# County of Los Angeles

# Trails Manual

# COUNTY OF LOS ANGELES
# TRAILS MANUAL

**Prepared by:**

**County of Los Angeles Department of Parks and Recreation**
**Planning and Development Agency**
**510 South Vermont Avenue**
**Los Angeles, CA 90020**

**With technical assistance by:**

**Sapphos Environmental, Inc.**
**430 North Halstead Street**
**Pasadena, CA 91107**

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430 North Halstead Street
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# SECTION 1.0
# INTRODUCTION

The County of Los Angeles Department of Parks and Recreation (LACO-DPR) manages the recreation system with funding provided by the County of Los Angeles Board of Supervisors for planning, construction, operation, and maintenance of recreation facilities and programs. LACO-DPR is responsible for providing parks and recreational facilities to meet the diverse needs of the County of Los Angeles (County) residents and visitors. Maintenance of existing trails and development of additional high-quality trails is one of the most cost-effective means of addressing the deficiency of recreational facilities identified in the County of Los Angeles Inventory of Parks Facilities and Areas of Jurisdiction and the Strategic Asset Management Plan (SAMP) for 2020. [1, 2]

Trails offer multiple recreational opportunities to County residents and visitors, providing access to open space and related natural resources, and facilitating exercise, outdoor education, and opportunities to explore new environments. These assets are essential components of the quality of life valued by Southern Californians. The ability to provide these benefits within the County requires maintenance of existing trails and planning, design, development, and maintenance of new trails. The need and usefulness of encouraging healthy communities through the provision of recreational facilities has been exemplified by the "Healthy Parks" program coordinated by LACO-DPR, whose goal is to "improve the quality of life for all Los Angeles County residents" by "creating healthy communities through people, parks and programs."[3]

## 1.1 COUNTY STRATEGIC PLAN FOR 2010 GOALS, OBJECTIVES, AND POLICIES

A Parks and Recreation Strategic Plan for 2010 describes a goal, related objective, and policy to guide trail planning and development:[4]

> **Goal:**
> Provide a system-wide level of planning processes for both long- and short-term solutions.
>
> **Objective:**
> Provide a system of park and recreation facilities that meet the diversified needs of residents.
>
> **Policy:**
> Provide a system of multi-use (equestrian, hiking, and mountain biking) trails for a diverse group of public users throughout the County that connect local, state, and federal trail systems and link recreational areas to residential, commercial, institutional, and industrial areas.

## 1.2 PURPOSE AND NEED

**Purpose**

The purpose of this Trails Manual is to provide an accessible resource that can be used for trail planning, design, construction, and maintenance within the County of Los Angeles. This manual provides guidance to County departments that interface with trail planning, design, development, and maintenance. Specifically, these departments include the Department of Regional Planning, the Department of Public Works, and the Department of Parks and Recreation. This Trails Manual recognizes the existence of a broader regional trail network that exists in the County of Los Angeles and surrounding counties that provides access to recreational resources operated by federal, state, and local agencies. Thus, this Trails Manual provides guidelines for implementation of the goals, objectives, and purpose for the 2010 Strategic Plan related to trails.[5] Specifically, the manual provides sources of information and physical factors to be considered when analyzing the regional planning context, design, and development of trails that create the highest quality recreational experience and the capacity to serve the diverse recreational needs of County residents and visitors while undertaking the necessary outreach with community and regulatory stakeholders.

Trails are an integral part of the American and Southern California lifestyle. The Southern California climate allows County residents and visitors to enjoy trails throughout the year. Many of the County's trails were developed in the 1930s and continue to be in use today (Appendix A, *History of Trail Development*). This Trails Manual provides a framework for preserving and continuing this rich legacy of trail development and recreational trail uses.

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1 County of Los Angeles Department of Parks and Recreation. 2003. *County of Los Angeles Inventory of Park Facilities and Areas of Jurisdiction*. Contact: Department of Regional Planning, Hall of Records, 320 West Temple Street, Los Angeles, CA 90012.

2 County of Los Angeles Department of Parks and Recreation. April 2004. *Strategic Asset Management Plan (SAMP) for 2020*. Prepared by: County of Los Angeles Chief Executive Office and County of Los Angeles Department of Parks and Recreation, with technical assistance by Sapphos Environmental, Inc.

3 County of Los Angeles Department of Parks and Recreation. 6 December 2005. "Healthy Parks." Web site. Available at: http://parks.co.la.ca.us/HealthyParks.htm

4 County of Los Angeles Department of Parks and Recreation. May 1992. *A Parks and Recreation Strategic Plan for 2010*. Contact: 433 South Vermont Avenue, 4th Floor, Los Angeles, CA 90020.

5 County of Los Angeles Department of Parks and Recreation. May 1992. *A Parks and Recreation Strategic Plan for 2010*. Contact: 433 South Vermont Avenue, 4th Floor, Los Angeles, CA 90020.

**Need**

The County of Los Angeles has approximately 262 miles of existing trails and roads for recreational use. Given current population trends, the County needs to build more than 1,000 miles of trails to meet the anticipated demand for trails by 2020. This Trails Manual establishes the necessary planning, design, construction, and maintenance guidelines to ensure the quality of the recreational experience provided by existing and proposed County trails.[6]

This Trails Manual provides a process to ensure quality planning and design that recognizes the opportunities and constraints represented by the physical environment; provides construction guidelines to ensure proper drainage and minimize erosion; and specifies maintenance procedures to ensure that trails are accessible, safe, and aesthetically pleasing.

## 1.3 APPLICATION OF THE TRAILS MANUAL

The guidelines provided in this Trails Manual are intended to be used by County departments engaged in the planning, design, construction, and maintenance of hiking, equestrian, and mountain biking recreational trails within the County of Los Angeles. This Trails Manual sets the guidelines for reviewing plans and specifications for trails that are provided in conjunction with land use planning and the entitlement process for projects proposed for development within the County.

This manual was developed as a management and field tool for design, construction, operation, and maintenance of trails in the County of Los Angeles. It provides guidelines for both supervisors and lead personnel responsible for trail design, construction, and maintenance activities. It also provides the County with a checklist of key factors that shall be considered in the estimation of costs for trail construction and maintenance programs. The establishment of well-defined trail types, guidelines, and priorities facilitates the provision of consistent, high-quality trail experiences to residents of and visitors to the County of Los Angeles.

This manual does not intend to supplant, nor is it capable of supplanting, trained, experienced, and skilled trail supervisors and workers. For experienced personnel, the manual is intended only to supplement knowledge and provide a resource for operational guidance. However, the manual can provide a base knowledge of trail design, construction, and management practices for the inexperienced manager or supervisor.

**This manual does not create any binding legal or procedural requirements regarding trail planning, design, construction, or implementation, nor does it limit the discretion of the County of Los Angeles to deviate from the recommendations and guidelines contained in this Trails Manual based on specific situations or unique site conditions. Consistent with the overarching goal of the County and the LACO-DPR to increase the number of trails available to users, the environment, topography, and many other factors may necessitate a deviation from the recommendations and guidelines contained in this Trails Manual.**

## 1.4 TRAILS MANUAL DEVELOPMENT

The guidelines provided in this Trails Manual are based on an extensive literature review of trail design standards and specifications; outreach to trail planning, design, and maintenance professionals at federal, state, county, and local agencies; outreach to community-based trail advocacy groups; site-specific investigations of existing County trails and other trails located within the County; and consulting input from a variety of technical specialists, including landscape and trail planners and designers, environmental analysts, biologists, cultural resource specialists, geologists, and trail construction specialists. Numerous trail guidelines were evaluated, including U.S. Department of Agriculture Forest Service specifications and the Trail Construction and Maintenance Notebook,[7, 8] California State Parks Trails Handbook,[9] Santa Monica Mountains Area Recreation Trails Coordination Project Final Summary Report,[10] San Diego County Trails Program,[11] and general trail design publications such as *Natural Surface Trails by Design*,[12] International Mountain Bicycling Association's (IMBA) *Trail Solutions*,[13] and and *Trails for the Twenty-First Century: Planning, Design, and Management Manual for Multi-Use Trails*.[14]

[6] County of Los Angeles Department of Parks and Recreation. April 2004. *Strategic Asset Management Plan (SAMP) for 2020*. Prepared by: County of Los Angeles Chief Executive Office and County of Los Angeles Department of Parks and Recreation, with technical assistance by Sapphos Environmental, Inc.

[7] U.S. Department of Agriculture Forest Service. September 1996. *Standard Specifications for Construction and Maintenance of Trails, EM-7720-103*. Contact: Forest Service, Engineering Staff, Washington, DC.

[8] U.S. Department of Agriculture Forest Service. April 2004. *Trail Construction and Maintenance Notebook*. Contact: Forest Service Missoula Technology and Development Center, 5785 Hwy, 10 West, Missoula, MT.

[9] California State Parks. 1998. *Trails Handbook*. Contact: California State Parks, Statewide Trails Office, P.O. Box 942896, Sacramento, CA.

[10] Santa Monica Mountains Area Recreation Trails Coordination Project. September 1997. *Final Summary Report*. Contact: SMMART Coordination Project, c/o Rivers, Trails and Conservation Assistance Program, National Park Service, 600 Harrison Street, Suite 600, San Francisco, CA 94107. Available at: http://www.nps.gov/samo/parkmgmt/smmartreports-ept1997.htm

[11] San Diego County. 2005. *County Trails Program and the Community Trails Master Plan*. Contact: San Diego County Department of Parks and Recreation, Resource Management Division, 5201 Ruffin Road, Suite P, San Diego, CA.

[12] Parker, Troy Scott. 2004. *Natural Surface Trails by Design*. Boulder, CO: Natureshape LLC.

[13] International Mountain Bicycling Association. 2004. *Trail Solutions*. Boulder, CO: International Mountain Bicycling Association.

[14] Flink, Charles A., Kristine Olka, and Robert M. Searns. 2001. *Trails for the Twenty-First Century: Planning, Design, and Management Manual for Multi-Use Trails*. Washington, DC: Island Press.

## 1.5 RELATIONSHIP OF THE TRAILS MANUAL TO THE STRATEGIC ASSET MANAGEMENT PLAN FOR 2020

The SAMP[15] provides a strategic plan for development of recreational facilities and programs to serve the diverse needs of County residents and visitors through 2020, in light of existing deficiencies and anticipated population growth and recreation trends. The population of California is expected to grow to 45.4 million in 2020, leading the nation in job, population, and income growth.[16] Similarly, the incorporated and unincorporated population of the County is projected to grow to 11.6 million in 2020.[17] According to the SAMP, population growth, demographic shifts, and cultural variances cause changes in the need for passive and active recreational activities and programs to serve both the existing and future residents of the County.[18] The SAMP provides a tool for the prioritization of County resources for refurbishment of existing recreational facilities and the development of new facilities to meet the public demand and accommodate recreational programs over a planning horizon of 20 years. The data presented in the SAMP demonstrate that trail-based recreational activities, including hiking, horseback riding, and bicycling, are expected to continue to increase in popularity, thus accelerating the wear and tear of existing trail facilities and exacerbating the existing Countywide deficiency for trails. In an effort to support advanced planning activities related to trails, the National Recreation and Park Association goal of providing 1 mile of trail per 1,000 people (approximately 50 feet of trail per person) and the assumed rate of 11 percent of the population engaged in the use of trails were used to anticipate existing and future demand for trails. As a reference, the County of San Diego utilizes a baseline level of service of 0.8 mile of trail per 1,000 residents.[19]

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15 Santa Monica Mountains Area Recreation Trails Coordination Project. September 1997. *Final Summary Report*. Contact: SMMART Coordination Project, c/o Rivers, Trails and Conservation Assistance Program, National Park Service, 600 Harrison Street, Suite 600, San Francisco, CA 94107. Available at: http://www.nps.gov/samo/parkmgmt/smmartreports-ept1997.htm

16 U.S. Census Bureau. Last updated 15 July 2003. State and County QuickFacts, Los Angeles County, California. Web site. Available at: http://quickfacts.census.gov/qfd/states/06/06037.html

17 U.S. Census Bureau. Last updated 15 July 2003. State and County QuickFacts, Los Angeles County, California. Web site. Available at: http://quickfacts.census.gov/qfd/states/06/06037.html

18 County of Los Angeles Department of Parks and Recreation. April 2004. *Strategic Asset Management Plan (SAMP) for 2020*. Prepared by: County of Los Angeles Chief Executive Office and County of Los Angeles Department of Parks and Recreation, with technical assistance by Sapphos Environmental, Inc.

19 San Diego County. 2005. *County Trails Program and the Community Trails Master Plan*. Contact: San Diego County Department of Parks and Recreation, Resource Management Division, 5201 Ruffin Road, Suite P, San Diego, CA.

# SECTION 2.0
# TRAIL PLANNING

Consideration of regional context, project objectives, and the constraints and opportunities that each site presents is essential to the planning and construction of high-quality trails that will provide for the diverse needs of County of Los Angeles (County) residents and visitors. The trail planning process generally includes research and data gathering for the site, public outreach to stakeholders, and site-specific analysis and investigation of integration of and/interconnectivity of regional trail systems throughout Southern California. The results of the trail planning process will serve as the basis for a feasibility analysis of possible trail alignments that incorporate the goals and objectives of the project. Other factors that can be determined through the trail planning process and subsequent feasibility analysis are the anticipated cost for construction, operation, and maintenance of trails based on the physical characteristics of the site and the anticipated capacity of the trail. Recreation trends, as well as supply and demand data, can be used as the basis for analyzing the recreation planning objectives within a park planning area, a community plan, a specific plan, a master-planned community, or a project. Frequently, the trail planning process involves repeated refinement of trail segment options as new data are obtained and stakeholders are consulted. The quality of the final project will be directly related to the quality of the input provided during the project planning process (Figure 2-1, *Trail Planning Flowchart)*. There are numerous useful trail construction and maintenance books, trail guidebooks, agencies that plan and direct trail projects, and suppliers of trail products that are useful during the trail planning process (Appendix B, *Trail Resources*).

## 2.1 STEP 1: DEFINE PROJECT GOALS AND OBJECTIVES

The first step in the trail planning process is to define the project goals and objectives that will guide the planning and design process. These goals and objectives may have to be updated as the project progresses and new data are obtained and stakeholders are consulted.

### 2.1.1 Goal Statement

The goal statement is usually linked to an identified community need or in conjunction with a proposed development project. It is a statement of what the project is attempting to achieve. The goal statement for a trail project is linked to the type of need, as well as the geographic area where the need was identified.

### 2.1.2 Project Objectives

The project objectives define standards that must be achieved for the project goals to be met. Project objectives are frequently linked to planning policies related to the level or quality of service that is intended to be provided to County residents and visitors. Whenever possible, the objectives should be tied into statutes, laws, and regulations; goals or polices of the adopted general plan; other relevant planning guidelines; and industry standards.

The stakeholder participation process is complex and affects all facets of project planning, entitlement, construction, operation, and maintenance. Appendix C, *Stakeholder Coordination*, provides additional information.

