



# Paths & Trails Element

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Vancouver (WA) Walking & Bicycle Master Plan

January 2004

City of Vancouver, Washington





**Paths & Trails Element**  
of the  
**Vancouver (WA) Walking & Bicycle Master Plan**

A component of  
the **Vancouver Transportation System Plan 2003**  
and  
the **Vancouver Urban Parks, Recreation and Open Space Plan 2002**  
and  
the **Regional Comprehensive Parks, Recreation and Open Space Plan 2000**  
for

**The City of Vancouver, Washington**  
**Visions for the Vancouver Urban Area**  
**Volume II**  
**Growth Management Plan**  
**Comprehensive Plan**

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<http://www.vanclarkparks-rec.org>

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# I. Introduction

As Vancouver prepares to commemorate the bicentennial of the Lewis and Clark Corps of Discovery in 2005-06, and the journey's legacy of nation-building, our community faces important opportunities and challenges. Years of foresighted planning have paid off, with many new projects now revitalizing the face of downtown, and thousands of acres of greenspace preserved for future generations. At the same time, unprecedented growth is pushing the urban and suburban landscape further into Clark County, and obesity and other health issues related to sedentary lifestyles are being recognized as national problems.

The number of Vancouver residents walking and cycling increases every year, thanks in part to our steadily-growing, world-class walking and bicycling network. Nationwide, however, our society is also facing a steady rise in obesity and poor health related to physical inactivity, especially among children.

This document is important as a roadmap for what we as a community can do over the next twenty years to make Vancouver a place where walking, bicycling, and active living are truly a part of everyday life.

## Plan Overview

This Paths & Trails Element of the proposed Walking & Bicycling Master Plan is intended to recommend development and design of an interconnected paths and trails system within the City of Vancouver. This Plan uses the terms 'paths' and 'trails' interchangeably to describe shared off-road facilities designed exclusively for non-motorized usage. The Paths & Trails Element is a vital component of the larger Vancouver Transportation System Plan (TSP), which identifies the need for increased bicycling and walking opportunities. Furthermore, the Plan is the first step within a larger framework that in upcoming years will identify a regional trails plan for the greater Vancouver region.

*"Think about when this country was built. Roads went out first, and towns were established on the roads. Open space, greenways, and parks are established on trails. Trails are the backbone of our system."*  
- Vision 2000 participant

The paths and trails system is an integral and key part of transforming the concept of a bicycle and pedestrian-friendly system into reality. The TSP recognizes that walkways and bikeways bring enormous benefits to all residents including increasing transportation choices for walking and bicycling, as well as improving environmental conditions and the overall health of residents. The TSP provides a general guideline for developing a network of bikeway and walkways; however, it does not establish recommendations for specific path or trail projects. Therefore, the Paths and Trails Element provides detailed, recommended improvements to the existing path and trail network. The intent of this Plan is to provide documentation for the trail projects, offer recommended trail design and features, and ensure successful trail implementation.

Multi-use, shared-use paths or trails are the foundation of a comprehensive bicycling and walking system. Trails offer numerous aesthetic and recreational opportunities, as well as commuter options for walking, hiking, bicycling, skating or otherwise traveling to and from destinations in Vancouver. Residents desire a comprehensive path and trail network in order to bicycle or walk to work, go for a family bicycle ride or walk to the park or library, enjoy a longer outing to and around Vancouver Lake or along the Columbia Waterfront, or simply to take pleasure in walking.

Developing more trails is a top priority for Vancouver residents, according to participants in the “Vision 2000” Symposium sponsored by Vancouver-Clark Parks and Recreation Services in March, 2000. The “Vision 2000” Symposium gathered citizens of Vancouver and Clark County to plan for a system of open space in southwest Washington that reflects community values and goals. Residents consider trails the “backbone of our system,” “a connection to our past,” and “a source of recreation.” Others noted that trails in an urban setting can have unexpected value by serving as routes for alternative modes of transportation, buffers for recreational spaces, wetlands, and wildlife habitat, even preserving clean water and the aquifer. Residents also offered this kind of enthusiasm for trails in the processes for the Transportation System Plan (TSP) and 2001 Vancouver Parks, Recreation, and Open Space Plan.

Vision 2000 participants recognized the need for trail system connectivity to shorelines, streams, wildlife areas, greenspaces, and other trails and bikeways such that all parts of the city and county are connected. Respondents to a 1999 Clark County survey ranked the creation of more trails for walking and bicycling the third most important of 15 possible parks and recreation facilities, projects, and improvements. Trails in other communities have helped raise property values, provide common space for social interactions, help improve overall community safety, encourage healthy lifestyles, and improve property values. They attract the young and the old, the healthy and the disabled. They are a marker of a welcoming and visionary community.

*“Trails are not roads. Roads go to malls and jobs and dental appointments. Roads are for destinations; trails are for journeys. Trails are for explorers and dreamers and wild hearts. Trails are where nature beats a path past waterfalls and volcanoes, through lush rain forests and spectacular deserts, right into the middle of your soul. Trails are for the important things like pine cones and rivers and word of mouth.*

- Mountain bike writer Lizann Dunnegan

This Plan is also an important piece of the Metropolitan Greenspaces Program, a regional planning approach - coordinated by Vancouver’s Metropolitan Service District (Metro) - to protecting natural resources. Working together with Vancouver and Clark County, the programs will link a mosaic of natural areas and parks into greenspaces, preserving wildlife habitats and creating greenway corridors for plants, wildlife, and people. Vancouver’s trail system is intended to be an integral part of Portland and Clark County’s greenways, trails, bikeway, and open space systems. Prominent natural features with on-going conservation and enhancement efforts include:

- The Columbia River
- Burnt Bridge Creek Greenway and wetlands
- Stewart Glen
- Salmon Creek
- Neighborhood and community parks and urban open space
- Vancouver Lake, and its Park and Lowlands

- Urban forests, including the 1826 Old Apple Tree and the newly planted Heritage Tree Walk

Other considerations include recreational and alternative transportation uses, public safety, floodway/floodplain protection, integration of linear parks and passive recreation, water pollution control, habitat enhancement, and natural resources protection. This planning effort is supported by Clark County, the Intergovernmental Resource Center, the Audubon Society, conservation organizations, bicycling and walking organizations, business and education leaders, and others.

Vancouver's existing trail system is called the Discovery Trail, proudly emphasizing the Lewis and Clark Corps of Discovery route through Vancouver. Named in a community competition back in 1965 by a local girl scout, the discovery theme also alludes to the desire of Vancouver's leaders to leave future generations with a trail system that provides more than just a transportation option. Instead, the trail system is intended to complement and enhance efforts to:

- Revive our appreciation of the Columbia River and other natural and cultural resources.
- Deepen our understanding of our history and culture.
- Provide educational opportunities for residents of all ages.
- Promote and offer healthy recreation, transportation, and community-gathering options.
- Provide opportunities for a variety of users to easily and safely access a network of trails connected to important community destinations such as schools and parks.
- Enhance the economic growth of the region.
- Improve our safety.
- Celebrate the Lewis and Clark discovery route via the Discovery Greenway.
- Discover and appreciate the area's rich beauty, both now and forever.

Vancouver is already well on its way to having a nationally-recognized trail system. It hosted the 2001 Washington State Trails Conference, attracting over 100 participants, who all went away with a deeper appreciation of the progress made to date. The existing parts of the Discovery Trail system including the Columbia Riverfront, Evergreen Highway, Burnt Bridge, and Frenchman's Bar trails are beautifully-designed, well-used, and a testament to residents' desire for a livable community.

## Plan Approach

The 2004 Vancouver Trails Plan was undertaken as part of the City's Transportation System Plan process. As such, the planning process followed a series of research and public process activities from Spring 2000 to 2002, and a workshop with the Park Commission, Planning Commission and City Council in early 2003. These activities included:

- Assessment of current bicycling and walking conditions and facilities in Vancouver.
- Evaluation of bicycle and pedestrian needs, such as safety problems, demographic and geographic population and employment demands, and facility deficiencies.
- Development of comprehensive and connected systems of bikeways and walkways.
- Development of bicycling and walking support programs.

- Public outreach through an on-going newsletter, numerous public meetings, focus groups, a City-wide survey, and meetings of the TSP's Citizens' Advisory Team (CAT), the City's Bicycle and Pedestrian Advisory Committee (which met in 2000 and part of 2001), and the County's Bicycle and Pedestrian Advisory Committee.

