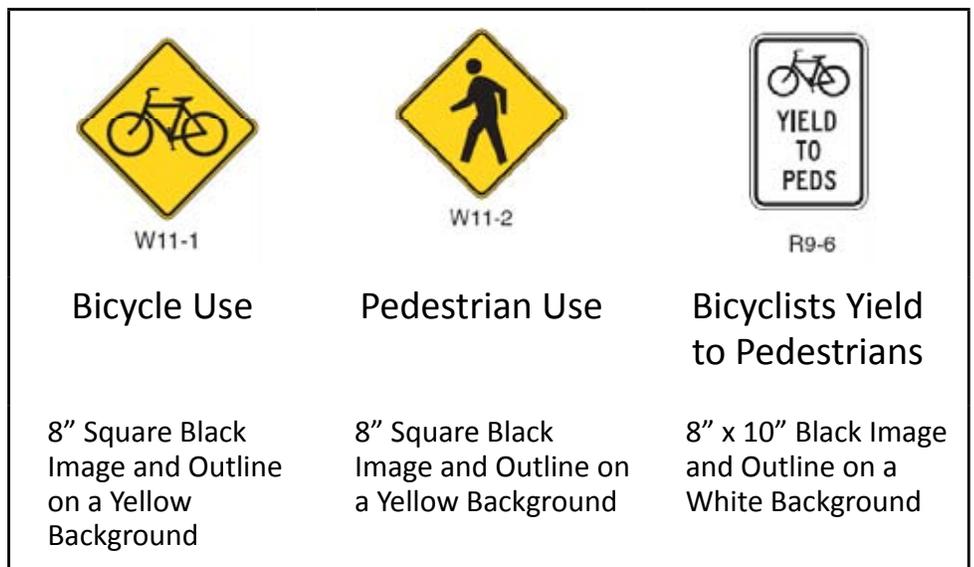
No permanent painted trail markings will be allowed to take the place of trail signage. Only signs mounted on posts will be considered for fulfillment of signage requirements.

### **Trail Furnishings**

General notes:

- all concrete for site amenity footings and slabs shall be 3000 psi minimum acceptable 28-day compressive strength, (AE);
- Finishes for all steel members shall be red oxide primer (dip coat) and black enamel paint (dip coat). All weld spots to be wire brushed, re-primed, and painted.

*Figure B-3.  
Example  
informational  
signs to be used.  
MUTCD sign  
format*



## Benches

Seating along the trail encourages a variety of users by offering points of rest. When locating benches, it is important to consider the amount of shade, the quality of views from the bench, and seasonal breezes.

The minimum quantity of benches provided shall be based on one bench for every  $\frac{1}{4}$  to  $\frac{1}{2}$  linear mile of trail to be determined by City Parks and Recreation staff. To avoid being a hazardous obstacle, the bench shall be located 5 to 10 feet from the path. Typically, areas around benches are subject to standing water, so it is necessary to provide a concrete pad that extends 2 feet beyond the perimeter of the bench and 5 feet beyond the perimeter of the bench on the end designated by the City to accommodate a trash receptacle; City to determine which end in the field. The concrete slab must be constructed with a continuation of the trail cross slope to insure proper surface drainage. A 4 inch pad of concrete with a 4 inch compacted base of CA5; or a 4 inch asphalt pad with a 6 inch compacted AB3 base over compacted subgrade shall be laid from the bench's concrete slab to the trail providing a suitable surface for users to access the benches.

City staff should consider the comfort, life-cycle costs, durability and simplicity of form and detail when selecting a bench style for the trail system.

## Irrigation

Irrigation is not required in the Trail System Corridor. If a developer desires to install an irrigation system within the Trail System Corridor adjacent to their

development, the following guidelines must be kept to protect the trail system.

- Spray heads shall be positioned in a manner that minimizes the possibility of over-spray coming into contact with the trail avoiding hazardous conditions for the bicyclist.
- Any irrigation equipment, excluding "pop-up" spray heads, that would be regarded as a hazardous obstruction is prohibited.

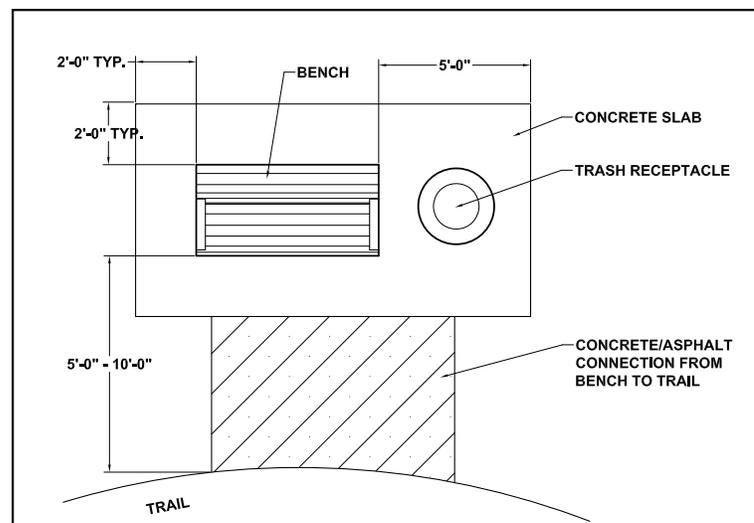


Figure B-4.  
Bench Layout Plan

## Bollards

In areas where trail access by motorized vehicles is a concern, the city may deem it necessary to locate bollards at the end of the trail segment where it intersects the street. The bollards shall be placed on each edge and directly in the center of the trail, 10 feet perpendicular from the back of curb. The center bollard shall be removable and all 3 bollards (if 3 are deemed necessary by City staff) shall be marked with a 3 inch reflective stripe 6 inches from the top of the bollards to make them visible at night.

## Environmental Conservation

Multi-use paths are often built along streamways and in other environmentally sensitive areas. A 50 foot buffer (10 foot minimum) should be maintained between a multi-use path and adjacent sensitive conservation area. Where possible, native vegetation should be used to re-vegetate the site following the construction of new trails.

## Trailhead Design

Trailheads, the primary access points to a trail, can be divided into two categories. Major trailheads include automobile parking and can be located at the beginning and end of a trail as well as points along the trail. Minor trailheads are located at intersections of two trails, resting points and at beginnings and ends of neighborhood trails, but generally do not include parking. Trailhead design varies from simple facilities to spaces with multiple design elements, Meeting the

needs of a diverse group of users should be taken into account when designing the facilities in and location of the trailheads.

Major trailheads may include the following:

- Convenient access to transit stops
- Automobile parking, including parking spaces reserved for persons with disabilities
- Secure bicycle parking
- Kiosks, with orientation information, interpretive information and/or bulletin board space
- Trailhead signage
- Interpretive signage
- Drinking water
- Trash receptacles
- Benches, or other places to sit
- Restrooms or directions to restrooms
- Staging or gathering spaces (may include shelters and picnic tables)
- Lighting

This page intentionally left blank