## 2.2 STEP 2: EVALUATION OF RECREATIONAL TRAIL NEEDS IN THE SERVICE AREA

The second step in the planning process is to determine the demand for trails within the service area. The County of Los Angeles General Plan establishes the goal and supporting policies to provide recreational resources to meet the diverse needs of County residents and visitors.[1] The demand for trails is a function of the size of the service area, the percent of the population who use trails, and number of miles of trails required to support each 1,000 people who are likely to be engaged in that activity.

### 2.2.1 Defining the Service Area

In general, the County uses a two-tier classification to defining the service area for recreational facilities: park types are characterized as either "regional facilities" or "local parks" (Table 2.2.1-1, *County Standards for Recreation Service Areas*). Trails can be developed to meet the needs of regional facilities or local parks. In addition, some trails are designed as part of the open space element of a community plan, specific plan, or master-planned community and, are by definition, intended to serve the anticipated residents and visitors within the land use planning area. Other trails may be designed as destination trails that would be expected to serve residents of, and visitors to, the entire County.

[1] County of Los Angeles Department of Regional Planning. 1965. *County of Los Angeles General Plan*. Contact: Department of Regional Planning, Hall of Records, 320 West Temple Street, Los Angeles, CA 90012.

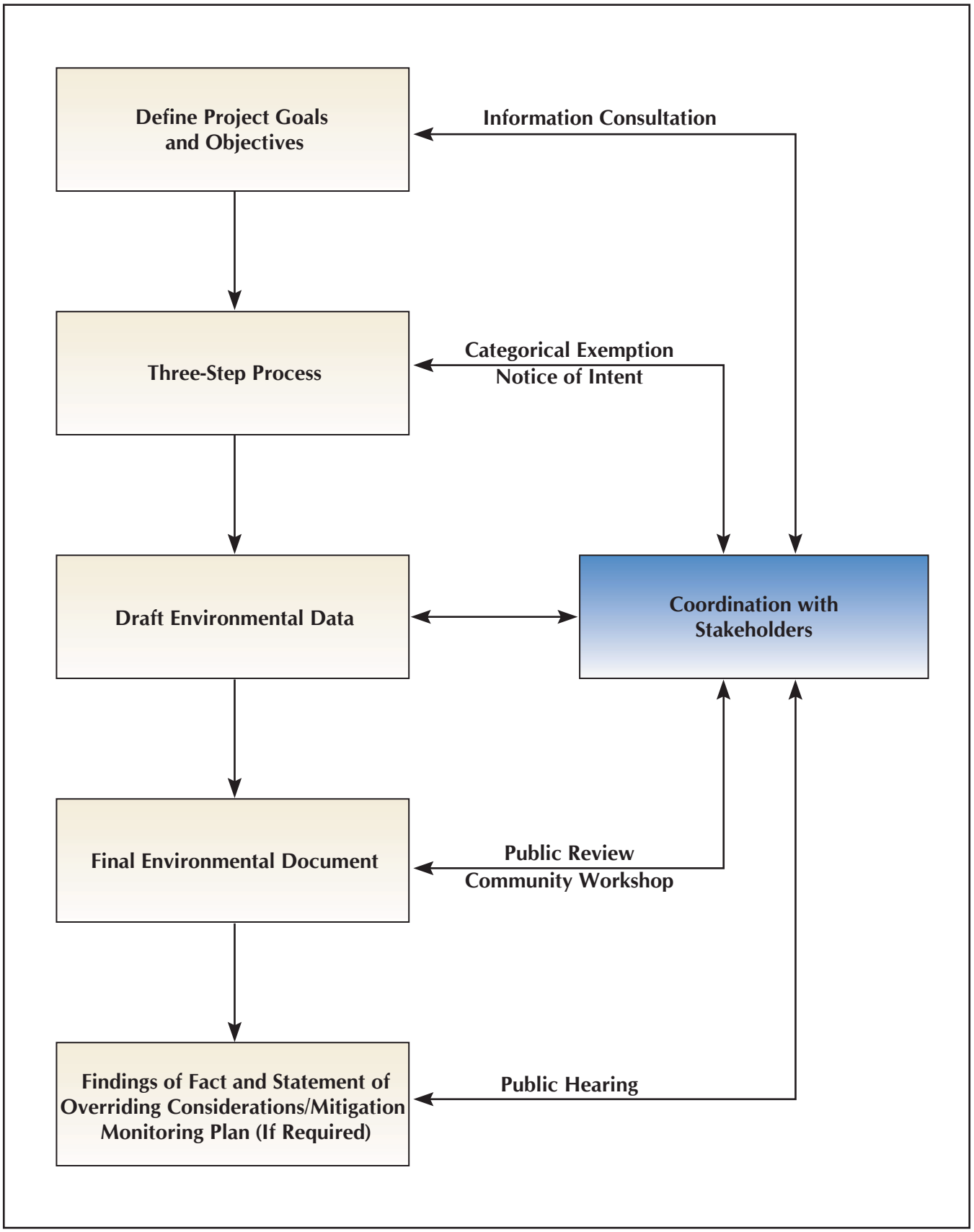


**Figure 2-1**
**Trail Planning Flowchart**

**TABLE 2.2.1-1**
**COUNTY STANDARDS FOR RECREATION SERVICE AREAS[2]**

| Park Type | Characteristics |
|---|---|
| **Regional Facilities** | |
| Regional | Provide a service radius of up to 50 miles in distance or 1 hour in driving time<br>Serve entire County population |
| Community Regional | Provide a service radius of up to 20 miles<br>Serve an entire County population |
| **Local Parks** | |
| Community | Provide a service radius of 0.5 to 1.5 miles<br>Serve a population of 4,000 to 25,000 residents |
| Neighborhood | Provide a service radius of up to 0.5 mile<br>Serve a population of 1,250 to 5,000 residents |

### 2.2.2 Sources of Data for Service Area Demand Analysis

There are a minimum of three sources of data that should be considered to define the existing population of the service area:

- County of Los Angeles General Plan[3]
- Southern California Association of Governments Regional Comprehensive Plan[4]
- U.S. Census Bureau data

Use these same sources of information to determine projected demand in the service area through the planning horizon established by the appropriate planning guidance document. Existing and projected population should be based on the most recent data available from the U.S. Census Bureau at the census tract level, and supplemented as appropriate by project-specific planning data that reflect the number of anticipated residents, employees, and visitors.

### 2.2.3 Demand Analysis

The County Strategic Asset Management Plan (SAMP) provides the existing and anticipated demand for trails in the County in relation to national opinion polls, supplemented by statewide data, and directed surveys of County recreational users. An analysis of trails demand can be based on participation rates from the National Statistical Abstracts recreation participation rate.[5] These rates are derived from a survey conducted nationwide by the National Sporting Goods Association.[6] Actual participation rates in the County will vary from national data due to factors such as climate, topography, and demographics. For the purposes of evaluating and planning the demand for trails, the SAMP used the goal of providing 1 mile per population of 1,000 (approximately 50 feet of trail for each trail user) and an assumption that approximately 11 percent of the population will engage in trail use, as specified by the National Recreation and Park Association.

**Calculation of Existing Demand**

$$\text{Existing demand (in miles)} = \frac{(\text{Existing population} \times 11\ \text{percent} \times 50\ \text{feet})}{5{,}280\ \text{feet/mile}}$$

**Calculation of Planning Horizon Projected Demand**

$$\text{Projected demand (in miles)} = \frac{\text{Projected population} \times 11\ \text{percent} \times 50\ \text{feet}}{5{,}280\ \text{feet/mile}}$$

### 2.2.4 Coordination with Stakeholders

Coordinate the results of the supply and demand analysis with stakeholders. This provides an opportunity to identify factors that are unique to the project site that may influence the supply and demand analysis (e.g., large private camps that use public trails as part of their programming, schools and after-school programs that use trails for outdoor education programs, etc.).

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2 County of Los Angeles Department of Parks and Recreation. April 2004. *Strategic Asset Management Plan (SAMP) for 2020*. Prepared by: County of Los Angeles Chief Executive Office and County of Los Angeles Department of Parks and Recreation, with technical assistance by Sapphos Environmental, Inc.

3 County of Los Angeles Department of Regional Planning. 1965. *County of Los Angeles General Plan*. Contact: Department of Regional Planning, Hall of Records, 320 West Temple Street, Los Angeles, CA 90012.

4 Southern California Association of Governments. January 1995. *Regional Comprehensive Plan and Guide*. Los Angeles, CA.

5 U.S. Census Bureau. Last updated 4 January 2006. "Arts, Entertainment, and Recreation." In *Statistical Abstract of the United States: 2004-2005*. Available at: http://www.census.gov/prod/2005pubs/06statab/arts.pdf

6 National Sporting Goods Association. Last updated 2006. *Sports Participation in 2002: Series 1 and Series II* Mt. Prospect, IL.

## 2.3 STEP 3: INVENTORY OF EXISTING TRAILS AND RECREATIONAL RESOURCES

The third step in the trail planning process is the inventory of existing trails, their features, and related recreational resources. The inventory consists of identifying existing trails in the service area that will serve as the basis for determining the number of miles of anticipated unmet need. The jurisdictional ownership of the trails should be noted. Where sufficient documentation of the existing network of trails is not available, a field inventory may be necessary. A field inventory would require surveying the existing trail network with global positioning system (GPS) units. Coordination with the Los Angeles Region Imagery Acquisition Consortium (LAR-IAC) should be undertaken to document the inventory of existing trails. Destination features such as unique biological, cultural, geological, hydrological, recreational resources, and viewpoints of interest within the proposed service area should be identified on the map. However, care should be taken in safeguarding localized data for historic or archaeological resources that may be vulnerable to vandalism or unauthorized collection. Schools, transportation hubs, and other special "nodes" may also need to be identified as potential links, destination points, access, and staging areas.

### 2.3.1 Sources of Information for Existing Trails and Recreational Resources

- County of Los Angeles General Plan[7]
- Los Angeles County Regional Recreation Areas Plan[8]
- "Shaping the Future 2025" Draft General Plan Conservation/Open Space element (in preparation)[9]
- Strategic Asset Management Program for 2020[10]
- County of Los Angeles Department of Parks and Recreation, A Parks and Recreation Strategic Plan for 2010 [11]
- Los Angeles County Riding and Hiking Trails[12] - Planning Section
- County of Los Angeles Inventory of Park Facilities and Areas of Jurisdiction[13]
- Southern California Association of Governments Regional Comprehensive Plan[14]
- Metropolitan Transit Authority's Long Range Transportation Plan[15]
- Federal- and state-level recreational need assessment evaluations developed by federal and state resource agencies, including the U.S. Forest Service's Angeles National Forest Land and Resources Management Plan,[16] the California Outdoor Recreation Resource Plan (CORRP),[17] and the 2005 California Recreation Policy[18]
- USGS topographic maps (1:24,000 scale) available at: http://www.usgs.gov
- Forest Service maps available at: http://www.fs.fed.us/maps
- Tom Harrison maps available at: http://www.tomharrisonmaps.com
- LAR-IAC maps available at: http://planning.lacounty.gov/LARIAC/
- Los Angeles River Revitalization Master Plan[19]
- San Gabriel River Master Plan[20]

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[7] County of Los Angeles Department of Regional Planning. 1965. *County of Los Angeles General Plan*. Contact: Department of Regional Planning, Hall of Records, 320 West Temple Street, Los Angeles, CA 90012.

[8] County of Los Angeles Department of Regional Planning. 1986. *Los Angeles County Regional Recreation Areas Plan* Contact: Department of Regional Planning, Hall of Records, 320 West Temple Street, Los Angeles, CA 90012.

[9] County of Los Angeles Department of Regional Planning. 2005. *Draft General Plan Conservation/Open Space Element*, "Shaping the Future 2025." Contact: Department of Regional Planning, Hall of Records, 320 West Temple Street, Los Angeles, CA 90012.

[10] County of Los Angeles Department of Parks and Recreation. April 2004. *Strategic Asset Management Plan (SAMP) for 2020*. Prepared by: County of Los Angeles Chief Executive Office and County of Los Angeles Department of Parks and Recreation, with technical assistance by Sapphos Environmental, Inc.

[11] County of Los Angeles Department of Parks and Recreation. May 1992. *A Parks and Recreation Strategic Plan for 2010*. Contact: 433 South Vermont Avenue, 4th Floor, Los Angeles, CA 90020.

[12] County of Los Angeles Department of Parks and Recreation. 2001. *Los Angeles County Riding and Hiking Trails*. Contact: 433 South Vermont Avenue, Los Angeles, CA 90020.

[13] County of Los Angeles Department of Parks and Recreation. 2003. *County of Los Angeles Inventory of Park Facilities and Areas of Jurisdiction*. Contact: Department of Regional Planning, Hall of Records, 320 West Temple Street, Los Angeles, CA 90012.

[14] Southern California Association of Governments. January 1995. *Regional Comprehensive Plan and Guide*. Los Angeles, CA.

[15] County of Los Angeles Metropolitan Transit Authority. 2001. *Long Range Transportation Plan for Los Angeles County*. Contact: Metropolitan Transit Authority, One Gateway Plaza, Los Angeles, CA 90012. Available at: http://www.mta.net/projects_plans/bikeway_planning/default.htm

[16] U.S. Department of Agriculture Forest Service. 1987. *Angeles National Forest Land and Resources Management Plan*. Contact: Forest Service Pacific Southwest Region, 1323 Club Drive, Vallejo, CA 94592.

[17] California Department of Parks and Recreation. Revised June 1974. *California Outdoor Recreation Resource Plan (CORRP)*. Contact: California Department of Parks and Recreation, 1416 9th Street, Sacramento, CA 95814.

[18] California Department of Parks and Recreation. 2005. *2005 California Recreation Policy*. Contact: California Department of Parks and Recreation, 1416 9th Street, Sacramento, CA 95814. Available at: http://www.parks.ca.gov/pages/795/files/rec_policy_final_2005.pdf

[19] City of Los Angeles. April 2007. *Los Angeles River Revitalization Master Plan*. Available at: http://www.lariverrmp.org/

[20] County of Los Angeles Department of Public Works. June 2006. *San Gabriel River Master Plan*. Available at: http://dpw.lacounty.gov/wmd/watershed/sg/mp/docs/SGR_MP.pdf

### 2.3.2 Supply Analysis

The analysis of trail supply is based on summing the total distance of all the trails available in the service area.

**Calculation of Existing Supply**

Existing supply = Sum of all existing trail segments in the service area

**Calculation of Planning Horizon Projected Supply**

Projected supply = Sum of all existing and entitled trail segments

**TABLE 2.4-1**
**TRAIL TYPES**

| Trail Type | Tread Width | Intensity of Use | Impact to Existing Conditions | Surface Type |
|---|---|---|---|---|
| A. Urban Pedestrian Path | 10 to 11 feet | High | High | Crusher fines / decomposed granite |
| B. Recreational Pathway | 8 to 10 feet | High | High | Natural surface |
| C. Natural Trail 1 | 7 to 10 feet | High | Medium | Natural surface |
| D. Natural Trail 2 | 5 to 8 feet | Medium to high | Low | Natural surface |
| E. Natural Trail 3 | 2 to 3 feet | Low | Minimal | Natural surface |

## 2.4 STEP 4: CONCEPTUAL TRAIL ALIGNMENT

The fourth step in the planning process is to develop a conceptual trail alignment capable of meeting the project goals and objectives. The trail planning process must recognize and work within the inherent environmental site conditions to achieve as many of the basic objectives of the project as possible. The trail must also be designed to meet the basic requirements of expected users, as well as connect with existing trail segments. In addition, the trail alignment must be designed with engineering and aesthetic factors in mind, such as the topography and soil types, and the desired experience.