In addition, planners reviewed other relevant documents produced in and around the City, to understand established goals. The primary plans that were reviewed are summarized below and include:

- 2004 Vancouver Transportation System Plan
- 2002 Urban Parks, Recreation and Open Space Plan
- 1992 Clark County Trails and Bikeway System Plan

Staff also reviewed a number of other documents to incorporate the intent of these pieces into the Walking and Bicycling Plan. These documents include:

- Various brochures and materials related to parks, open spaces, the Columbia River Renaissance, Lewis and Clark 2005 Bicentennial activities, and trail projects
- Twenty-five Vancouver Neighborhood Action Plans
- 2002 "Rediscovery of the Rivers – Lewis & Clark Discovery Greenway"
- 2001 Vancouver Parks, Recreation, and Open Space Plan, Draft Report
- 2000 Vision Symposium
- 2000 Vancouver Transportation System Plan - Vision for the Future
- 2000 Vancouver Transportation Vision Research Report
- 2000 Vancouver Transportation Improvement Program
- 2000 Vancouver Recreation Program & Cost Recovery Plan
- 2000 Clark County Regional Parks, Recreation and Open Space Plan
- 2000 Ridgefield National Wildlife Refuge Report
- 2000 Recommended Bicycle Facility Design Implementation Practices
- 1999 Vancouver-Clark Facilities & Services Strategic Plan
- 1999 Metropolitan Transportation Plan for Clark County
- 1999 Downtown Transportation System Plan
- 1999 C-TRAN Pedestrian Accessibility Program Report
- 1998 Clark County Comprehensive Sports Fields Master Plan
- 1995 Vancouver Parks, Recreation, and Open Space Plan
- 1994 Clark County Parks, Recreation, and Open Space Plan
- 1994 Vancouver Growth Management Plan
- 1992 Columbia River Renaissance Project
- 1992 Clark County Open Space Commission Report

- 1991 Columbia River/Evergreen Highway Trail Study
- 1990 Washington State Growth Management Act (GMA)

## Plan Goals

The Vancouver Paths and Trails Plan promotes the goals and visions which have been identified through previous planning efforts throughout which residents have agreed a comprehensive paths and trails network is an integral component of Vancouver's future. The Paths and Trails Plan seeks to:

- To provide a comprehensive trail system that will connect with regional trail systems and transportation's system of sidewalks and bike lanes
- To provide a system of shared use paths within one mile of every home
- To fully utilize the recreational opportunities within Vancouver's open spaces and parks by connecting citizen's to their homes, parks, schools, businesses and work.

Other goals are set forth in the Vancouver Transportation System Plan, the 1992 Clark County Trails and Bikeway System Plan, and the 2002 Urban Parks, Recreation, and Open Space Plan.

### *Vancouver Transportation System Plan*

A primary goal of the planning process is to develop a community-based transportation system plan that promotes livability, accessibility, and mobility. The plan will encourage and depend on the creation of pedestrian and bike-friendly, mixed-use environments. Vancouver's Transportation System will also promote accessibility, support many types of travel, and help build a truly walkable community.

The Vancouver Transportation System Plan includes the following goals and policies intended to enhance the ability of Vancouver residents to bicycle and walk for daily travel:

**Goal:** To provide a balanced, multi-modal transportation system for Vancouver that supports the safe, efficient movement of people and goods. Policies include:

- The vehicle, transit, bicycle, and pedestrian circulation systems shall be designed to connect major activity centers in the Vancouver, increase the overall accessibility of Vancouver, and provide access to residential, school, shopping and industrial areas.
- The implementation of transportation system and transportation demand management measures, provision of enhanced transit service, and provision of bicycle and pedestrian facilities shall be embraced by policy as the first choice for accommodating travel demand and relieving congestion in a travel corridor, before street widening projects are undertaken.
- The system shall consist of an integrated network of facilities and services for a variety of motorized and non-motorized travel modes.
- The System Plan shall promote alternative commute methods that decrease demand on the transportation system, such as using transit, telecommuting, carpooling, vanpooling, using flexible work schedules, walking, bicycling, etc.

- o The system shall be designed with consideration of the needs of persons with disabilities by meeting the requirements set forth in the Americans with Disabilities Act (ADA).
- o Transportation facilities in Vancouver shall be designed and constructed to mitigate noise, energy consumption, neighborhood disruption, economic losses to the private or public economy, and social, environmental or institutional disruptions, and to encourage the use of public transit, bikeways, sidewalks, and walkways.

**Goal:** To facilitate the increased use of pedestrian transportation in Vancouver by assuring that convenient, accessible, and safe pedestrian facilities are provided.

**Goal:** To facilitate the increased use of bicycle transportation in Vancouver by assuring that convenient, accessible, and safe bicycling facilities are provided.

**Goal:** To facilitate provision of an appropriate supply of parking facilities in Vancouver while reducing reliance on the automobile. Policies include:

- o To define the role of on-street parking as secondary in priority to the needs of the various transportation modes (vehicular, transit, bicycle, pedestrian) in use of the street right-of-way.

### ***1992 Clark County Trails and Bikeway System Plan***

The purpose of this study was to prepare a comprehensive plan for a trail and bikeway system throughout Clark County that a wide variety of issues and concerns . The study reviewed all aspects of county development required by the state Growth Management Act:

- The County should develop and maintain a comprehensive trail and bikeway system to link with other providers
- The County should plan and coordinate the development of trail and bikeway links within Clark County and surrounding jurisdictions (Metro, Columbia River Gorge Commissions, US Forest Service, Washington State Dept. of Natural Resources, adjoining counties, etc.) and become a facilitator for other provider and volunteer efforts.
- Acquire open greenspace and natural corridors for trail development.
- Promote appropriate planning and design solutions to avoid adverse environmental impacts on sensitive areas.
- Work closely with corporate business, private developers and public agencies to incorporate trails and bikeways, where feasible.
- Promote sensitive planning solutions and develop support services to diminish land owner concerns.
- Promote sensitive planning solutions and design, and develop support services such as education, enforcement and maintenance to reduce safety hazards.
- Develop an interpretive, educational program for the historic and environmentally significant sites along the trail and bikeway system.
- Coordinate planning for appropriate facilities where feasible for off-road vehicle users.

## ***2002 Urban Parks, Recreation, and Open Space Plan***

This Plan, adopted by both the City of Vancouver and Clark County, is the roadmap for providing urban parks, open space, and recreation programs in the region. The paths and trails goals of the Plan build on the Clark County Trails and Bikeway Plan and provide the following objectives:

- Develop trails within parks and along natural features such as greenways
- Complete improvements along existing trail network to provide uniform surfaces and amenities throughout the trail network

## ***Other Goals***

A comprehensive trail network has benefits beyond transportation and recreation. Economic, environmental and urban design goals are all identified in numerous other reports and plans:

- 1990 Washington State Growth Management Act

*Planning Goal (RCW 36.70A.020), Open Space and Recreation:*

*Encourage the retention of open space and development of recreational opportunities, conserve fish and wildlife habitat, increase access to natural resource lands and water, and develop parks.*

- Columbia River Renaissance:

*Objective:*

*Improve public access to the Columbia River shoreline and its adjacent natural areas.*

*Near-term strategies:*

- Coordinate efforts to rewrite the National Trails Plan of 1965 to include off-road trails in the Portland/Vancouver area.
- Coordinate completion of the 12-mile trail from Frenchman's Bar to the I-205 Bridge and pedestrian/cycling corridors from the city's neighborhoods across SR-14.
- Coordinate transportation projects which will facilitate access to workplaces and commercial areas along the waterfront.

*Long-term strategies:*

- Restore unobstructed and/or appealing visual corridors to the river.
- Incorporate the waterfront's natural, historic and commercial assets into project design. Promote destination attractions.
- Establish the waterfront as an area on the cutting edge of urban design
- Solve safety and security issues.
- Seek public/private partnerships to develop commercial enterprises on the waterfront.
- Maintain portions of the waterfront as greenspaces.
- Connect the Lacamas Heritage Trail to the Burnt Bridge Creek Greenway and Vancouver Lake via the 18<sup>th</sup> Street Powerline corridor.
- Establish a citizen Trail Advocacy Group to work with agencies and organizations to better involve the public in trail system planning, implementation and management.