This section includes information on trail types established for design guidelines. It is meant to be used to determine trail type based on planning focus. The following planning focus tables are meant to be used as a scoring system by the trail planner. It is up to the trail planner to determine the most important focus. The design guidelines for trails provided in Section 4.3, Application of Design Guidelines, are based on best management practices (BMPs) and serve as a means of standardizing trail development. However, portions of a trail may include combinations of trail types due to site-specific minimum and maximum trail tread widths that were developed based on a thorough literature review of established standards and guidelines utilized by federal, state, and local agencies, including the Forest Service Trail Handbook, and the State of California Department of Parks and Recreation Trail Handbook, as well as consultation with trail building professionals (Table 2.4-1, *Trail Types*).[21, 22] Generally, an 8-foot-wide Natural Trail 2 is the recommended trail type to be utilized throughout the County where site conditions support its use. Natural Trail 2 and all other trail types were designed to meet the current Americans with Disabilities Act (ADA) recommendations for trails.[23]

### 2.4.1 Trail Types

Trails can be categorized using multiple classification systems. This Trails Manual provides a method of classification based on planning and design criteria to determine the trail type appropriate for a particular site. This classification can also be utilized to determine trail maintenance priorities. The trail planner should evaluate a trail based on the four distinct planning focuses: trail user, trail location, trail purpose, and trail site conditions (Figure 2.4.1-1, *Trail Type Identification*). A trail may have four different recommended trail types. The final trail type is based on the particular planning focus of the project.

The planning focus of the trail can either be: 1) the trail users (hiker, equestrian, cyclist, accessibility challenged) and their experience level, 2) the location (regional or local), 3) the purpose of the trail (connecting trails, interpretation, or a destination), and 4) the site conditions (sensitive areas). Well-planned, -designed, and -maintained trails are generally more dependant on

[21] U.S. Department of Agriculture Forest Service. April 2004. *Trail Construction and Maintenance Notebook*. Contact: Forest Service Missoula Technology and Development Center, 5785 Hwy, 10 West, Missoula, MT.

[22] California State Parks. 1998. *Trails Handbook*. Contact: California State Parks, Statewide Trails Office, P.O. Box 942896, Sacramento, CA.

[23] Architectural and Transportation Barriers Compliance Board. 30 September 1999. *Accessibility Guidelines for Outdoor Developed Areas: Final Report*. Available at: http://www.access-board.gov/outdoor/outdoor-rec-rpt.htm

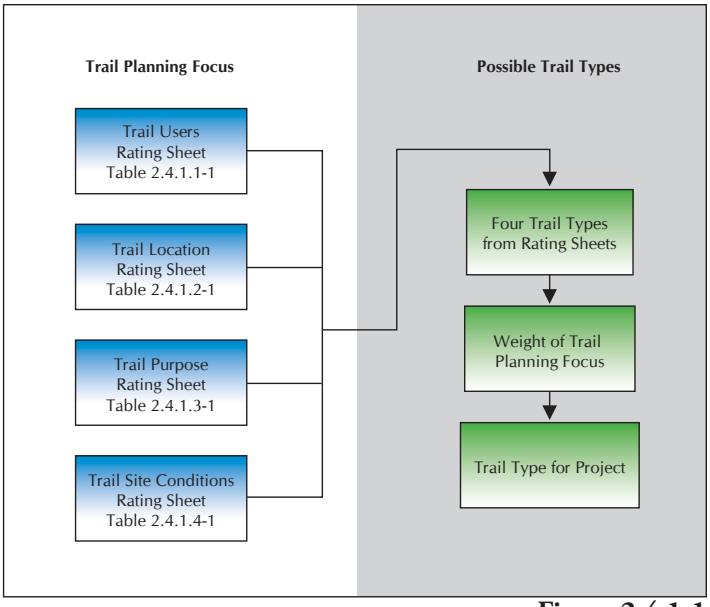



**Figure 2.4.1-1**
**Trail Type Identification**

site conditions such as soil type and slope. As a result, the trail site conditions planning focus should typically be the determining factor for the type of trail to construct.

The four planning focus worksheets provide a scoring method to determine the type of trail that is suitable for a particular project. In addition, California State Parks has developed a unique classification system that provides guidance on setting maintenance priorities; this system is discussed later and cross-referenced with the trail types described in this Trails Manual.

### *2.4.1.1 Trail Users*

Proper trail design should take into account the needs of expected user types, as well as the conditions of the proposed trail environment. Both the needs of the users and the conditions dictate the type of trail and trail-users. A goal of trail planning within the County is to design trails for use by hikers, equestrians, and bicyclists. However, occasions arise where trails will not be open to multiple uses due to site-specific environmental constraints such as blue-line streams, which may necessitate limitations of a particular type of use. In such instances, hiking only or dual-use trails, such as hiking or biking trails, may be appropriate. Table 2.4.1.1-1, *Trail User Rating Planning Focus Worksheet,* provides a list of criteria to determine the proper trail to develop based on users. Trails should be designed with the expected users in mind, and consider their experience level and recreational expectations. In highly urbanized areas, a lower user experience level can be anticipated and a trail of lower difficulty, such as Natural Trail 1 or Natural Trail 2, may be expected and welcomed by users.

#### *2.4.1.1.1 Accessible Trails*

In planning, trail usage steps should be taken to ensure accessibility for all potential trail users. Therefore, trail planning must take into account users' various needs and conditions. In areas where it is feasible, trails should be located adjacent to already accessible trailheads and or accessible recreational elements, such as parks. It is also important to locate accessible trails that reach highly used destination areas such as waterfalls, scenic vistas, or other points of interest. Trail alignments should be located in areas where grade and obstacles will not be a problem with accessible trails. This requires careful planning and route selection to ensure grades are ideally below 8 percent, widths are at least 36 inches, few protruding objects are present, tread obstacles are less than 2 inches in height, and that the surface is reasonably firm. Additional information regarding designing accessible trails is provided in Section 4.3.1.1, ADA Compliance.

### *2.4.1.2 Trail Locations*

The location of a trail in terms of its park setting or its distance from an urban or other open space setting may also determine the type of trail to be designed and designated. Table 2.4.1.2-1, *Trail Location Rating Planning Focus Worksheet*, provides a list of criteria to determine the proper trail to develop based on the trail's location and distance to trail facilities. The type of trail to be built and maintained will differ depending on the location of the trail, such as in an urban park versus a National

**TABLE 2.4.1.1-1**
**TRAIL USER RATING PLANNING FOCUS WORKSHEET**

| User Criteria | Criteria Ranking | Rating |
|---|---|---|
| Accessibility | 5 to 1 (assign a higher number to more accessible trails) | |
| Frequency of use | 3 to 1 (assign a higher number to more frequently used trails) | |
| User experience level | 3 to 1 (assign a higher number when less experienced users are expected) | |
| Multiple user types | 2 to 1 (assign a higher number when there are multiple user types) | |
| | **Total:** | |

**KEY:**
Total ≥ 11 equals Trail Type A, Urban Pedestrian Path
Total 10 to 11 equals Trail Type B, Recreational Pathway
Total 8 to 10 equals Trail Type C, Natural Trail 1
Total 6 to 8 equals Trail Type D, Natural Trail 2
Total < 6 equals Trail Type E, Natural Trail 3

## TABLE 2.4.1.2-1
## TRAIL LOCATION RATING PLANNING FOCUS WORKSHEET

| Location Criteria | Criteria Ranking | Rating |
|---|---|---|
| Within local park | 5 to 1 (assign a higher number to trails within or connected to a local park) | |
| Within regional park | 3 to 1 (assign a higher number to trails close to a regional park ) | |
| Adjacent to visitor facility | 3 to 1 (assign a higher number to trails close to a visitor center) | |
| Parking access | 2 to 1 (assign a higher number to trails with parking access) | |
| | **Total:** | |

**KEY:**
Total ≥11 equals Trail Type A, Urban Pedestrian Path
Total 10 to 11 equals Trail Type B, Recreational Pathway
Total 8 to 10 equals Trail Type C, Natural Trail 1
Total 6 to 8 equals Trail Type D, Natural Trail 2
Total <6 equals Trail Type E, Natural Trail 3

Forest or wilderness area. Local trails will be utilized by local populations; therefore, depending on the expected intensity of use, Natural Trail 2 is recommended, but either Natural Trail 1 or 3 may be preferable based on site-specific conditions. Local trails can be close to areas with high population densities; therefore, local trails may experience a higher intensity of use and require a wider trail width to accommodate the increased number of users. Regional trails extend over large expanses of land, providing a continuous route around or through areas such as a mountain range or around the rim of a valley (e.g., Pacific Crest Trail is 2,650 miles long and passes through three states). Regional trails should typically be designed to adhere to guidelines for Natural Trail 2 or 3. Trails within parks should be designed for diverse users and therefore, utilize guidelines for Urban Pedestrian Path, Recreational Pathway, or Natural Trail 1.

### *2.4.1.3 Trail Purpose*

The purpose of a trail is one of the most important considerations in design and construction. The purpose of a trail is a function of its intended result, end, mean, aim, or goal, whether or not the purpose was a primary or secondary effect. Therefore, by definition, the purpose of a trail is a function of the location and the ability to serve as a stand-alone feature or provide a connection between features. The purpose of a trail may be as simple as providing a walking / exercise path within a local park. Trails may also be a means of providing access to destination points of interest. A trail may serve as an educational or introspective venue when located in conjunction with natural or cultural resources. At the greatest scale, trails may serve as part of an infrastructure that provides an opportunity to explore regional resources by walking, hiking, horseback riding, or mountain biking. Trails within an urban park or adjacent to a visitor center should be designed for higher frequency of use and accessibility. The guidelines for Pedestrian Path, Recreational Pathway, and Natural Trail 1 are intended for these types of trails. The guidelines for Natural Trail 2 or 3 are intended for General LACO-DPR multi-use trails. Table 2.4.1.3-1, *Trail Purpose Rating Planning Focus Worksheet*, provides a list of criteria to determine the proper trail to develop based on the trail's intended purpose and connection to other trails or to trail facilities.

## TABLE 2.4.1.3-1
## TRAIL PURPOSE RATING PLANNING FOCUS WORKSHEET

| Purpose Criteria | Criteria Ranking | Rating |
|---|---|---|
| Connection of visitor centers | 5 to 1 (assign a higher number to trails directly connecting to a visitor center) | |
| Connection of regional trails | 2 to 1 (assign a higher number to trails connecting multiple trails) | |
| Interpretative trail | 3 to 1 (assign a higher number to trails utilized for interpretative purposes within a park) | |
| Loop trail | 2 to 1 (assign a higher number to loop trails) | |
| Destination trail | 3 to 1 (assign a higher number to trails with a destination purpose, but reduce the number as the distance to the destination increases) | |
| | **Total:** | |

**KEY:**
Total ≥12 equals Trail Type A, Urban Pedestrian Path
Total 10 to 12 equals Trail Type B, Recreational Pathway
Total 8 to 10 equals Trail Type C, Natural Trail 1
Total 6 to 8 equals Trail Type D, Natural Trail 2
Total <6 equals Trail Type E, Natural Trail 3

### *2.4.1.4 Trail Site Conditions*

In addition to selecting a type of trail based on the expected user, trail location, and intended purpose, trail planning must also consider the specific site conditions and areas to avoid, specifically areas of steep terrain, areas adjacent to blue-line streams or oak trees, areas that cross wetlands, or areas with highly erodible soils or other environmentally sensitive features identified during the feasibility analysis for the trail. Table 2.4.1.4-1, *Trail Site Conditions Rating Planning Focus Worksheet*, provides a list of criteria to determine the proper trail to develop based on the physical environmental where the trail is located. Trails should be designed to avoid environmentally sensitive features by evaluating feasible alternative routes or at least minimize potential impacts to the maximum extent practicable. In areas where sensitive site conditions exist, a reduction in the impact of the trail will require a reduction in the width of the trail. In addition, certain users may need to be restricted; for example, equestrian use may be restricted adjacent to streams and water courses that are seasonal or man-made in order to reduce surface water pollution due to equine pathogens. In areas with site-specific environmental constraints, trails should adhere to the guidelines for Natural Trail 3 to reduce impacts to the surrounding environment and reduce trail construction and maintenance costs.

### *2.4.1.5 Trail Type Identification*

The final trail type is identified based on the rating sheets for trail user, trail location, trail purpose, and trail site conditions. Table 2.4.1.5-1, *Example Trail Type Identification*, provides an example of trail type identification using the four worksheets. After collecting the results of the four rating sheets, the trail planner must determine which criterion is the most important for the trail and assign a correspondingly greater or lesser weight to each criterion. Typically, the trail site conditions criterion should be assigned the greatest weight for determining the trail type; however, if the trail will be located in a very densely populated area, have a high number of user types, and have a variety of user types, the trail user criterion should be assigned the greatest weight.

## 2.4.2 California State Parks Maintenance Evaluation System

The California State Parks Department includes a trail maintenance classification system (Table 2.4.2-1, *State Parks Trail Maintenance Classification Matrix*) to allow managers to follow maintenance and design standards, and to assign work priorities that are consistent with a trail's primary function, environmental sensitivity, and relationship to developed facilities and visitor use.[24] Managers can use this system to determine which

**TABLE 2.4.1.4-1**
**TRAIL SITE CONDITIONS RATING PLANNING FOCUS WORKSHEET**

| Site Conditions Criteria | Criteria Ranking | Rating |
|---|---|---|
| Sensitive environment | 3 to 1 (assign a lower number to trails crossing or located in sensitive environments) | |
| Landslide and rock fall risk | 5 to 1 (assign a higher number to trails where landslide and rock fall is an issue due to the high number of users or types of users) | |
| Developed or urban location | 3 to 1 (assign a higher number to trails that occur in or originate in developed locations) | |
| | **Total:** | |

**KEY:**
Total ≥11 equals Trail Type A, Urban Pedestrian Path
Total 10 to 11 equals Trail Type B, Recreational Pathway
Total 8 to 10 equals Trail Type C, Natural Trail 1
Total 6 to 8 equals Trail Type D, Natural Trail 2
Total <6 equals Trail Type E, Natural Trail 3

**TABLE 2.4.1.5-1**
**EXAMPLE TRAIL TYPE IDENTIFICATION**

| Criteria | Trail Type* | Score |
|---|---|---|
| Trail user | Trail Type C, Natural Trail 1 | 9 |
| Trail location | Trail Type D, Natural Trail 2 | 7 |
| Trail purpose | Trail Type D, Natural Trail 2 | 7 |
| Trail site conditions | Trail Type E, Natural Trail 3 | 4 |
| **Final Trail Type:** | Trail Type E, Natural Trail 3 | |

**KEY:**
* From each of the four rating sheets

[24] California State Parks. 1998. *Trails Handbook*. Contact: California State Parks, Statewide Trails Office, P.O. Box 942896, Sacramento, CA.

trails should have priority for maintenance based on numerous criteria that include intensity of use, location, and types of users. By utilizing the table, one can determine those trails that should have a higher trail maintenance priority on a typical basis. State Parks Class I trails are assigned the highest value for trail construction and maintenance, and therefore would have the highest priority. However, situations may arise that would require work to be conducted on a State Parks Class IV trail before a State Parks Class I Trail. The placement of trails into these classes is determined by adding the values placed in the rating column for each criterion; the sum will determine which class a trail falls into.

***Class I***

This trail class includes ADA-accessible, equestrian, mountain biking, interpretive, and hiking trails. Class I trails may include gravel, turnpikes, puncheon, or other drainage structures in areas of trail trenching, trampling, multiple trails, or saturated trail beds for resource protection and visitor safety. The trail tread varies from 30 inches to 48 inches depending on site conditions. Due to the high use of this class of trail, numerous bridges, drainage structures, and retaining structures may be utilized. This trail class would include Urban Pedestrian Path, Recreational Pathway, Natural Trail 1, and Natural Trail 2.

***Class II***

This trail class includes hiking trails providing access into regions away from developed visitor use facilities. Native material is used for trail tread. The trail tread will be 18 to 24 inches. Some structures and bridges may be necessary for this trail class. This trail class would include Recreational Pathway, Natural Trail 1, and Natural Trail 2.

**TABLE 2.4.2-1**
**STATE PARKS TRAIL MAINTENANCE CLASSIFICATION MATRIX**

| Criterion | Point Value | Rating |
|---|---|---|
| Handicapped accessible | 20 | |
| Interpretive | 20 | |
| Within visitor use facility | 20 | |
| Equestrian and bike | 15 | |
| Adjacent to visitor use facility | | |
| a. 0–1/4 mile | 12 | |
| b. 1/4–1 mile | 8 | |
| c. 1–2 miles | 4 | |
| d. 2 or more miles | 0 | |
| Connection of visitor use facilities | 5 | |
| Parking access | 5 | |
| Destination oriented | | |
| a. 0–1 mile | 3 | |
| b. 1–3 miles | 2 | |
| c. 3+ miles | 1 | |
| Connection with other agency trail | +3 to +5 | |
| Special use or access | 1 | |
| Dead end trail | 0 or –3 | |
| Loop or connecting trail | +1 to +3 | |
| Fragile environment | | |
| a. Protected by lessening use | –1 to –3 | |
| b. Protected by upgrading | +1 to +3 | |
| Safety factors | | |
| a. Encourage less use by not providing improvements | –1 to –5 | |
| b. Provide and maintain improvements | 0 to +5 | |
| Staff determined use patterns | | |
| a. Little or no use | –1 to –3 | |
| b. Higher use | +1 to +3 | |
| | **Total:** | |

**KEY:**
Rating of 20+ = Class I trail
Rating of 10 to 19 = Class II trail
Rating of 5 to 9 = Class III trail
Rating of 0 to 4 = Class IV trail

***Class III***

The trail class includes lightly used hiking trails. The trail tread ranges between 12 to 18 inches and utilizes native materials for the trail tread. These trails have little to no drainage or crossing structures. This trail class would include Natural Trail 1, Natural Trail 2, and Natural Trail 3.

***Class IV***

This trail class includes special use and access trails. The trail tread is minimal in size but wide enough to provide safe footing. The trail class should avoid use of any structure or drainage control. This trail class would include Natural Trail 3.

## 2.4.3 Alignment Layout

The trail conceptualization process must include the initial alignment layout, which is designed based on control points, topography, and desired trail experience.

### *2.4.3.1 Control Points*

When aligning a trail, it is essential to develop a set of control points for a trail alignment. Positive and negative features should be used as control points to provide a richer trail experience, as well as protection for the surrounding open space and sensitive areas (Figure 2.4.3.1-1, *Example Control Points*). Positive features are those for which a trail should be designed to reach, such as a waterfall, historic site, scenic viewpoint, or a connection with another trail. Negative features are those that a trail should avoid, such as a critical habitat or hazardous terrain.[25] The most crucial positive control points are the starting and ending points for a trail. Consideration must be given to how users will access the trail. Oftentimes, parks and other recreation facilities with amenities such as parking, comfort stations, and other site amenities, serve as excellent trailheads. Control points should direct the path of a trail and ensure that trails avoid areas that will pose a hazard to users or will cause excessive damage to natural resources. In general, trail alignments should be developed to avoid urban and suburban areas and provide the user with an open space experience. Choose an alignment that provides good opportunities for future realignment of the trail should that become necessary. Look for conveniently spaced flat areas where climbing turns and switchbacks can be easily built. Finally, create alignments that traverse slopes in a curvilinear fashion, and stagger switchbacks for a more attractive and durable trail. Switchbacks should be minimized to the maximum extent practicable through the initial design layout and utilized where required to gain elevation within a reasonable grade. Good initial design of a trail alignment is the best management tool available.

**Positive Control Points:**

- Existing trailheads
- Local parks
- Regional parks
- Federal and state parks and public lands
- Natural and open space areas
- Natural habitats
- Unique geological or natural features
- Existing trails
- Paleontological, archaeological, or historic sites
- Scenic vistas

**Negative Control Points:**

- Blue-line streams
- Wetlands
- Habitat for sensitive species
- Private landholdings
- Urban areas
- Street crossings
- Off-highway vehicle recreation areas

### *2.4.3.2 Topography*

The conceptual alignment should strive to reduce excessive trail grades by following the natural contours of the land, thus reducing the need for and use of switchbacks. This can be accomplished by having the conceptual trail follow contour lines on a USGS topographic map or LAR-IAC imagery to the maximum extent practicable. When laying out a trail that must gain elevation, it is preferable to increase the length of the trail segment to progress across contour lines to ensure that the trail grade is not excessive. As the trail grade increases, erosion on the trail will become a constraint on trail development and maintenance.

### *2.4.3.3 Trail Experience*

Many users, especially those from urban areas, expect a trail to provide more than a cleared path from one place to another. They are looking for an experience that may include the natural environment, beautiful landscape features and panoramic views, photographic opportunities, a place to have a picnic, a challenging physical experience, or simple serenity. Users may also wish to avoid dangerous cliffs, visual blight, or poisonous plants. To provide a good trail experience while protecting surrounding natural features, plants, and animals, land managers can identify sensitive areas where users would have negative impacts or where building a trail may contribute to washouts or mudslides.

Trail design, layout, and construction should strive for creating a stimulating and emotive experience at every turn. In order to provide the optimal recreational benefits for trail users, consid-

[25] International Mountain Bicycling Association. 2004. *Trail Solutions*. Boulder, CO: International Mountain Bicycling Association.

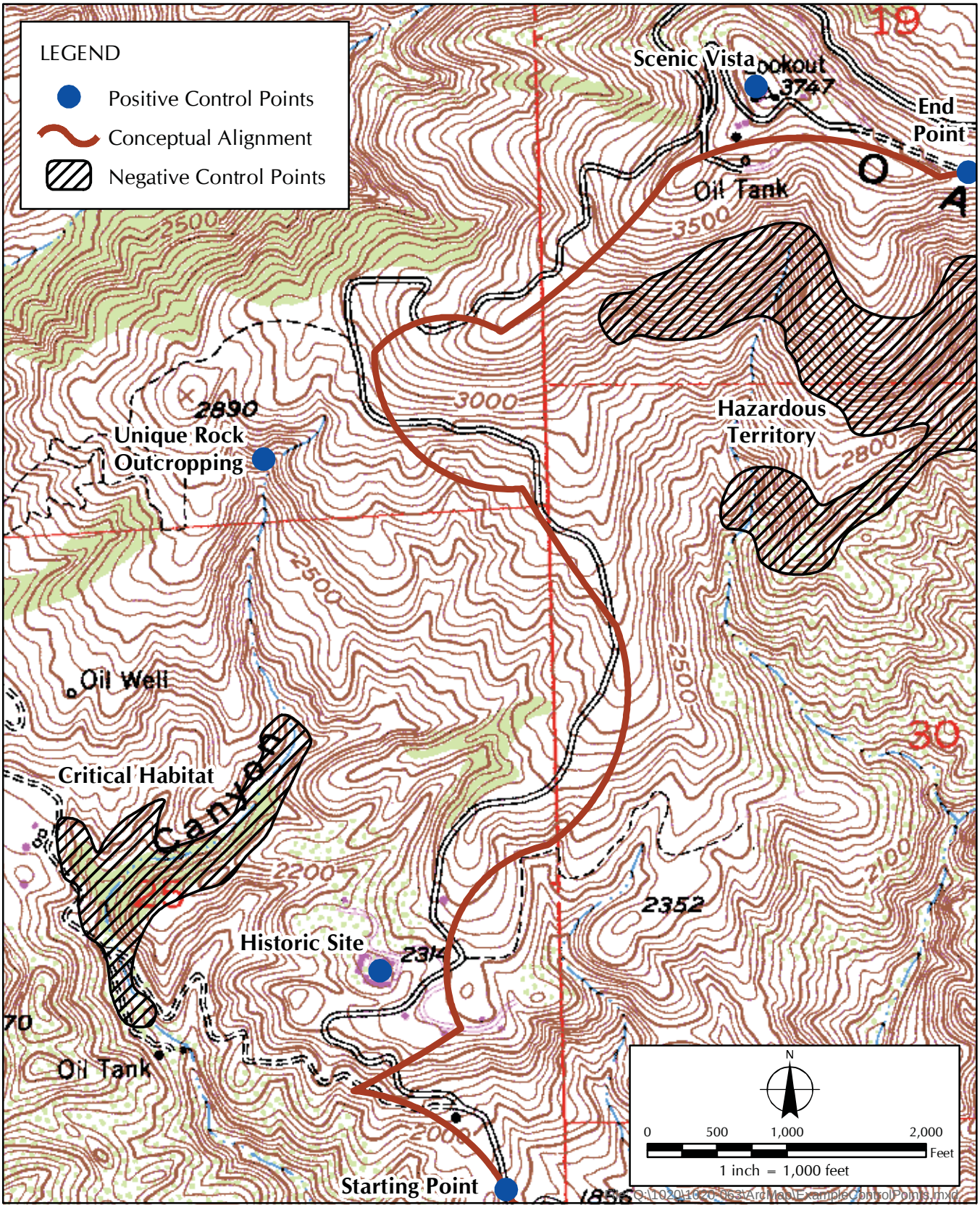



**Figure 2.4.3.1-1**
**Example Control Points**

er the following design strategies during trail design and utilize these strategies to create and blend the types of experiences for a trail user as described in Natural Surface Trails by Design.[26]

**Natural Shapes.**
Natural shapes refers to designing a trail to incorporate natural forms and may be defined by words such as "rough," "rustic," and "wild." Trails should follow the contours of the landform and general topography in a way that blends with the landscape. Straight lines, constant-radius curves, and predictable curvilinear lines should very rarely be used in trail design (Figure 2.4.3.3-1, *Natural Shapes*).

**Figure 2.4.3.3-1**
**Natural Shapes**

**Anchors.**
Anchors are visual markers that attract a trail user's attention and compel the trail user to move toward the anchor, be it an interesting rock, tree, or an exposed bluff. An anchor is similar to a control point for a trail in that it influences the path of the trail. Anchors should be located at the end of all trail switchbacks to provide an incentive to stay on the trail and reward the user with a point of interest. Anchors should be used intermittently throughout the trail to enhance the variety of experiences that the trail has to offer (Figure 2.4.3.3-2, *Anchors*).

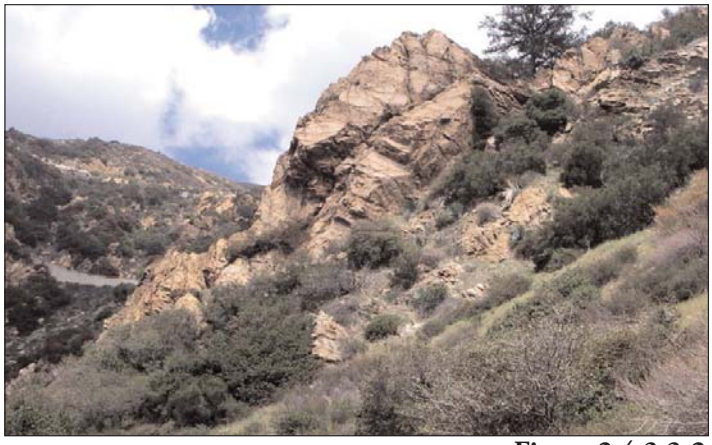


**Figure 2.4.3.3-2**
**Anchors**

**Edges.**
Edges are a type of anchor because they capture a trail user's interest. Edges occur at the intersection of two different features, for example, a river's edge, a cliff's edge, or the edge at a stand of trees. Edges are generally intriguing places to be, and trails should explore edgeways by following, crossing, crisscrossing, and interacting with them in a variety of ways (Figure 2.4.3.3-3, *Edges*).

**Figure 2.4.3.3-3**
**Edges**

**Gateways.**
Gateways occur when there are strong anchors on both sides of the trail. Gateways create a psychological threshold for the trail user and should be used to enhance the drama of major shifts in scenery or to introduce an interesting view. Gateways are used in a more standard way at the start of a trail as a psychological introduction to the natural world experience (Figure 2.4.3.3-4, *Gateways*).

**Figure 2.4.3.3-4**
**Gateways**

[26] Parker, Troy Scott. 2004. *Natural Surface Trails by Design*. Boulder, CO: Natureshape LLC.

**Vistas**.
A visually exciting composition can occur when a trail sets up an interesting combination of foreground and background views. Trails should introduce scenic views with a sense of layering and give views a sense of depth (Figure 2.4.3.3-5, *Vistas*).

**Figure 2.4.3.3-5**
**Vistas**

**Playfulness.**
Playfulness with trail planning means incorporating interesting features just for the sake of having trail users interact with them. This may be providing access to a group of rock outcroppings for opportunities to scramble up a boulder for sheer fun or to reach a higher vista point, or to access a waterfall to take a refreshing splash in the pool (Figure 2.4.3.3-6, *Playfulness*).

**Figure 2.4.3.3-6**
**Playfulness**

**Harmony.**
Harmony results from a properly designed trail that utilizes natural shapes, visual anchors, natural edges, gateways, and aesthetically pleasing combinations of views at different depths. Harmony is accomplished in trail design when the trail feels like it belongs to and was created by the natural landscape (Figure 2.4.3.3-7, *Harmony*).

**Figure 2.4.3.3-7**
**Harmony**

### 2.4.4 Easements

Conservation or trail easements are a commonly used strategy to help trail projects on private lands move forward. A conservation easement is a legal agreement between a landowner and an eligible organization, such as a public agency or nonprofit organization, which restricts future activities or uses on the land, such as development. If a private landowner creates an easement for trail use, the easement can be donated or granted directly to the County. However, not all granted trail easements have existing trails or pathways and, consequently, a trail must be constructed on those easements. The trail easement width and the trail tread width is site dictated. The trail easement width is larger than the trail tread constructed to provide a buffer for the private landowner and trail users.