- Improve the health of the community through recreational infrastructure including paths and trails

## Report Layout

The report is divided into the following main sections:

### ***Section I. Introduction***

*Plan overview, approach and goals.*

### ***Section II. Design Guidelines***

*Infrastructure design standards, including trails, crossings, amenities and signs.*

### ***Section III. Recommended Improvements***

*Detailed trail project proposals, maps, and special destination features to include.*

### ***Section IV. Implementation***

*Project phasing, estimated costs and funding recommendations.*

### ***Section V. Support Programs***

*Internal and external programs that can support the system's installation and use.*



## II. Design Guidelines

### Terminology: Trail and Path Design Types

Vancouver’s walking and bicycling network is organized into five standard design types, which are outlined in Table II-1.. This Paths & Trails Plan proposes primarily two design types including the shared use path and walking path, which are also referred to as trails throughout this plan. The overarching Walking & Bicycling Master Plan considers more specifically pedestrian and bicycling connections including sidewalks, bicycle lanes and bicycle routes. Although, the Paths & Trails Element recommends primarily shared use and walking paths, each of the design types are outlined below to provide understanding of the entire network. The table provides a brief explanation of each design type’s dimensions, surface material, treatment and function. Following the table are examples of trails or paths from each category along with figures illustrating the design type.

**Table II-1: Vancouver Trail and Path Design Types**

Design Type	Width	Surface	Primary User	Treatment	Function
Sidewalk	5'-16'	Concrete	Pedestrian	Located along streets and are separated vertically on curb or horizontally by planting strip.	Provides local access to homes, businesses, and other local features for pedestrians and wheelchair users.
On Street Bike Lane	4'-6'	Asphalt	Bicyclist	Striped lane for one-way bike travel on street or highway.	For bicyclists on roadways.
Bike Route Shared Roadway	N/A	N/A	Bicyclist	Proper signage allows for shared use between bicyclists and motor vehicle traffic.	Accommodates bicyclists typically on lower volume roadways.
Shared Use Path	10'-16'	Paved Surface or concrete	Pedestrian and Bicyclist	Provides a completely separated right of way from motor vehicle traffic for the exclusive use by bicyclists and pedestrians. Minimized crossflow.	Provides major connections to land uses and areas of interest (e.g. parks, schools, shopping areas, natural areas, etc.), the region and the larger regional trail system.
Walking Path	4'-10'	Earthen or gravel surface	Pedestrian	Vary in width depending on intended user. Careful attention to topographic and environmental considerations.	Provide less intensive connections or walking routes within parks or natural areas. Can provide opportunities for bicyclists if width and safety concerns are met.

### *Design Type 1: Sidewalks*

The existing pedestrian system in the City of Vancouver consists of on-again/off-again sidewalk network. The city has no specified pedestrian districts or designated pedestrian malls. In several Vancouver locations, the pedestrian system is comprehensive, such as in some areas of downtown and the Fort Vancouver area. However, some areas of the city are characterized by a relatively piecemeal system, with high-quality sidewalks and pedestrian crossings adjacent to new developments connecting to inadequate or nonexistent systems adjacent to older developments. In some cases, Vancouver has provided 12-foot wide sidewalks (as well as bicycle lanes) on streets such as Columbia and the Mill Plain Extension. system.



*Wide sidewalk on the Mill Plain Extension*

It should be noted that, in most cases, a traditional sidewalk is not a good substitute for either bicycle lanes or a separated path, as sidewalk bicycle riding has been found to be a significant safety hazard nationwide. In fact, 26 percent of reported bicycle-motor vehicle related crashes in Vancouver involve sidewalk bicycle riding. Thus Vancouver's sidewalk/paths must be designed with careful attention to driveway and roadway crossings, sight lines, and connections to the bikeway. These sidewalk/paths are intended to be primarily used by pedestrians, with the corresponding bike lanes intended for bicycle use. Figure II-1 illustrates a sidewalk design that is used in conjunction with bike lanes.

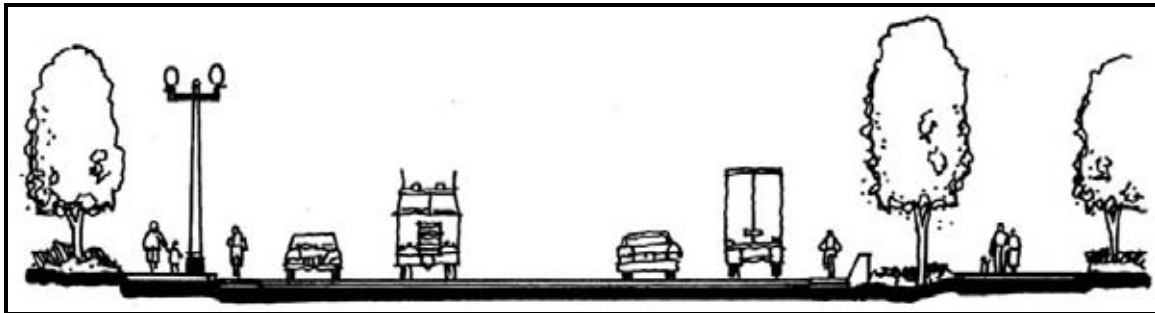


Figure II-1: Sidewalk and Bike Lane Design

### *Design Type 2: Bike Lanes*

A bicycle lane is the portion of the roadway designated by striping and bicycle pavement markings for the one-way, exclusive or preferential use of bicycles. Bike lanes should be provided on most collectors and arterials with traffic greater than 3,000 vehicles per day. Bike lanes can help increase the total capacity of the roadway by removing bicycles from the vehicle lanes, provide for more predictable movements, and encourage cycling. Vancouver is committed to providing bicycle lanes to create an interconnected system of facilities available to the widest possible variety of users. Figure II-2 illustrates a bike lane designed to facilitate bike travel on a street or highway.

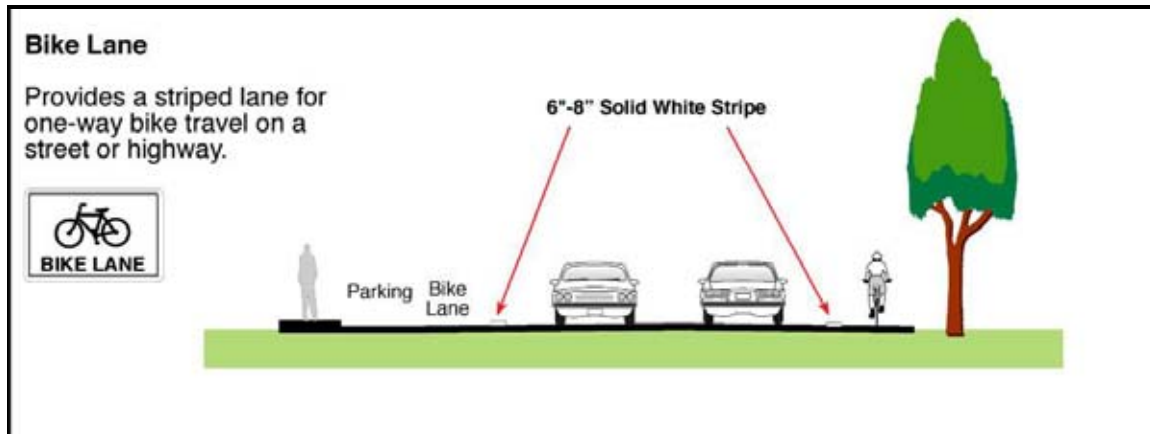


Figure II-2: Bike Lane Design

### *Design Type 3: Bike Route Shared Roadway*

When designated by appropriate signing and stenciling, shared roadways provide for shared use with pedestrian or motor vehicle traffic, preferably on lower volume roadways. On higher volume roadways, an extra wide (12 to 14 feet) curb lane is recommended.