## 2.5 STEP 5: FEASIBILITY ANALYSIS

The final step in the trail planning process is the assessment of feasibility. A feasibility analysis assesses the proposed trail alignment with regard to engineering, environmental, economic, and social opportunities and constraints. The feasibility analysis outlined in this section is a sample approach that can be modified by adding or removing particular parameters to make it applicable to a specific trail project. However, the general approach of analyzing engineering, environmental, economic, and social factors is recommended. The level of detail provided is not applicable to all situations and can be reduced or expanded where needed.

### 2.5.1 Engineering Factors

Engineering opportunities and constraints should be analyzed by considering the various phases of the permitting, environmental review, design, and feasibility processes that must occur before and during trail construction. Some of these considerations include excavation, grading, drainage, and erosion control for trail construction. A "feasible" alignment would not require substantial engineering specifications or review. A "feasible, but constrained" alignment would require increased excavation, grading, installation of a bridge, drainage, and erosion control, leading to design modifications to trail specifications. An "infeasible" alignment is one that physically could not be constructed using standard design. Engineering constraints are based on geology and soils parameters for the proposed project site.

#### *2.5.1.1 Geology and Soils*

Geology and soils address issues such as soil erosion, landslides, and earthquakes. For this analysis, a geological ranking system should be developed to evaluate the geological conditions of each trail segment. The ranking system should utilize collected geologic information, including geologic formations, streams and drainage crossings, earthquake-induced landslide areas, and the surface gradients (slope). Record the geologic formations, the earthquake-induced landslide areas, slope stability, and drainage crossings within each segment to develop a ranking matrix that assigns feasibility scores for all evaluated trail segments. For each trail, the values should be summed and averaged to develop a ranking for each potential segment. Each score should be weighted by the importance attached to each category. The geology-based rankings should be more sensitive to ground surface slope and earthquake-induced landslide potential than geologic unit characteristics and stream crossing.

### 2.5.2 Environmental Factors

Evaluate environmental opportunities and constraints for proposed trails based on site analysis and input regarding the following five factors: (1) aesthetics, (2) biological and hydrological resources, (3) cultural resources, (4) hazards and hazardous materials, and (5) land use and land ownership. The evaluation should consider the degree to which environmental documentation and permitting would be required to construct a specified trail alignment. Proposed trail alignments are expected to be "feasible" if no potential for significant environmental impacts would occur. Proposed trail alignments are expected to be "feasible, but constrained" if the potential for significant environmental impacts exists, but could be mitigated to below the level of significance. Trail alignments are deemed "infeasible" if the potential for significant environmental impacts is identified or if other factors would hinder the placement of the trail.

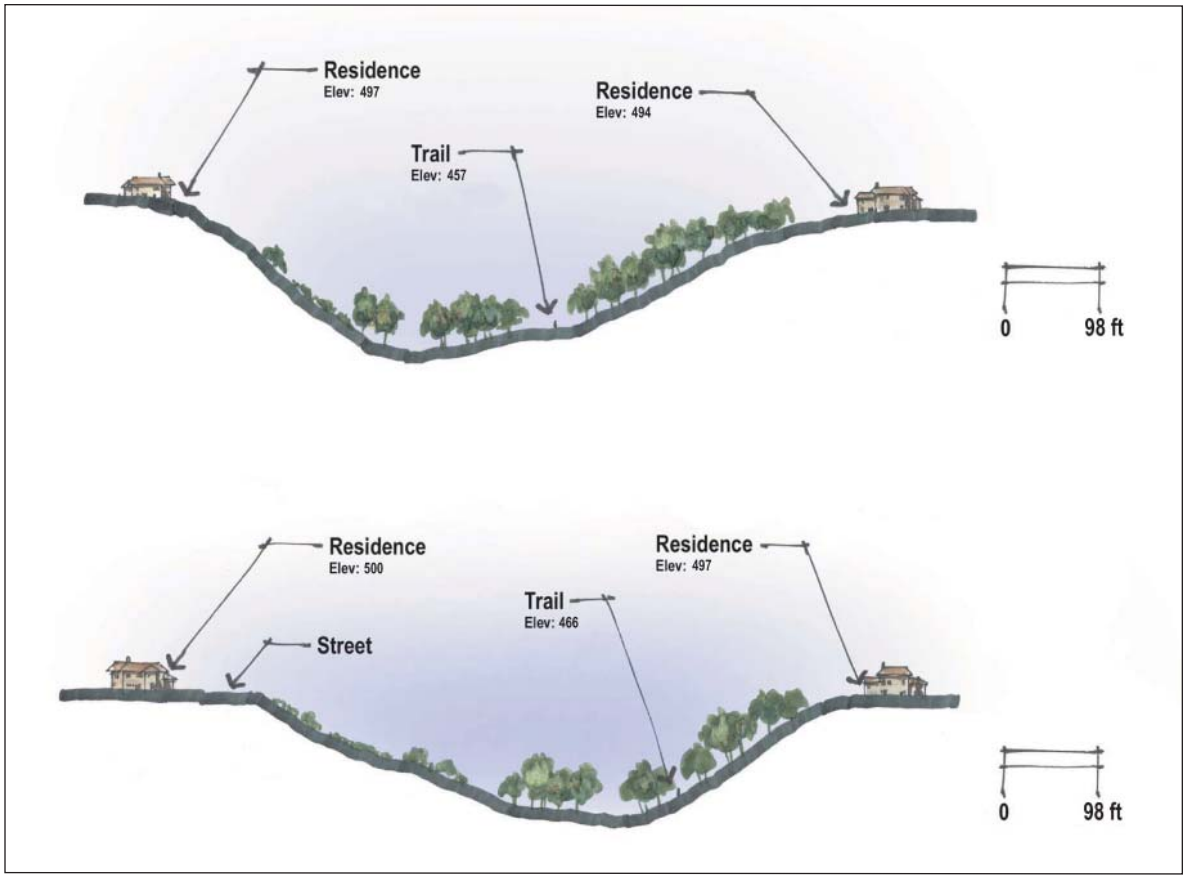



**Figure 2.5.2.1-1**
**Landscape Sections**

### *2.5.2.1 Aesthetics*

A site reconnaissance is a critical initial step in assessing the potential for scenic vistas or other visual amenities that shall be taken into consideration in the trail planning process. Analyze aesthetic factors by performing a visibility analysis in a three-dimensional modeling program to determine if the trail would be visible by the surrounding area residences and other landowners living adjacent to proposed trails. Vantage points may be placed at important visual points of interest, known scenic vistas, or individual residences. The results should be presented as a percentage of the trail that would be visible from the vantage points. In addition, cross-sections depicting the distance and the elevation of the trails from adjacent residences should be produced to provide a representation of the visibility of the trails by incorporating the landscape and vegetation (Figure 2.5.2.1-1, *Landscape Sections*).

### *2.5.2.2 Biological Resources and Hydrology*

Biological resources include the consideration of the potential presence of sensitive species, habitats, and communities, particularly riparian and wetland resources, migratory corridors, and proximity to conservation areas. At a minimum, the evaluation of biological resources shall include a review of available records including 7.5-minute series topographic quadrangles for the study area, National Wetland Inventory Maps, Wieslander Vegetation Maps (where available), the California Wildlife Habitat Relationship systems, California Natural Diversity Database, and request for information to the U.S. Fish and Wildlife Service and the California Department of Fish and Game. When a study includes or is adjacent to a property managed as open space, outreach to the federal, state, local, or private entity managing the property regarding the known or potential presence of biological resources shall be undertaken. If biological resources could potentially be affected by trail development, it is likely that a field investigation will be warranted to characterize the baseline resources.

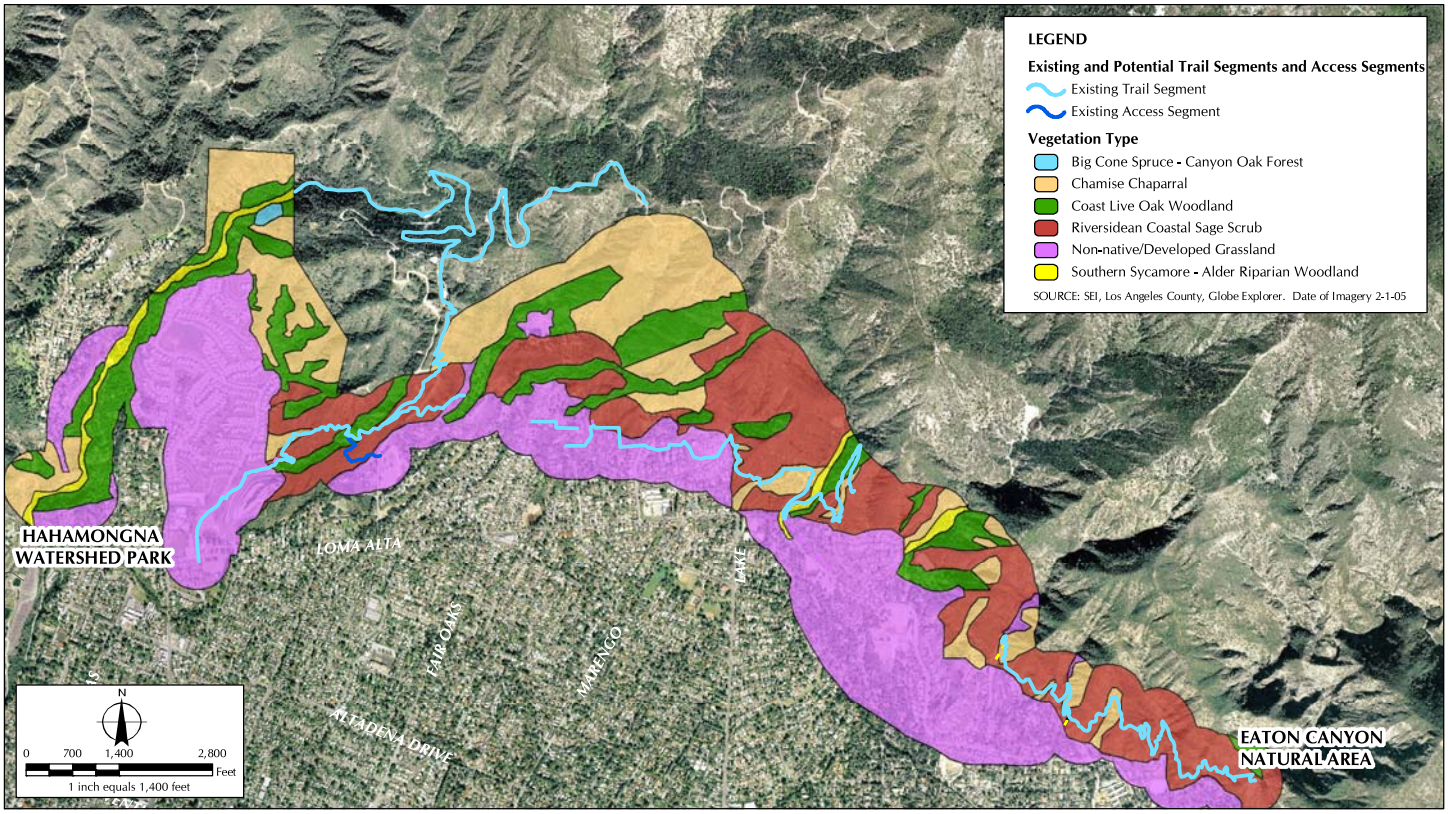



**Figure 2.5.2.2-1**
**Plant Communities Map**

Conduct the evaluation of biological resources by determining the plant communities through which the trails would pass, and the listed and sensitive species with the potential to occur within those plant communities and elevations, including any observed during biological field surveys (Figure 2.5.2.2-1, *Plant Communities Map*). The survey personnel should have experience in conducting biological field surveys, as well as be knowledgeable about the identification and ecology of all species surveyed. In addition, ensure that all survey personnel are familiar with both federal and state statutes related to listed and sensitive wildlife species, and have experience analyzing the impacts of development on listed and sensitive wildlife species. There are 164 federal- and state-listed species that have a potential to occur within the County as of the date of this publication (Appendix D, *Federal- and State-Listed Species with Potential to Occur within the County of Los Angeles*). The listed and sensitive species should be ranked on a basis of "most likely," "likely," and "least likely" to occur in the trails area. Only those species deemed "most likely" and "likely" to occur should be included in the final numbers of species potentially occurring along a given trail alignment. If there are biological corridors located on proposed trail sites, the LACO-DPR will cooperate with developers to work around these corridors.

Determine the number of blue-line stream crossings by conducting a preliminary analysis. Tabulate the number of crossings to formulate any associated constraints from additional permitting for trails intersecting riparian habitat and blue-line streams.

### *2.5.2.3 Cultural Resources*

Conduct a literature review for previously recorded archaeological and historic resources within the boundaries of the proposed trail area. The search should include a review of all known relevant cultural resource survey and excavation reports to determine potential impacts to archaeological and historic resources in the proposed trail area, also known as the area of potential effects (APE). As part of the literature review, search the 2005 editions of the California Historical Resources Inventory (HRI), the National Register of Historic Places (NRHP), the listing of California Historic Landmarks (CHL), and the California Points of Historical Interest (CPHI) to determine the presence of historic resources potentially impacted as a result of the proposed trails. Record the results as the number of historic and archaeological sites occurring within a 25-foot buffer of each proposed trail. In areas determined to have a high sensitivity for archeological or paleontological resources, surveys along the trail path may be beneficial to ensure that sensitive resources are avoided.

### *2.5.2.4 Hazards and Hazardous Materials*

Relevant sources of information considered in the evaluation of hazards and hazardous materials should include a review of historical aerial photographs; historical topographic maps; and a compilation of federal, state, and local government records consistent with the American Society of Testing and Materials

(ASTM) Standard E 1527-05, *Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process* and the U.S. Environmental Protection Agency proposed due diligence standard regarding "all appropriate inquiry." Conduct a Phase I Environmental Site Assessment along with site surveys for the proposed project area. The locations of all possible sites should be entered into a geographic information system (GIS) database to determine if any potential hazards or hazardous materials occurred along the proposed trail areas. Hazards and hazardous materials constraints are determined to exist if the proposed trail segment is adjacent to listed hazardous sites.

#### *2.5.2.5 Land Use and Land Ownership*

Land use and land ownership address the existing land use plan and conservation plans produced by the agency with jurisdiction over the project and the existing owners of the lands in the study area. Land use considerations for the feasibility analysis should be determined through the review of the County General Plan and Community Plan Map if applicable. A review of these documents will assist in identifying land use regulations critical to the viability of the proposed project. In addition, zoning limitations and boundaries should be determined using the applicable County of Los Angeles or applicable jurisdictions zoning map. If the consulted documents reveal land use restrictions incompatible with trail usage, the project proponent may have to pursue either a change in land use designation and zoning or revision of the trail route. Land ownership information and parcel information can be obtained from the County of Los Angeles Office of the Assessor (Assessor). A GIS database with property ownership data from the Assessor and LAR-IAC aerial imagery is useful to determine potential impacts to adjacent land uses, such as calculating the distance from the proposed trail to the closest residence within the proposed project area.