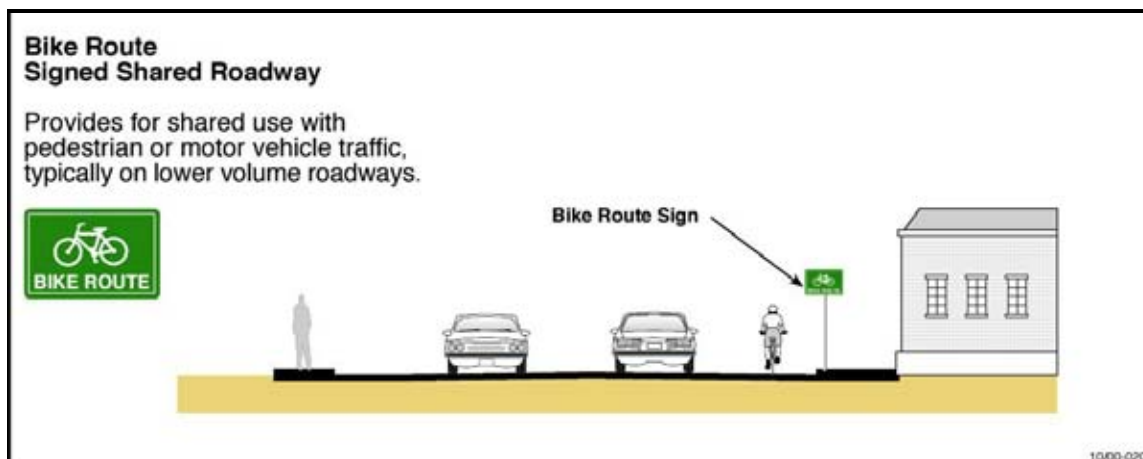


Figure II-3: Bike Route Shared Roadway Design

### *Design Type 4: Shared Use Paths*

The 1999 American Association of State Highway and Transportation Officials' (AASHTO) *Guide for the Development of Bicycle Facilities* uses the term “shared use path” to refer to facilities on exclusive rights-of-way and with minimal cross-flow by motor vehicles. Shared use paths are distinctly different from on-street striped bicycle lanes and signed, shared roadways described above, which serve useful and complementary facilities. Shared use paths provide opportunities for a wide range of users that, AASHTO notes, “includes but is not limited to: bicyclists, in-line skaters, roller skater, wheelchair users (both non-motorized and motorized) and pedestrians, including walkers, runner, people with baby strollers, people walking dogs, etc...”. Shared use paths are sometimes referred to

as trails. In many states, however, the term “trail” means an unimproved recreational facility. AASHTO notes, “When shared use paths are called trails, they should meet all design criteria for shared use paths to be designated as bicycle facilities”. Additionally, shared use paths should meet or exceed the Americans With Disabilities Act (ADA) standards.

Shared use paths represent the majority of recommended improvements in the Vancouver Paths and Trails Plan, as they serve as major connections in the regional trail system linking important features, land uses and areas of interest. They can provide recreational opportunities, learning ground for new cyclists, and utilitarian routes, depending on their locations. Shared use paths can take on a variety of different treatments that both enhance the surrounding landscape and meet the needs of users. The following trail cross sections illustrate shared use path treatments for trail design opportunities in Vancouver. These treatments include designs for a standard shared use trail, a powerline trail, and a waterside trail.

Figure II-4 shows the typical design of a standard off-road shared use path.

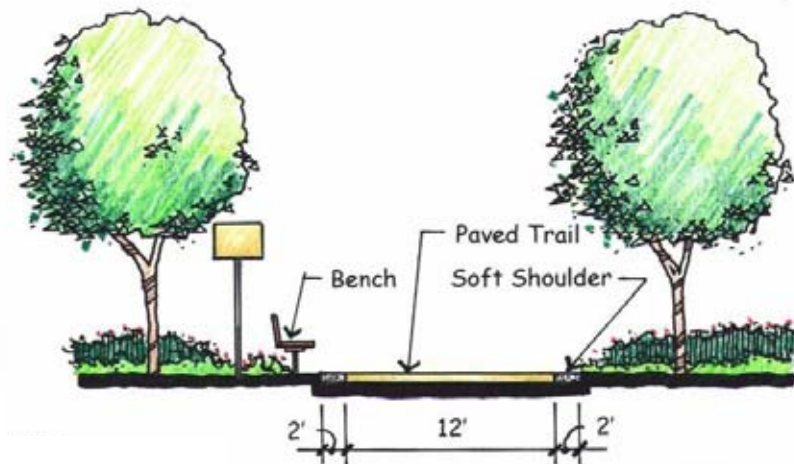


Figure II-4: Shared Use Path Design, Standard Treatment

Figure II-5 illustrates the particular issues to be considered with shared use trails parallel to powerlines, such as vegetation setbacks and buffers.

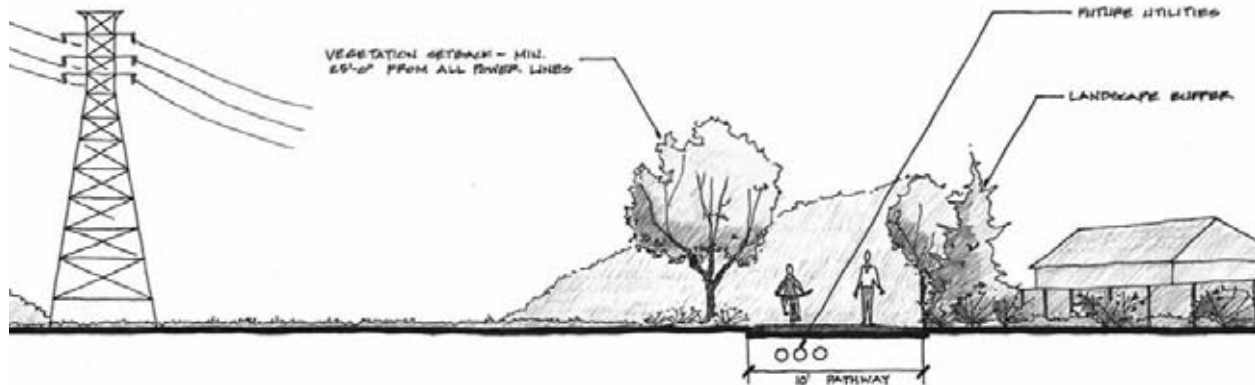


Figure II-5: Shared Use Path Design, Powerline Trail Treatment  
e.g., 18th Street Corridor

Figure II-6 illustrates a waterside path design equally appropriate for lakesides, creeksides and riversides.

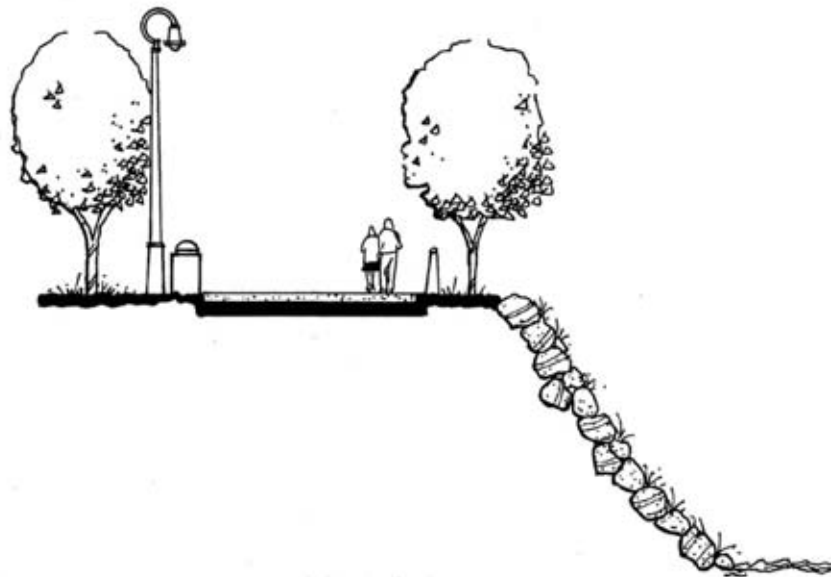


Figure II-6: Shared Use Path Design, Waterside Path Treatment

### *Design Type 5: Walking Trails*

The design of walking trails is highly dependent on the intended use. Walking paths should take into account issues like drainage, erosion, slope, presence of waterways, vegetation, riparian and habitat areas, environmental requirements and regulations, and other issues. Walking trails can vary in width from 4'-12' and do not necessarily meet ADA requirements, and are therefore ineligible for federal funding. Walking trails can accommodate bicyclists if there is adequate space and safety concerns are met.

Figure II-7 provides dimensions of a walking trail such as the Ellen Davis Walking Trail.

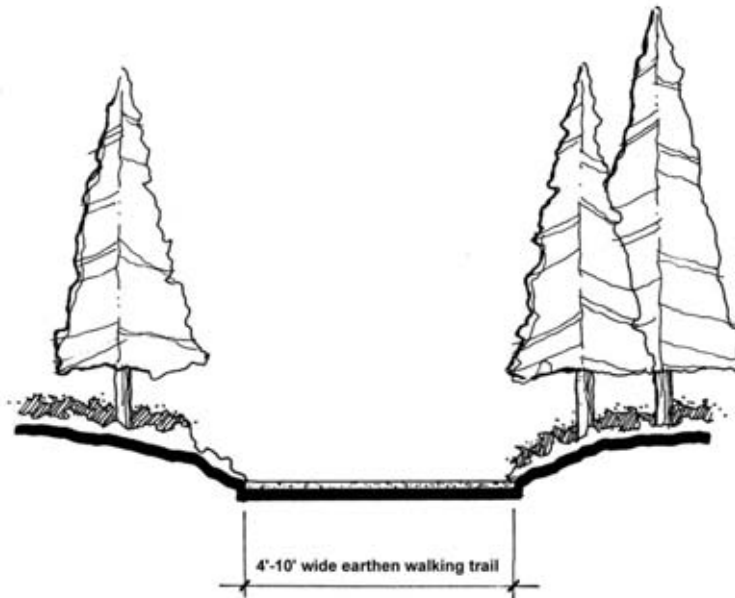


Figure II-7: Walking Trail Design

## Trail-Roadway Crossings

Like most trails in built-up urban areas, Vancouver's trails must cross roadways at certain points. These roadway crossings may be designed at-, below-, or above-grade. At-grade crossings create a potentially high level of conflict between trail users and motorists. However, well-designed crossings have not historically posed a safety problem, as evidenced by the thousands of successful trails around the United States with at-grade crossings. Designing safe grade crossings is a key component of the safe implementation of this Plan.

When considering a proposed separated trail and its required crossings of roadways, it is important to remember two items: (1) trail users will enjoy a largely auto-free experience and may enter into an intersection unexpectedly, and (2) motorists will not expect to see bicyclists shooting out from an unmarked intersection into the roadway. In some cases, a required trail crossing may be so dangerous or expensive (e.g., to build an undercrossing or overcrossing) as to affect the feasibility of the entire alignment. In most cases, at-grade trail crossings can be properly designed to a reasonable degree of safety and to meet existing traffic and safety standards.

Evaluation of trail crossings involves analysis of traffic patterns of vehicles as well as trail users. This includes traffic speeds, street width, traffic volumes (average daily traffic, peak hour traffic), line of sight, and trail user profile (age distribution, destinations). This study identifies the most appropriate crossing options given available information, which must be verified and/or refined through the actual engineering and construction document stage.

## Basic Crossing Prototypes

The proposed intersection approach in this report is based on established standards, published technical reports, and the experiences on existing facilities. Virtually all crossings fit into one of four basic categories, described below.

- Type 1: Unprotected/Marked Crossings  
Unprotected crossings include mid-block crossings of residential, collector, and sometimes major arterial streets.
- Type 2: Divert Users to Existing Intersection  
Bikeways which emerge near existing intersections may be routed to these locations.
- Type 3: Signalized/Controlled  
Bikeway crossings which require signals or other control measures due to traffic volumes, speeds, and trail usage.
- Type 4: Grade-separated  
Bridges or under crossings provide the maximum level of safety but also generally are the most expensive and have right of way, maintenance, and other public safety considerations.

### *Type 1 and 1+ Unprotected/Marked Crossings*

A Type 1 unprotected crossing consists of a crosswalk, signing, and often no other devices to slow or stop traffic (see photos). The approach to designing crossings at mid-block locations depends on an evaluation of vehicular traffic, line of sight, trail traffic, use patterns, road type and width, and other safety issues such as the proximity of schools. The following general thresholds outline where unprotected crossings may be acceptable:

- Install crosswalks at all locations
- Maximum Traffic Volumes:
  - 10,000-15,000 average daily traffic (ADT),
  - 1,000-1,500 peak hour
- Maximum 85<sup>th</sup> percentile speeds:
  - 35-45 mph
- Maximum trail user volumes:
  - 50-75 per hour, 300-400 per day
- Maximum street width:
  - 60 feet (no median)
- Minimum line of sight:
  - 25 mph zone: 100 feet;
  - 35 mph zone: 200 feet;
  - 45 mph zone: 300 feet



*Type 1 treatment  
on 18th Ave.*



*Type 1 treatment  
on Springwater Corridor, Portland*

On residential and collector streets below 10,000 ADT, crosswalks and warning signs (“Bike Xing”) should be provided for motorists, and STOP signs and slowing techniques (bollards/geometry) used on the trail approach. Care should be taken to keep vegetation and other obstacles out of the view line for motorists and trail users.

Collector streets up to 15,000 ADT require a higher level of treatment for crossings than residential streets. These are referred to as ‘Type 1+’ in the recommended treatments (see Figure II-8). In addition to the features described for residential streets, signing locations may need to be moved further upstream and made more visible for motorists. A flashing yellow beacon costing between \$15,000 and \$30,000, may be used, preferably one that is activated by the trail user rather than operating continuously. Some jurisdictions have successfully used a flashing beacon activated by motion detectors on the trail, triggering the beacon as trail users approach the intersection. This equipment, while slightly more expensive, helps keep motorists alert.

Crossings of higher volume arterials over 15,000 ADT may be unprotected in some circumstances – for example, if they are located near a signalized intersection, a median island is present, and there are substantial gaps in traffic. Such crossings would not be appropriate, however, if a significant number of school children used the trail.

### ***Type 2: Divert Users to Existing Intersection***

Crossings within 250 feet of an existing signalized intersection with pedestrian crosswalks are typically diverted to the signalized intersection for safety purposes (see Figure II-9). For this option to be effective, barriers and signing would be needed to direct trail users to the signalized crossings. In most cases, signal modifications would be made to add pedestrian detection and to comply with the American with Disabilities Act. In many cases the intersections are directly adjacent to the crossings and are not a significant problem for trail users. Several crossings do fall into this category in Vancouver.



*Type 2 treatment on Springwater Corridor, Portland*

### ***Type 3: Signalized/Controlled Crossings***

New signalized crossings (see Figure II-8) are recommended for crossings more than 250 feet from an existing signalized intersection and where 85<sup>th</sup> percentile travel speeds are 45 mph and above and/or ADT's exceed 15,000 vehicles. Each crossing, regardless of traffic speed or volume, requires additional review by a registered engineer to identify sight lines, potential impacts on traffic progression, timing with adjacent signals, capacity, and safety.

Trail signals are normally activated by push buttons, but also may be triggered by motion detectors. The maximum delay for activation of the signal should be two minutes, with minimum crossing times determined by the width of the street and trail volumes. The signals may rest on flashing yellow or green for motorists when not activated, and should be supplemented by standard advanced warning signs. Typical costs for a signalized crossing range from \$75,000 to \$150,000.



*Type 3 treatment on Springwater Corridor, Portland*

### *Type 4: Grade-separated Crossings*

Grade-separated crossings (see Figure II-10 and Figure II-11) are needed where ADT's exceed 25,000 vehicles, and 85<sup>th</sup> percentile speeds exceed 45 mph. Safety is a major concern with both overcrossings and undercrossings. In both cases, trail users may be temporarily out of sight from public view and may have poor visibility themselves. Under-crossings, like parking garages, have the reputation of being places where crimes occur. Most crime on trails, however, appears to have more in common with the general crime rate of the community and the overall usage of the trail than any specific design feature.

Design and operation measures are available which can address trail user concerns. For example, an undercrossing can be designed to be spacious, well-lit, equipped with emergency cell phones at each end, and completely visible for its entire length prior to entering.

Other potential problems with undercrossings include conflicts with utilities, drainage, flood control, and maintenance requirements. Overcrossings pose potential concerns about visual impact and functional appeal.