### 2.5.3 Economic Factors

Analyze the economic and fiscal opportunities and constraints according to the costs of trail construction, which may include rough construction costs and estimates of expected costs for completing the trail. Baseline costs should be developed on a project-by-project basis. Typically, the average cost for rough grading is used as the baseline, which excludes costs such as design, bridges, way-finding signs, permitting, and mitigation/restoration. Proposed trails can be deemed "feasible" if the cost per linear foot is not 20 percent greater than the baseline cost. Proposed trails can be deemed "feasible, but constrained" if the cost per linear foot is between 20 and 50 percent greater than the baseline cost. Proposed trails can be deemed "infeasible" if the cost per linear foot is 50 percent greater than the baseline cost.

Rough construction cost estimates should be based on previous development of trails in the surrounding area for developers and public agencies. More exact estimates should be based on the design for the trails that are being proposed.

#### *2.5.3.1 Construction Cost Considerations*

There is a variety of factors that should be taken into consideration when estimating the cost of a trail project. The cost of building, rerouting, or maintaining a trail includes numerous associated costs from labor to materials (Table 2.5.3.1-1, *Construction Cost Considerations*). The California State Parks trail labor and materials construction worksheet is included with additional trail costs in Appendix E, Trail Construction Costs. The cost of constructing a trail depends on the type of trail, the terrain traversed by the trail, whether the trail crosses streams or roads, and the cost of mobilization to begin trail construction. After construction, a trail may require restoration of the vegetation disturbed during trail construction. Yearly maintenance is required to keep a trail safe and functional. Signs may include highway, regulatory, and informational signs. Some trailheads may require the construction of a parking lot to accommodate trail users. Additional costs include fencing, landscaping, temporary and permanent irrigation, trash receptacles, benches, drinking fountains, and solar-powered flashing beacons for traffic safety.

### 2.5.4 Social Factors

Analyze the social feasibility of the trail based on the recreational needs of the area and the ability to meet the current and future recreational goals for the surrounding communities. Proposed trails would be deemed "feasible" if they meet recreational needs. Proposed trails would be deemed "feasible, but constrained" if they provide for the recreational needs of many individuals but may not prove accessible for all user groups. Proposed trails would be deemed "infeasible" when they do not meet the recreational needs of the community. In addition, the length of the trail and the number of plant communities encountered alongside as an indication of the diversity of the scenery can be presented as a means of determining the recreational quality of the trail.

#### *2.5.4.1 Recreational Need*

Recreational needs for a trail project are based on numbers derived from the demand analysis and the analysis of existing trails in the area. The SAMP provides information on the recreational needs for the County and should be utilized to identify the needs in an area.[27] Therefore, the recreational need for each particular trail segment can be evaluated based on the difference between the current and expected demand for trails and the ability of a proposed trail segment to meet the needs for trails.

[27] County of Los Angeles Department of Parks and Recreation. April 2004. *Strategic Asset Management Plan (SAMP) for 2020*. Prepared by: County of Los Angeles Chief Administrative Office and County of Los Angeles Department of Parks and Recreation, with technical assistance by Sapphos Environmental, Inc.

## TABLE 2.5.3.1-1
## CONSTRUCTION COST CONSIDERATIONS

| |
|---|
| **Construction** |
| Trail construction (depends on site conditions) |
| Stream crossing |
| At-grade road crossing (includes signs and striping) |
| Mobilization |
| **Restoration** |
| Restoration |
| **Maintenance** |
| Annual maintenance |
| **Way-finding Signs** |
| Highway informational sign |
| Highway warning sign |
| Permitted use sign |
| Etiquette sign |
| “Crossing private lands” sign |
| Boundary sign/map |
| Temporary connector sign |
| Entrance sign |
| Trailhead information sign and kiosk |
| Reassurance marker |
| Direction change/juncture indicator |
| Interpretive sign |
| Wayside exhibit |
| Destination sign |
| Monument sign |
| Adopter sign |
| **Landscaping** |
| Landscaping |
| Temporary irrigation |
| Permanent irrigation |
| **Parking Lot** |
| Parking lot construction (pervious concrete) |
| Guardrail |
| **Support Structure** |
| Kiosk |
| Restroom with sewage lines |
| Composting restroom |
| **Additional Trail Amenity** |
| Drinking fountain |
| Equestrian fencing (staging areas, etc.) |
| Horse tie-up |
| Horse drinker |
| Trash receptacle |
| Vault toilet/regular-style toilet |
| Ramada |
| Bench |
| Solar-powered flashing beacon |

## 2.6 IDENTIFY AND ENGAGE WITH STAKEHOLDERS

### 2.6.1 Step 1

Identify and engage potential stakeholders early in the planning process. They should be informed of the project purpose and need and related goal statements. They should also be asked to provide their input on potential objectives to be considered by the County. Potential stakeholders include federal, state, county, and city representatives who manage resources in or adjacent to the proposed trail location; private landowners; as well as other interested parties that manage lands or represent recreational users in or adjacent to the proposed trail location.

***Federal Government***

- National Park Service: http://www.nps.gov/
  - Manages the Santa Monica Mountains National Recreation Area
- U.S. Army Corps of Engineers: http://www.usace.army.mil/
  - Regulatory and permitting authority for navigable waterways, wetlands, and other waters of the United States that may include blue-line streams depending on topographic maps
- U.S. Department of Agriculture Forest Service (Forest Service): http://www.fs.fed.us/
  - Manages the 650,000 acres of Angeles National Forest within the County
- U.S. Fish and Wildlife Service: http://www.fws.gov/
  - Regulatory and permitting authority for special status species and associated designated critical habitat afforded protection pursuant to applicable federal regulations, particularly the Endangered Species Act, the Migratory Bird Treaty Act, and the Bald and Golden Eagle Protection Act

***State of California***

- California Coastal Commission: http://www.coastal.ca.gov/
  - Plans and regulates the use of land and water in the coastal zone, typically within 5 miles of the coast
- California Department of Fish and Game: http://www.dfg.ca.gov/
  - Regulatory authority for special status, national community conservation planning areas, and state waters with applicable state regulations, particularly the Endangered Species Act and the State Fish and Game Code (Sections 1600 and 2081)
- California Department of Parks and Recreation: http://www.parks.ca.gov/
  - Manages California State Parks, including the development of trail networks
- Mountains Restoration Trust: http://www.mountainstrust.org/
  - Works to preserve, protect, and enhance the natural resources of the Santa Monica Mountains in the County of Los Angeles
- Rivers and Mountains Conservancy: http://www.rmc.ca.gov/
  - Works to preserve open space and habitat to provide for low-impact recreational and educational uses, wildlife habitat restoration and protection, and watershed improvements along the San Gabriel and Lower Los Angeles Rivers
- Santa Monica Mountains Conservancy: http://smmc.ca.gov/
  - Seeks to establish an interlinking system of urban, rural, and river parks; open space; trails; and wildlife habitats that are easily accessible to the general public

***Other Interested Parties Active in the County of Los Angeles***

- The American Hiking Organization: http://www.americanhiking.org/
  - A national organization that provides a comprehensive nationwide trails finder
- Equestrian Trails Inc., Sylmar, CA: http://www.etinational.com/
- California Riding and Hiking Trails Advisory Committee
- Marshall Canyon, Mounted Assistance Unit, County of Los Angeles: http://marshallcanyonmau.com/
- Bonelli Park, Mounted Assistance Unit, County of Los Angeles
- Whittier Narrows, Mounted Assistance Unit, County of Los Angeles
- Los Angeles County Sheriff's Department, Volunteer Mounted Unit
- Los Angeles County Sheriff's Department, Park Bureau, Patrol Unit

- The California Coastal Trail: http://www.californiacoastaltrail.org/
  - An organization that provides information concerning the trail and its individual segments
- The Land Trust Alliance: http://www.lta.org/
  - A national, nonprofit organization composed of several hundred non profit land trusts that assist interested landowners in finding ways to protect their land
- The Santa Monica Trails Council: http://www.smmtc.org/
  - A volunteer, nonprofit organization dedicated to establishing and maintaining the public trail system throughout the Santa Monica Mountains
- The Trust for Public Land: http://www.tpl.org/
  - A national, nonprofit, land conservation organization that conserves land for parks, community gardens, historic sites, rural lands, and other natural places
- Private Property Owners
  - Private property owners who are interested in developing land
- Adjacent Counties and Cities to the County of Los Angeles

### 2.6.2 Step 2

Coordinate the results of the supply and demand analysis with stakeholders. This provides an opportunity to identify factors that are unique to the project site that may influence the supply and demand analysis [e.g., large private camps that use public trails as part of their programming, clubs (hiking clubs, cycling clubs, or equestrian units), schools and after-school programs that use trails for outdoor education programs, etc.)].

### 2.6.3 Step 3

The documentation of existing and proposed trails and recreational resources in the service area should include outreach to federal, state, county, and city representatives, as well as other interested parties that manage lands or represent recreational users in or adjacent to the service area.

### 2.6.4 Step 4

The conceptual trail alignment should be presented to federal, state, county, and city representatives, as well as other interested parties that manage lands or represent recreational users in or adjacent to the service area prior to initiating the detailed design process.

### 2.6.5 Step 5

The results of the feasibility analysis should be presented to federal, state, county, and city representatives, as well as other interested parties that manage lands or represent recreational users in or adjacent to the service area prior to finalizing the alignment and initiating the construction process.

# SECTION 3.0
# ENVIRONMENTAL COMPLIANCE FOR TRAILS

The County of Los Angeles Board of Supervisors (BOS) is the lead agency under the California Environmental Quality Act (CEQA) and has the principal responsibility for carrying out or approving trail projects in the County of Los Angeles (County). These specific trail projects are exclusive of others located on lands owned by the federal government or the State of California. As the lead agency, the County must make a determination regarding the appropriate level of environmental documentation to be prepared in accordance with criteria contained in the *Guidelines for the Implementation of the California Environmental Quality Act* (State CEQA Guidelines, Title 14 CCR, Chapter 3, Sections 15000–15387). In addition, County trail projects may also require environmental analysis pursuant to the National Environmental Policy Act (NEPA) (42 USC 4321; 40 CFR 1500.1) where projects involve the use of federal funds or lands, require a federal permit or other authorization, or if the trail projects are carried out or partially carried out by the federal agency.

As described in Section 15002(k) of the State CEQA Guidelines, a lead agency undertakes a three-step approach in determining the type of analysis required for a project subject to CEQA.[1] The County has developed a set of CEQA Environmental Impact Report (EIR) Guidelines that should be consulted in preparation for and during the environmental review process if an EIR is warranted. During the course of trail planning and development, additional regulatory agencies that have jurisdiction over particular resources that intersect with trail development, such as streambeds, will need to be consulted and is typically integrated with the CEQA process.

The trails planning process identified in Section 2 is intended to provide for the integration of project planning and environmental analyses for all County trail projects consistent with the goals and policies of NEPA and CEQA.

The provisions of NEPA apply to an action that is to be carried out by a federal agency; requires a federal permit, entitlement, or authorization; requires federal funding; or will occur on federal land. There are four purposes stated in the NEPA statute:

(1) Declare a national policy to encourage "productive and enjoyable harmony between humans and their environment"

(2) Promote efforts that will prevent or eliminate damage to the environment and biosphere and stimulate human health and welfare

(3) Enrich the understanding of the ecological systems and natural resources important to the nation

(4) Establish a Council on Environmental Quality (CEQ)

The provisions of CEQA apply to all projects that require a discretionary decision by the Board of Supervisors, the use of County funds, or the use of County property, including those that provide benefit for the public, such as trail projects. There are four basic purposes at the heart of CEQA, described in Section 15002 of the State CEQA Guidelines:

(1) Inform governmental decision-makers and the public about the potential, significant environmental effects of proposed activities.

(2) Identify the ways that environmental damage can be avoided or significantly reduced.

(3) Prevent significant, avoidable damage to the environment by requiring changes in projects through the use of alternatives or mitigation measures when the governmental agency finds the changes to be feasible.

(4) Disclose to the public the reasons why a governmental agency approved the project in the manner the agency chose if significant environmental effects are involved.[2]

## 3.1 DEFINE PROJECT GOALS AND OBJECTIVES

The definition of the trail project goals and objectives developed during the planning process will also be used to meet the requirements of Section 15124 of the State CEQA Guidelines, which require the lead agency to define a statement of objectives sought by the proposed project.[3] This is a critical step in the environmental compliance process for an EIR, in that those projects involving significant impacts need only

[1] State of California. *California Code of Regulations*. Title 14, Chapter 3, "Guidelines for Implementation of the California Environmental Quality Act," Article 1, Section 15002 (k): "General Concepts." Sacramento, CA. Available at: http://ceres.ca.gov/topic/env_law/ceqa/guidelines/art1.html

[2] State of California. *California Code of Regulations*. Title 14, Chapter 3, "Guidelines for Implementation of the California Environmental Quality Act," Article 1, Section 15002 (k): "General Concepts." Sacramento, CA. Available at: http://ceres.ca.gov/topic/env_law/ceqa/guidelines/art1.html

[3] State of California. *California Code of Regulations*. Title 14, Chapter 3, "Guidelines for Implementation of the California Environmental Quality Act," Article 9, Section 15124: "Project Description." Sacramento, CA. Available at: http://ceres.ca.gov/topic/env_law/ceqa/guidelines/art9.html

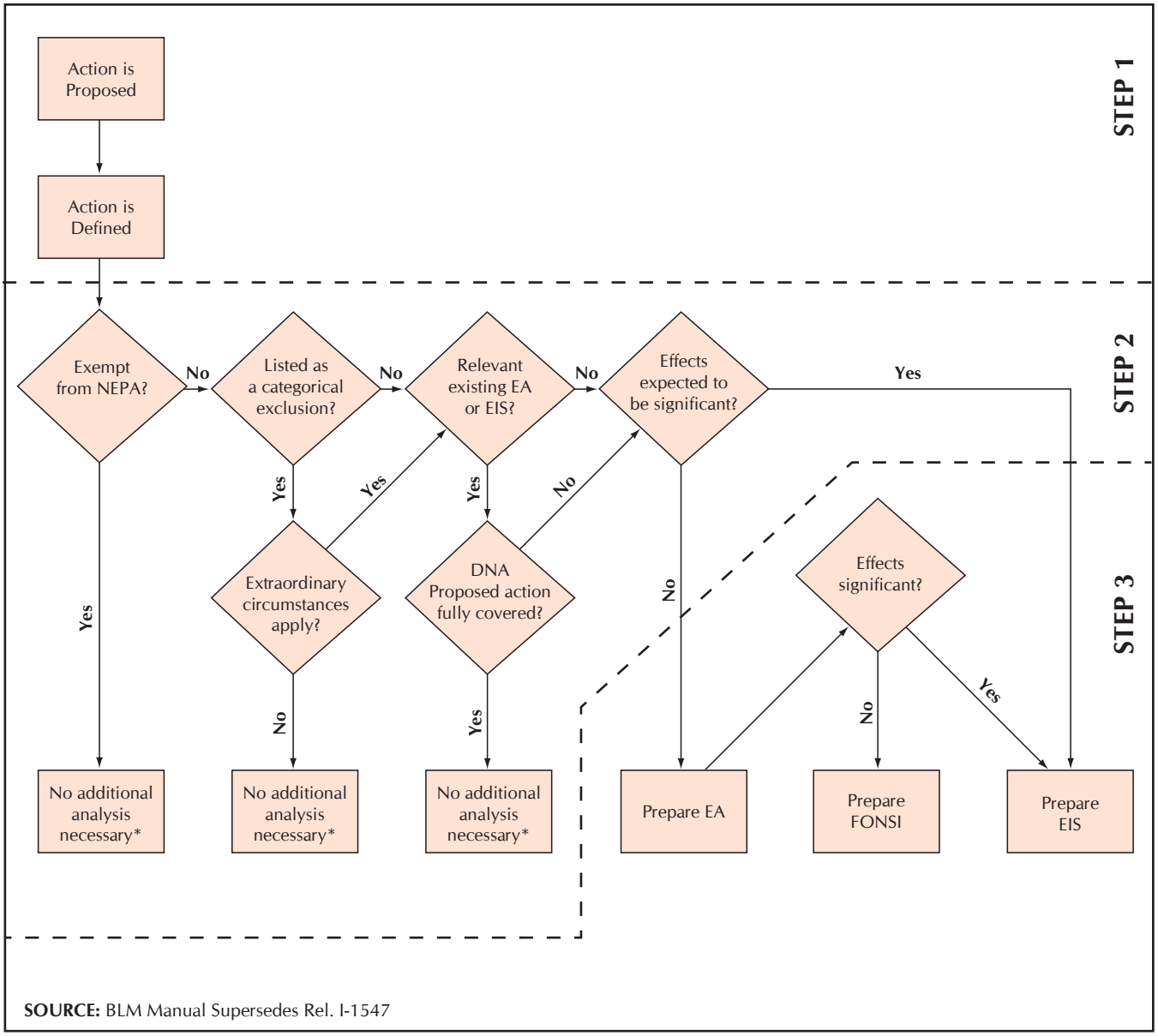



**Figure 3.2-1**
**Determining NEPA Compliance for a Proposed Action**

consider alternatives that are capable of avoiding or lessening significant impacts, and that are capable of meeting most of the basic objectives of the project.