*Type 4 Undercrossing  
at Old Apple Tree Park*



*Overcrossing of I-5*

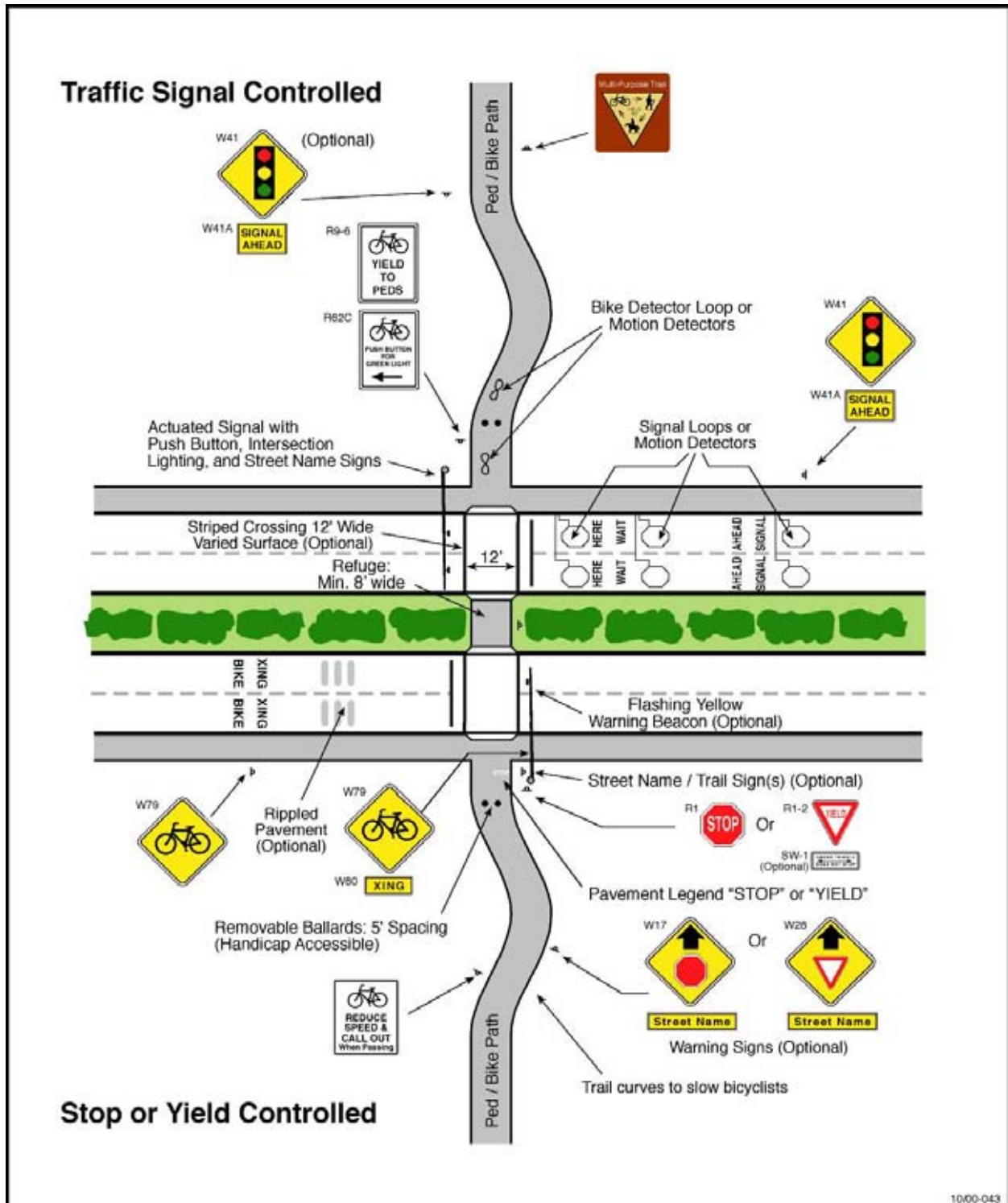


Figure II-8: Type 1 or 3 Crossing Prototype (depending on presence of signal)