## 3.2 THREE-STEP NEPA PROCESS

This section describes the three-step process for determining the appropriate environmental document to be prepared for an action under NEPA. NEPA applies when a proposed trail project involves the use of federal funds or lands, requires a federal permit or other authorization, or if the trail project is carried out or partially carried out by the federal agency. Examples include when the proposed trails are located on lands owned by the United States Forest Service (USFS), the Bureau of Land Management (BLM), or when the California Department of Transportation (Caltrans) is acting on behalf of the Federal Highway Administration (FHWA). Each federal agency has its own guidelines for implementing the procedural provisions of NEPA. The federal agency serves as the lead agency in determining through the three-step process if NEPA applies to the proposed trail project (Figure 3.2-1, Determining NEPA Compliance for a Proposed Action).

The first step in the NEPA process is to determine whether or not the proposed action is subject to NEPA. NEPA applies to a proposed action if it is subject to any one (or more) of the following situations:[4]

[4] Bass, Ronald E., Albert I. Herson, and Kenneth M. Bogdan. 1999 (with 2001 supplement. *The CEQA Deskbook*. Point Arena, CA: Solano Press Books.

- Is to be carried out by a federal agency
- Requires a federal permit, entitlement, or authorization
- Requires federal funding
- Will occur on federal land

If the proposed trail is found to be within the jurisdiction of NEPA, the federal lead agency will determine whether a Categorical Exclusion applies to the proposed trail.

### 3.2.1 Consideration of Categorical Exclusions

The availability of a Categorical Exclusion for a proposed trail and the potential for significant environmental impacts determines the extent of NEPA documentation required. The use of a Categorical Exclusion is conditioned on the ability to provide substantial evidence that the proposed trail project would not cause a significant direct, indirect, or cumulative effect on the environment due to unusual circumstances. However, each federal agency has its own specified Categorical Exclusions. The County must consult with the appropriate federal agency to determine if a proposed trail is consistent with the conditions for use of a Categorical Exclusion. If a Categorical Exclusion is applicable to a proposed trail, no further NEPA documentation is needed. However, the County of Los Angeles Department of Parks and Recreation (LACO-DPR) does not construct trails on federal land.

### 3.2.2 Preparation of an Environmental Assessment

If the proposed trail is found to be within the jurisdiction of NEPA and is not exempt, the County takes the second step and prepares a written Environmental Assessment (EA) to determine if the proposed trail would pose significant impacts on the environment. Each federal agency may adopt its own checklist and format for an EA. Generally, these checklists are tailored to the type of action and impacts the agency oversees. The County must coordinate with the appropriate federal agency early in the proposed trail process to determine the checklist and format. An EA must discuss the following points:[5]

- The need for the proposed action
- The proposed action and alternatives
- Probable environmental impacts of the proposed action and the alternatives
- The agencies and persons consulted during preparation of the EA

During preparation of an EA, though it is not required under NEPA, the County may find scoping useful.[6] After the EA is completed, a public Notice of Availability (NOA) must be published in the Federal Register for public review.

An EA can lead to different outcomes. An EA may determine that significant impacts are less than significant or that they can be reduced to less-than-significant levels with mitigation measures. In these cases, the EA leads to a Finding of No Significant Impact (FONSI) or mitigated FONSI, respectively. Each federal agency has specific guidelines for EA/FONSI preparation, review, and decision making. The FONSI contains an explanation as to why the proposed action will not have a significant environmental impact, a copy of the EA, and related environmental documents. In some cases, public review is required for a FONSI. Neither the EA nor the FONSI is a decision-making document. Each agency has its own decision-making format. Therefore, the County should coordinate with the appropriate federal agency to adhere to agency-specific guidelines when a proposed trail requires a FONSI and include public review when it is required.

### 3.2.3 Preparation of an Environmental Impact Statement

If the information contained in the EA indicates that the proposed trail may have a significant direct, indirect, or cumulative impact on the environment, the County must take the third step and prepare an Environmental Impact Statement (EIS). Prior to preparation of the EIS, a Notice of Intent (NOI) to prepare the EIS must be published and a scoping process must be conducted. The results of the EA and scoping process can be used as the basis for determining the scope of environmental issues that need to be carried forward for detailed analysis in the Draft EIS. However, the document must include relevant CEQA checklist issues. The EIS should determine the direct, indirect, and cumulative effects for each issue. The scope will also evaluate a range of alternatives, including those eliminated from further study. After the Draft EIS is complete, the County will circulate and receive and respond to comments on the Draft EIS. The County will file the Draft EIS with the Environmental Protection Agency (EPA) and the EPA will review it. A public hearing will be held when appropriate to solicit comments from the public on the Draft EIS.

When this is complete, preparation of the Final EIS can begin. The Final EIS will address the comments on the Draft EIS from the public as well as reviewing agencies. The Final EIS will be circulated prior to adoption by the County. The federal agency will then make a decision on the proposed trail. Once the federal agency has come to a decision on the proposed trail, a Record of Decision will be prepared and filed. Based on the decision of the federal agency, the proposed trail can be constructed.

[5] Council on Environmental Quality. *NEPA's Forty Most Asked Questions, Question 8*. Available at: http://ceq.hss.doe.gov/nepa/regs/40/40p3.htm

[6] Paraphrased from *The NEPA Book: A Step-by-Step Guide on How to Comply with the National Environmental Policy Act*, Solano Press Books, 2001 (Second) Edition, p. 72.

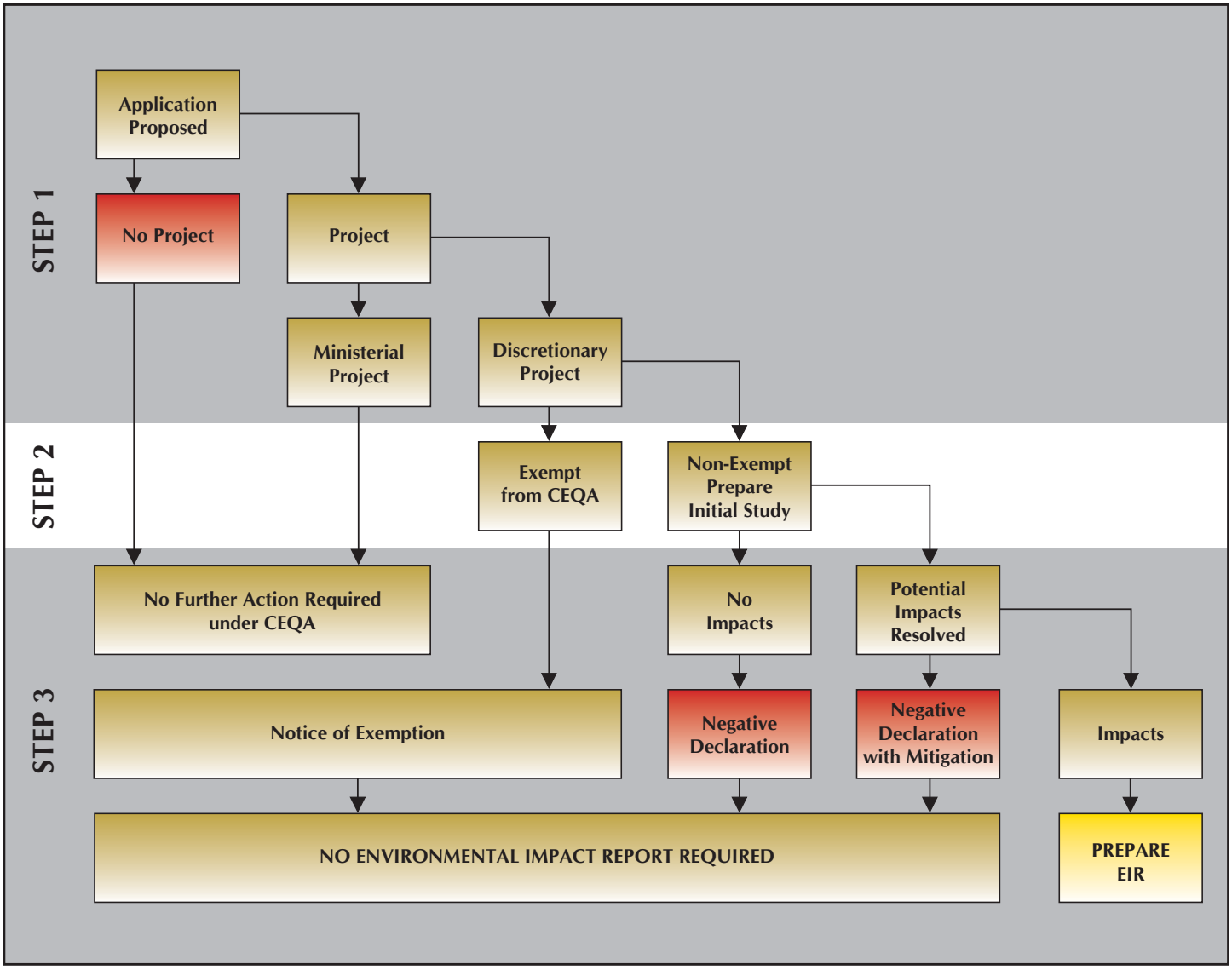



**Figure 3.3-1**
**CEQA Process Flowchart**

## 3.3 THREE-STEP CEQA PROCESS

This section describes the three-step process for determining the appropriate environmental document to be prepared for a project (Figure 3.3-1, *CEQA Process Flowchart*). The CEQA process is similar to the NEPA process as NEPA is the national statute on which CEQA was modeled. However, there are differences between the national process and the state process (Figure 3.3-2, *CEQA and NEPA Parallel Processes*). This process applies to both trail projects reviewed by the Regional Planning Commission and the Board of Supervisors pursuant to their discretionary land use decision-making authority and to those projects where the County, a County special district, or the redevelopment agency is involved as a project applicant, through the provision of County funds or leases, or the use of County land. Private projects typically intersect with CEQA in the process of obtaining financial assistance, a lease, a permit, a certificate, or other entitlement for use via the discretionary approval of a governmental agency.[7] In approving a permit or license, the County takes the role of the lead agency and is responsible for exercising its independent review of the environmental analysis and certifying the technical and procedural adequacy of the environmental documentation prepared to support the County's land use decision-making process. For the approval of projects, it is essential for documents and plans to maintain internal consistency as well as consistency with the County's general plan and community plans.

[7] State of California. *California Code of Regulations*. Title 14, Chapter 3, "Guidelines for Implementation of the California Environmental Quality Act," Article 20, Section 15377: "Private Project." Sacramento, CA. Available at: http://ceres.ca.gov/topic/env_law/ceqa/guidelines/art20.html

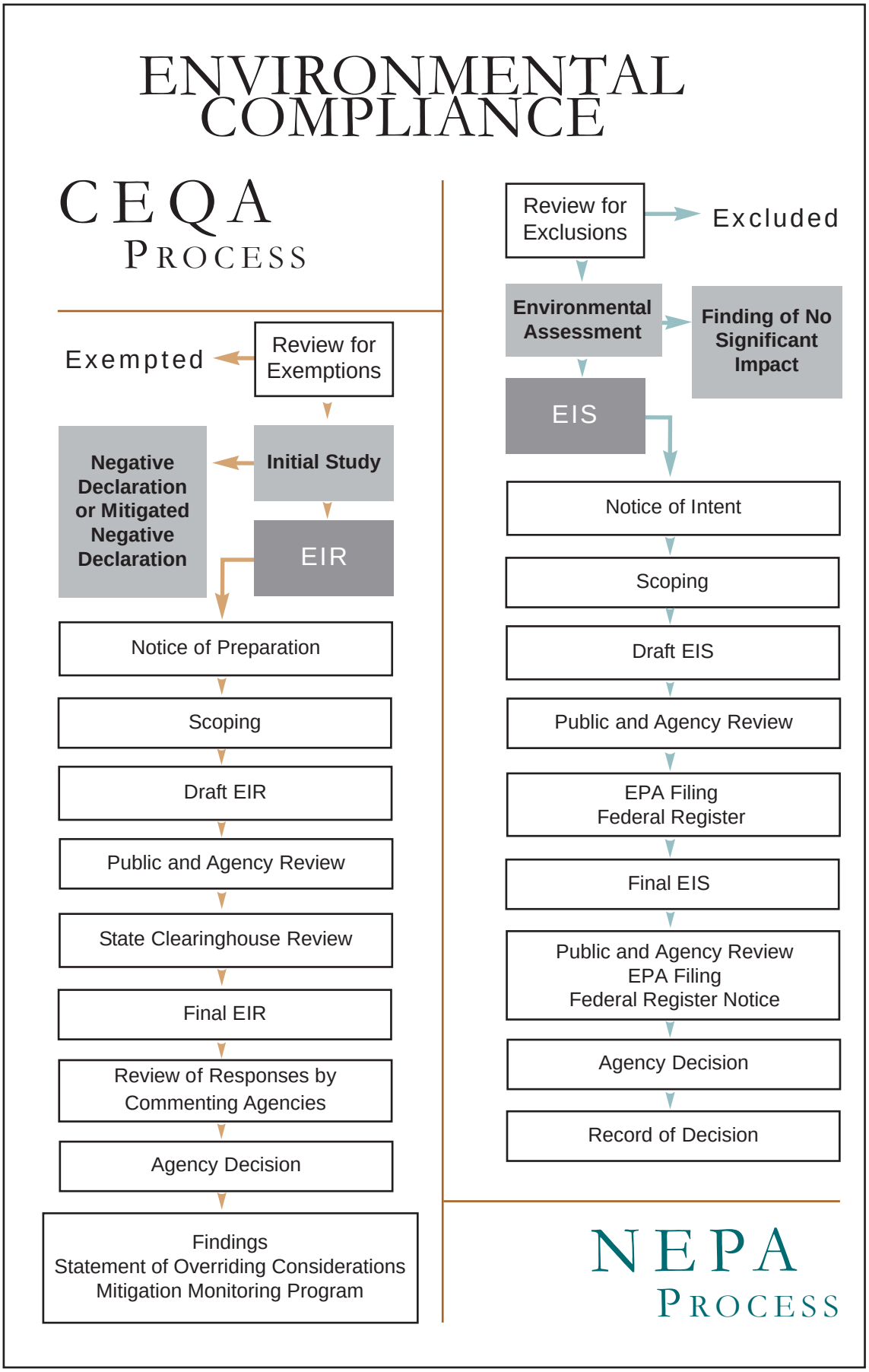



**Figure 3.3-2**
**CEQA and NEPA Parallel Processes**

For both public and private projects, the County will normally undertake three steps in deciding the type of environmental document to prepare for a trail project, or a larger project of which a trail is an element, component, mitigation measure, or condition of approval.