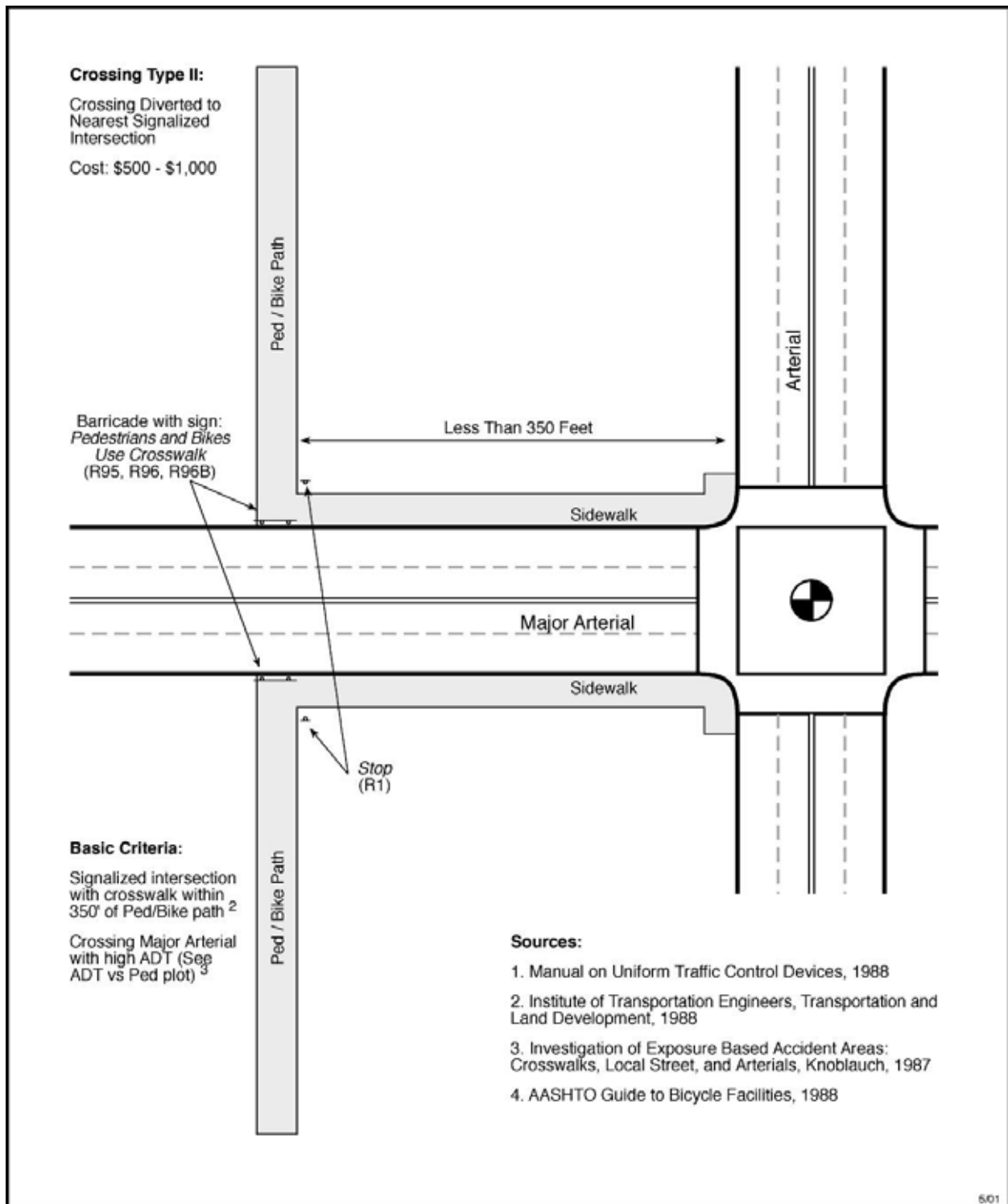


Figure II-9: Type 2 Crossing Prototype, Divert Users to Existing Intersection

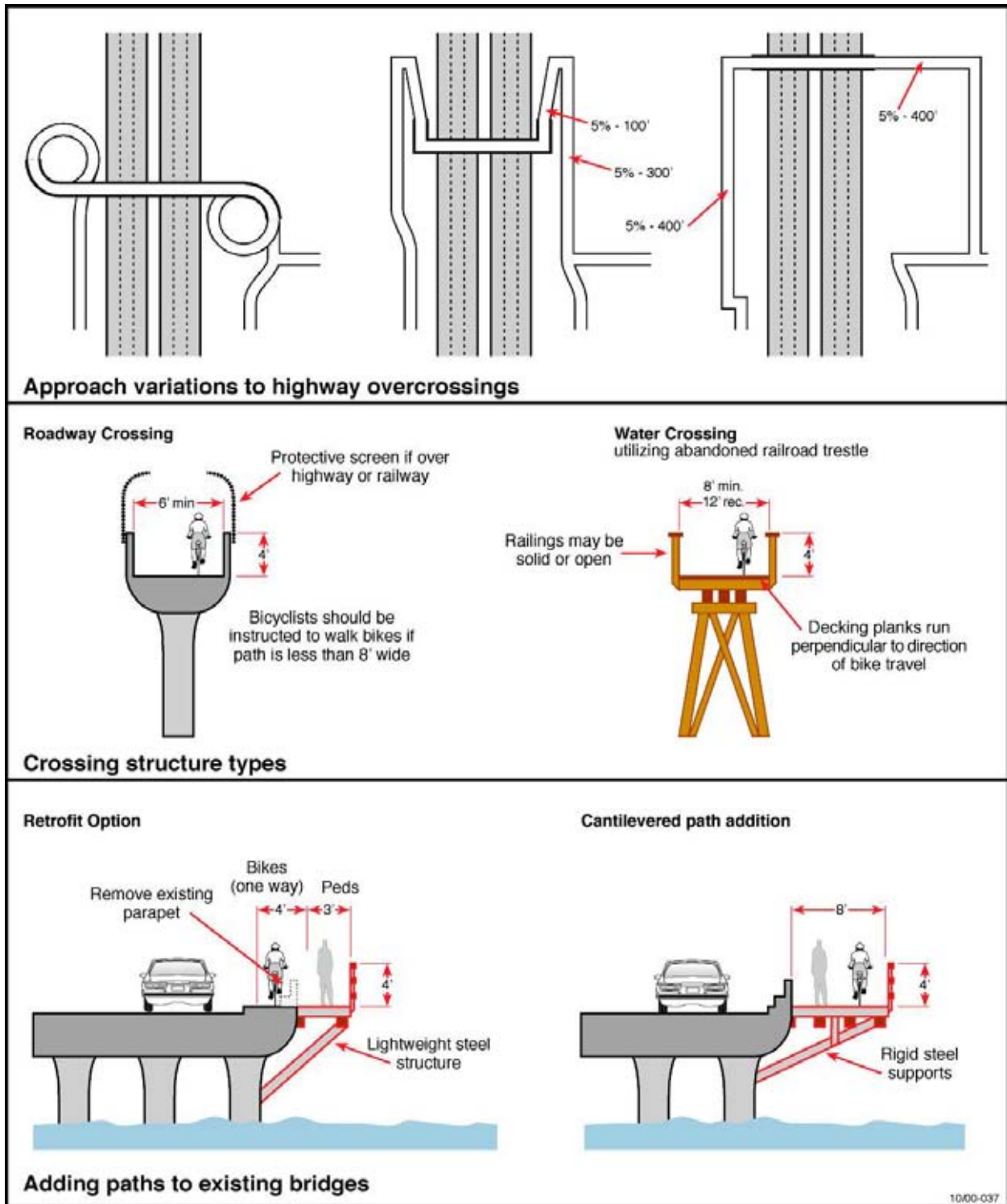


Figure II-10: Type 4 Crossing Prototype, Overcrossings

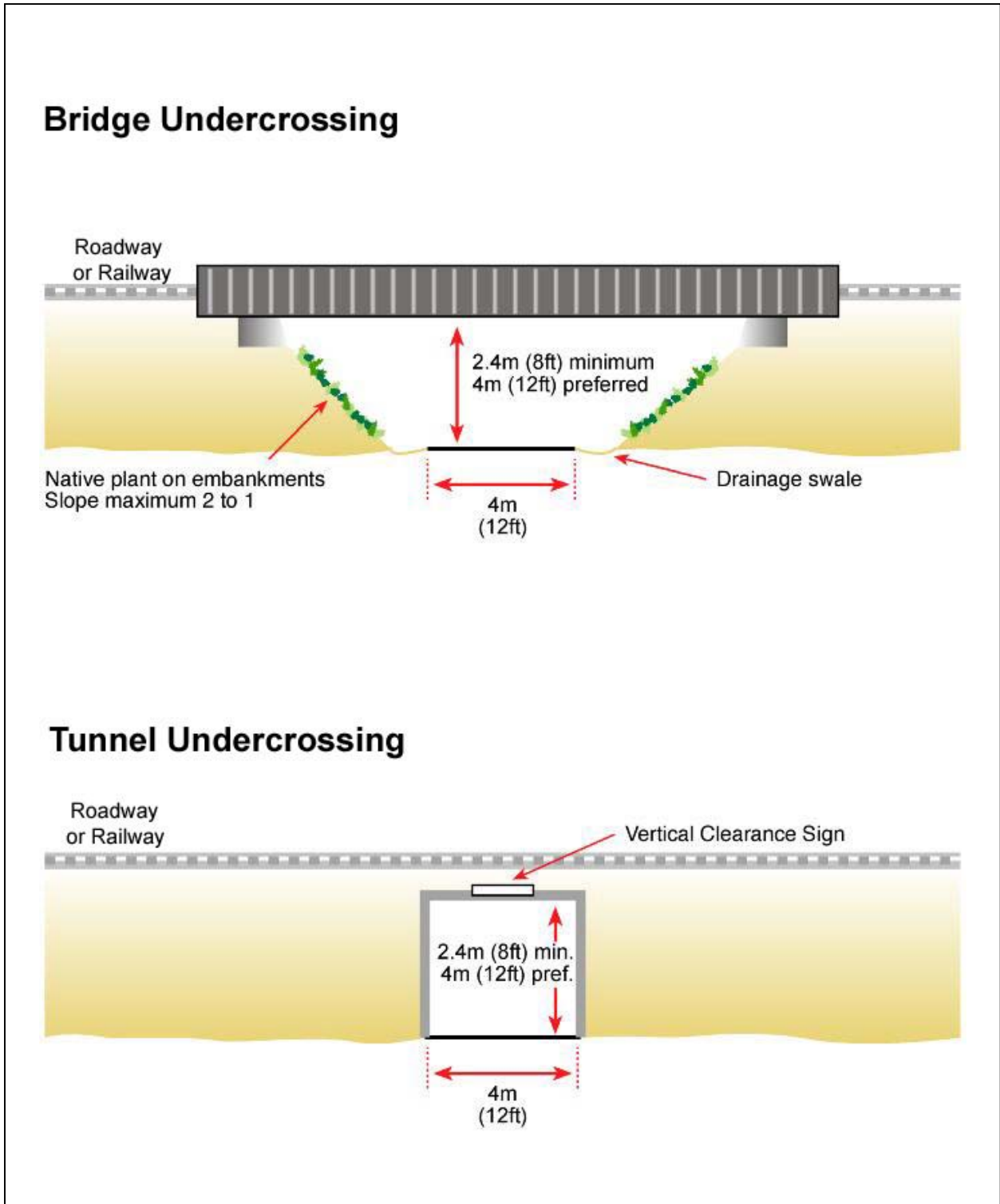


Figure II-11: Type 4 Crossing Prototype, Undercrossings

## Signing and Striping

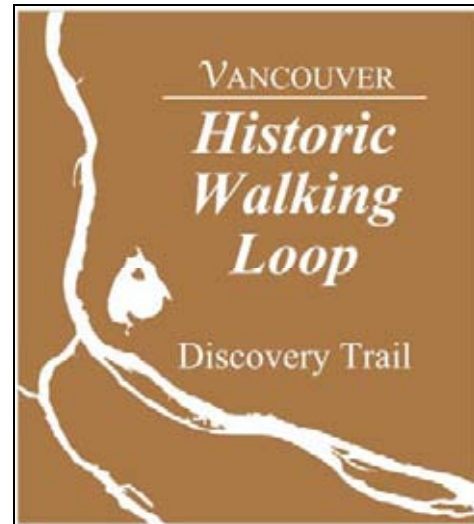
Crossing features for all roadways include warning signs both for vehicles and trail users. The type, location, and other criteria are identified in the Manual for Uniform Traffic Control Devices (MUTCD). Consideration must be given for adequate warning distance based on vehicle speeds and line of sight, with visibility of any signing absolutely critical. Catching the attention of motorists jaded to roadway signs may require additional alerting devices such as a flashing light, roadway striping, or changes in pavement texture. Signing for trail users must include a standard “STOP” sign and pavement marking, sometimes combined with other features such as bollards or a kink in the trail to slow bicyclists. Care must be taken not to place too many signs at crossings lest they begin to lose their impact.

Directional signing may be useful for trail users and motorists alike. For motorists, a sign reading “Trail Xing” along with a Vancouver trail emblem or logo helps both warn and promote use of the trail itself. For trail users, directional signs and street names at crossings help direct people to their destinations.

A number of striping patterns have emerged over the years to delineate trail crossings. A median stripe on the trail approach will help to organize and warn trail users. The actual crosswalk striping is a matter of local and state preference, and may be accompanied by pavement treatments to help warn and slow motorists. The effectiveness of crosswalk striping is highly related to local customs and regulations. In communities where motorists do not typically defer to pedestrians in crosswalks, additional measures may be required.

## Trailheads

Vancouver’s shared-use paths attract pedestrians, cyclists and equestrians. Trailheads and trailhead amenities must therefore be designed to meet the needs of this diverse set of users. Figure II-12 illustrates the various aspects of trailhead design to consider for such shared-use paths. Figure II-13 provides a standard design for a trailhead informational display.



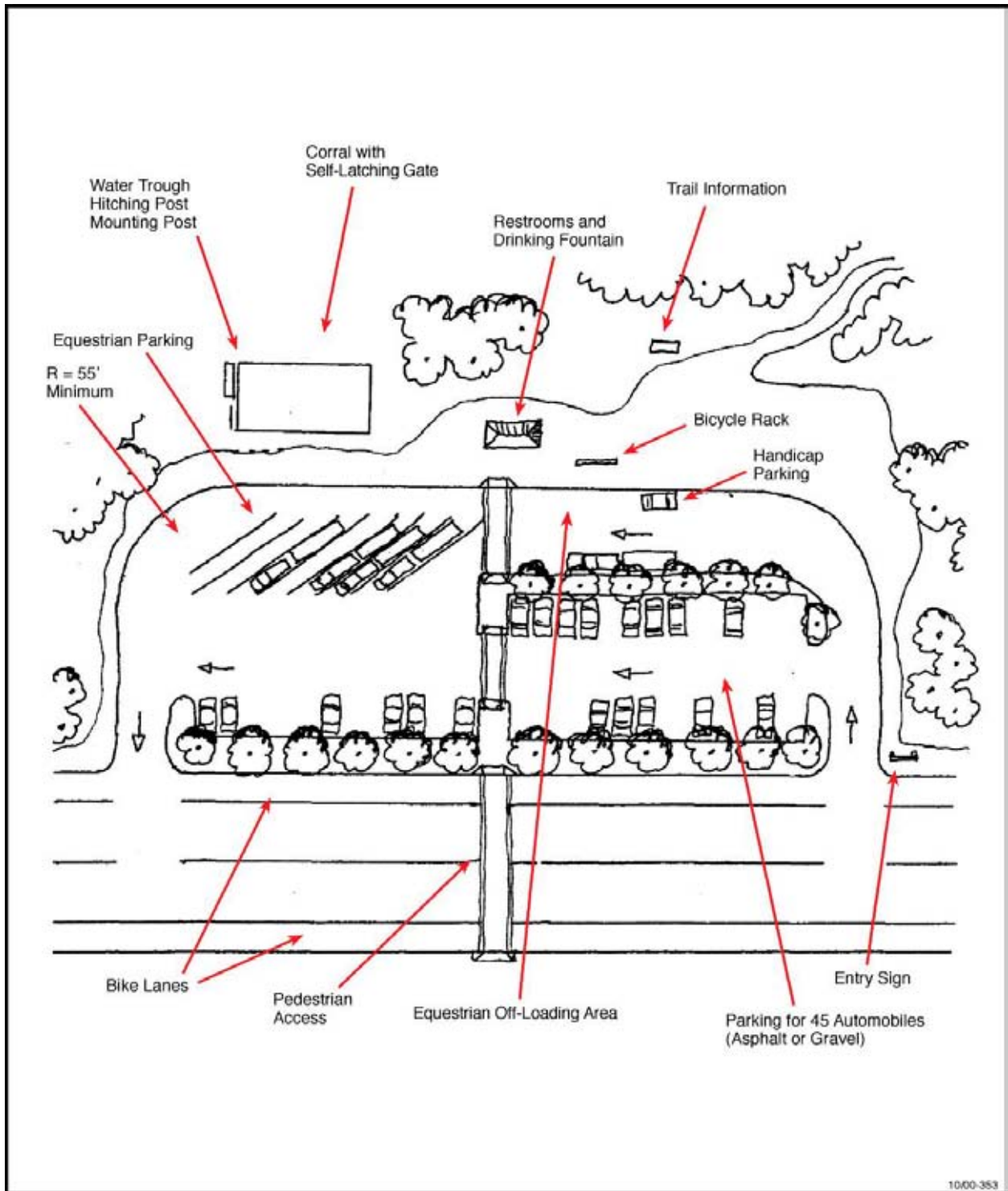


Figure II-12: Trailhead Design

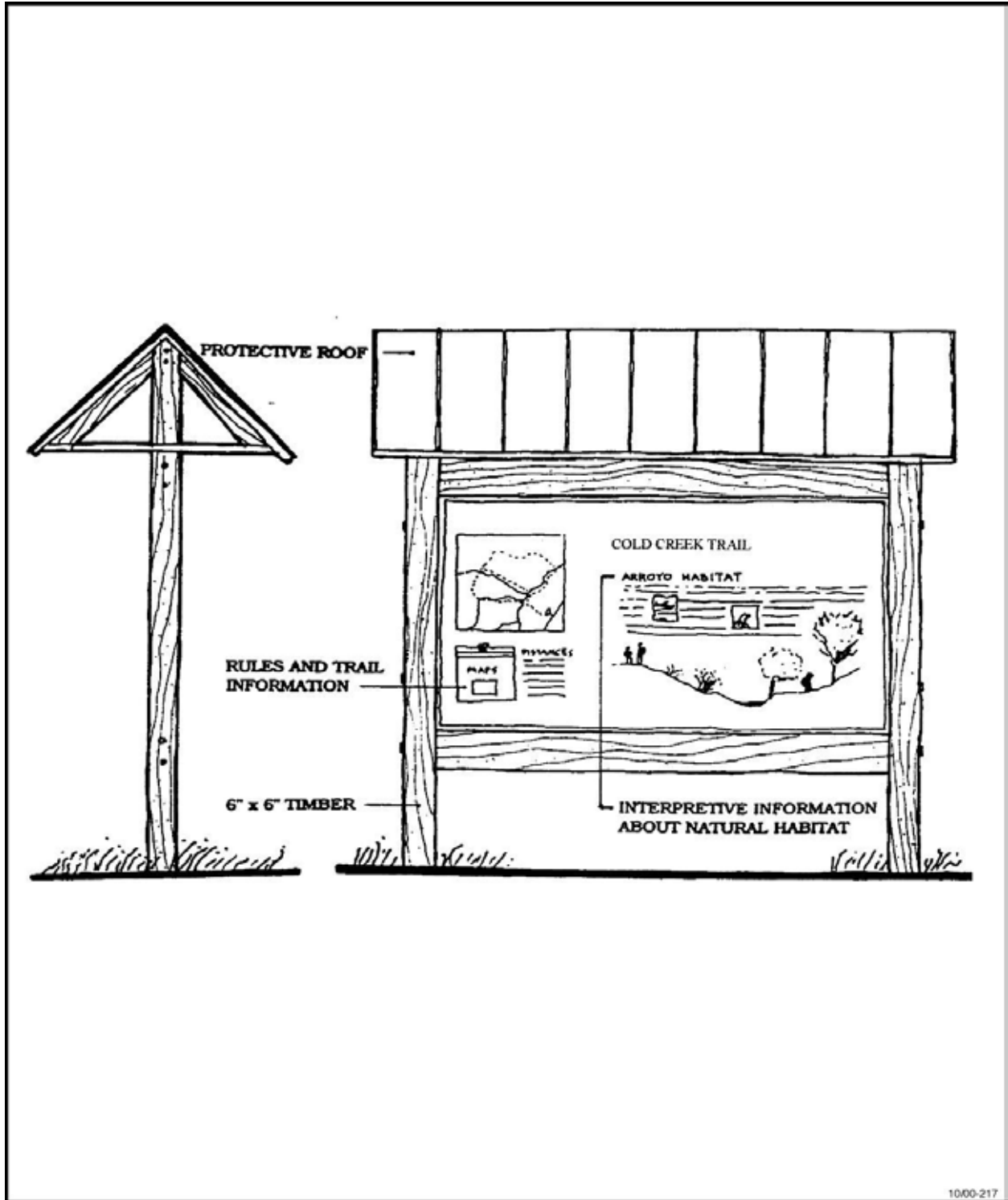


Figure II-13: Trailhead Sign

## Trail Amenities Photo Gallery

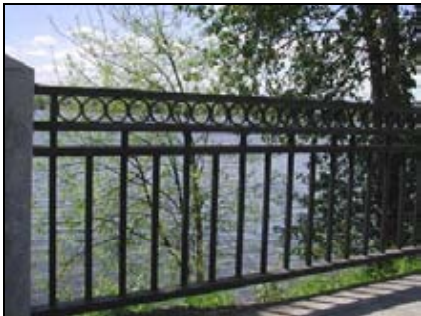
Vancouver has already established distinctive designs for certain trail amenities and design details. Use of this common aesthetic in developing Vancouver’s trails will be a valuable tool in creating a cohesive trail network, although for certain trails an individually distinctive design aesthetic may be more appropriate.



*Promenade with fence and trail amenities*



*Distinctive path illumination*



*Fence along trail*



*Bench and trash can*



*Bollard*



*Drinking fountain*