There are a wide variety of improvements to existing trail facilities and or proposed trails that involve minor grading that may be appropriate for consideration pursuant to the categorical exemptions described in Sections 15301 and 15304 of the State CEQA Guidelines. The environmental component of the

**TABLE 3.3.1-1**
**POTENTIAL CEQA EXEMPTIONS FOR TRAIL PROJECTS**

| Guideline Section | Exemption Type | Exemption Title | Exemption relevant section | Examples |
|---|---|---|---|---|
| 15262 | Statutory | Feasibility and Planning Studies | Projects only involving feasibility or planning studies for possible future actions | Trail Feasibility Report |
| 15300 | Categorical | Ministerial Projects | Projects over which public agencies exercise only ministerial authority, nondiscretionary actions | Typically private projects involving minor actions such as a renovation project |
| 15301 | Categorical | Existing Facilities | Restoration or demolition of small existing structures, replacement of signage | Replacement of existing restrooms, kiosks, or trailheads |
| 15302 | Categorical | Replacement or Reconstruction | Replacement or reconstruction of existing structures or facilities located on the same site | Trail, kiosk, or restroom reconstruction |
| 15303 | Categorical | New Construction or Conversion of Small Structures | Accessory (appurtenant) structures | Fences, kiosks, restrooms |
| 15304 | Categorical | Minor Alterations to Land | Minor grading of slopes, replacement landscaping, bicycle lanes on existing right-of-way | Minor routine maintenance on trails, including clearing and revegetation |

### 3.3.1 Consideration of Categorical Exemptions

The County first evaluates the conceptual proposed project to determine whether it is subject to CEQA. There are a number of statutory, ministerial, and categorical exemptions provided in the State CEQA Guidelines (Table 3.3.1-1, *Potential CEQA Exemptions for Trail Projects*). The use of a Categorical Exemption is conditioned on the ability to provide substantial evidence that the proposed trail project would not cause a significant direct, indirect, or cumulative effect on the environment due to unusual circumstances (such as the presence of rare, threatened, endangered species, designated critical habitat, and the potential to substantially alter jurisdictional streams or wetlands), damages to resources within a state scenic highway, location on a hazardous waste site, or potential to cause significant impacts to any historical resource.[8]

feasibility analysis described in Section 2 of this Trails Manual should provide sufficient substantial evidence to determine if a proposed trail project is consistent with the conditions for use of a Categorical Exemption.

### 3.3.2 Preparation of an Initial Study

If the proposed trail project is not exempt, the County takes the second step and prepares an Initial Study (consistent with the provision of Section 15063 of the State CEQA Guidelines) to determine whether the proposed project may have a significant effect on the environment. Normally, the information compiled in the feasibility analysis described in Section 2 of this Trails Manual should be sufficient to support preparation of an Initial Study.[9] If the Initial Study demonstrates that there is no substantial evidence that the proposed project may have a significant effect on the environment, the County can prepare a Negative Declaration. Consistent with the provisions of Article 6 of the State CEQA Guidelines, the County is required to

[8] State of California. *California Code of Regulations*. Title 14, Chapter 3, "Guidelines for Implementation of the California Environmental Quality Act," Article 19, Section 15300.2: "Exceptions." Sacramento, CA. Available at: http://ceres.ca.gov/topic/env_law/ceqa/guidelines/art19.html

[9] Feasibility studies are not a requirement of CEQA. Depending on the scope of the proposed project, a feasibility study may not be warranted.

circulate the Notice of Intent to adopt a Negative Declaration for public review.

Similarly, where a proposed project involves impacts and the application of mitigation measures that are known to be capable of reducing the significant effects of the project to below the level of significance, the County can prepare a Mitigated Negative Declaration. Consistent with the provisions of Article 6 of the State CEQA Guidelines, the County is required to circulate the Notice of Intent to adopt a Mitigated Negative Declaration for public review. In addition, the County is required to prepare and implement a Mitigation Monitoring and Reporting Program for those mitigation measures required by the Regional Planning Commission or Board of Supervisors.

### 3.3.3 Preparation of an Environmental Impact Report (EIR)

If the information contained in the feasibility analysis and Initial Study indicates that the proposed project may have a significant direct, indirect, or cumulative impact on the environment, the County takes the third step and prepares an EIR. The results of the Initial Study can be used as the basis for determining the scope of environmental issues that need to be carried forward for detailed analysis. Interested parties, including responsible and trustee agencies, special interest groups or organizations, and the public, are informed regarding the County's intent to prepare an EIR through posting of the Notice of Preparation with the State Clearinghouse (within the Governor's Office of Planning and Research) and/or the County Clerk.

As described in Section 15083 of the State CEQA Guidelines, prior to completing the Draft EIR, the County may consult directly with any person or organization it believes will be concerned with the environmental effects of the proposed project. Early consultation allows the proactive identification and resolution of issues early in the project planning and environmental compliance process. This process is referred to as scoping.

The Draft EIR will address those environmental issues that may have a significant impact on the environment. Those issues will be addressed and mitigation measures will be included to reduce impacts to levels below the level of significance. The Draft EIR will also evaluate the environmental impacts from alternatives to the proposed project, including a no project alternative. The rationale for not using an alternative to the proposed project must also be included and evaluated based on the project's goals and objectives. The completion of the Draft EIR is announced through the posting of a Notice of Completion and a Notice of Availability with the State Clearinghouse (within the Governor's Office of Planning and Research) and/or the County Clerk.

A public review period is initiated with the Notice of Availability. During this review period, comments on the proposed project and the Draft EIR are taken from the general public via public meetings or letters. In addition, federal, state, and local agencies are consulted regarding the Draft EIR.

Comments and issues disclosed during the public comment period and through consultation will be addressed in the Final EIR. The Final EIR will document the impacts and mitigation measures set forth to reduce impacts to below the level of significance. However, the lead agency may make a finding of overriding consideration for those impacts from the project that will be significant and for which no mitigation measure will reduce to below the level of significance. In addition, a Mitigation Monitoring and Reporting Plan will often be developed to ensure that the mitigation measures set forth in the Final EIR will be administered.

The lead agency will then approve the project and adopt the EIR along with the Findings of Fact and Statement of Overriding Considerations and any other environmental documentation completed for the project. The approval of the project and the adoption of the EIR are announced to the public through the posting of the Notice of Determination with the State Clearinghouse (within the Governor's Office of Planning and Research) and/or the County Clerk.

## 3.4 REGULATORY AGENCIES

In the planning stage and the initial development of a trail, it is necessary to understand those agencies that would have to be involved through either the need for permits or the process of notification. Numerous agencies maintain and have jurisdiction over resources within the County of Los Angeles. Table 3.4-1, *Regulatory Agencies and Trail Regulatory Nexus*, provides information on the nexus between certain regulatory agencies and trail planning. The table is organized by questions to ask while a trail is being developed and which agencies would be involved.

Where there is federal agency involvement, that agency would be consulted. The federal agency would determine if NEPA applies and administer the federal three-step process. The NEPA process may run concurrently with CEQA and the environmental analysis may be combined into a joint CEQA/NEPA document, upon mutual agreement by the federal agency and the County.

## 3.5 ENTITLEMENT PROCESS

Typically, where the trail alignment traverses private land, the environmental review process is triggered by the initiation of the entitlement process for a private development project. The entitlement process involves many steps that typically include design reviews, plan checks, environmental reviews, and project approvals/disapprovals.

Recreational resources such as parks and trails are typically included as conditions of approval, mitigation measures, or additional agreements for the project to proceed, and are recorded as land or easement dedications on parcel maps or

## TABLE 3.4-1
## REGULATORY AGENCIES AND TRAIL REGULATORY NEXUS

| Regulatory Agency | Potential Trail Regulatory Nexus | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | Perceived Brownfields | Culturally Sensitive Areas | Riparian Vegetation | Streams | Wetlands | Flood Control Channels | Roadways | Oak Trees | Sensitive Habitats or Plant Communities |
| California Department of Fish and Game | | | X | X | X | | | | X |
| U.S. Army Corps of Engineers | | | | X | X | | | | |
| California Office of Historic Preservation | | X | | | | | | | |
| Regional Water Quality Control Board | | | | X | X | X | | | |
| County Flood Control District | | | | | | X | | | |
| County Department of Public Works | | | | | | X | X | | |
| County Department of Forestry | | | | | | | | X | |
| California Department of Toxic Substances Control | X | | | | | | | | |
| U.S. Fish and Wildlife Service | | | | | | | | | X |
| Native American Heritage Commission | | X | | | | | | | |
| U.S. Environmental Protection Agency | X | | | | | | | | |
| California Department of Transportation | | | | | | | X | | |

tract maps , both subdivision maps, approved by the County under the Subdivision Map Act. The inclusion of trails can either be a voluntary action by the project proponent, or imposed on the project proponent by the County at the time of project approval. If it is imposed by the County, it is typically an outcome of recreational funding of additional recreational resources to support the community by covering the costs of the environmental review, design, and construction of a trail. This is typically covered under the 1975 Quimby Act (California Government Code §66477). However, a project proponent may voluntarily choose to include a trail in the proposed project. Therefore, they may seek funding from alternative recreational funding sources to cover the additional costs (Appendix F, *Recreational Funding*). Regardless of whether the action is voluntary on the part of the project proponent or imposed by the County, the securing of trail easements and construction of trails is an essential step to ensuring that the trails will be completed.

Applications for subdivisions, such as tentative tract or parcel maps, submitted by private parties to the County Department of Regional Planning, are subject to review for park space, open space, and trails requirements. LACO-DPR reviews subdivision applications to ensure that trails planned for areas designated as future trails on trail plans are included as conditions of approval in the development process, and shown as dedicated trail easements on the subdivision map. This step is necessary to ensure that gaps in trails do not develop. Existing trails, either historic or presently in use, that may not yet be mapped on a trails plan, and that may be modified or eliminated by development, should also be evaluated by the County for possible conditioning as a requirement of the entitlement document for the subdivision, and included in all tentative, vesting, and final tract maps. Additionally, the County requires a trail easement or easements for trail alignments not displayed on a County trails map.

### 3.5.1 Quimby Funds

Since the passage of the Quimby Act in 1975, California cities and counties have been authorized to pass ordinances requiring that developers set aside land for parks, or pay in-lieu fees for park improvements.[10] The Quimby Act allows municipalities and park districts to levy a fee on local, new residential development construction for purchasing and developing park land, including construction of recreational facilities and pathways, but not for ongoing maintenance or general labor. It also sets minimal standards for how much open space there should be per 1,000 residents. Typically, these funds are used for local park construction for active recreation activities and not trails, which are considered passive recreation. The Quimby Act in fact does not mention trails; and although trails are defined as "local park space" in the Los Angeles County Code under Title 21 because of the County's deficiency in actual park land, as a matter of policy, the Department typically does not consider trails when giving credit for an applicant's Quimby obligation. The Department chooses instead to focus attention on recommending Quimby obligations to be satisfied through the dedication and improvement of actual parks, or the payment in lieu fees used for these purposes.

The County, as well as most Southern California cities, includes the Quimby Act in their subdivision ordinance provisions.[11] Implementation of a Quimby ordinance begins once a developer files an application for a development project with a tentative subdivision parcel map. The developer pays the Quimby fees to the LACO-DPR prior to the Department clearing the final map for recordation and approval by all relevant agencies and the Board of Supervisors.

### 3.5.2 Securing Easements

Conservation or trail easements are a commonly used strategy to help trail projects on private lands move forward. A conservation easement is a legal agreement between a landowner and an eligible organization, such as a public agency or nonprofit organization, which restricts future activities or uses on the land, such as development. Easements protect the specific conservation values of a property according to the wishes of the individual landowner and easement holder (Appendix G, *Sample Trail Easement*).

Easements are acquired from landowners who either donate some or all of the value of the easement, or receive market-rate compensation for the property interest. Purchasing easements generally costs less than purchasing land outright. If public agencies do not have the funds to purchase all lands that need to be protected, purchasing easements can be a cost-effective acquisition alternative.[12] Easements require careful legal review and consideration.

If a private landowner creates an easement for trail use, the easement can be donated or granted directly to the County. When the County agrees to accept a trail easement, the County will normally take on responsibility for trail operation and maintenance, which would be specified in the approval documents known as the Trail Grant Deed.

In many cases, a conservation easement can serve as a donation by the project proponent, for tax purposes. Further information regarding tax deductions for conservation easements can be obtained in Appendix H, Conservation Easement Tax Information.

[10] State of California. 1975. California Government Code, §66477, "Quimby Act."

[11] Governor's Office of Planning and Research. May 1997. "Jurisdictions Whose Subdivision Ordinance Provides for The Quimby Act, Tentative Parcel Maps, and Merger of Lots by Parcel Map." In *The California Planners' Book of Lists*. Sacramento, CA: Department of General Services. Available at: http://ceres.ca.gov/planning/bol/1997

[12] Byers, Elizabeth, and Karin Marchetti Ponte. 2005. *The Conservation Easement Handbook*. (Second Edition.) Washington, DC: Land Trust Alliance and Trust for Public Land.

# SECTION 4.0
# TRAIL DESIGN

Adherence to trail design guidelines facilitates the ability to consistently provide high-quality trails to serve the diverse needs of County of Los Angeles (County) residents and visitors. Final trail design normally takes place after the identification of a feasible conceptual trail alignment and completion of the environmental review process. Waiting until the environmental compliance process is completed reduces the need for design modifications that may arise during review of the conceptual design by the public, regulatory oversight agencies, and the lead agency rendering the decision on the proposed project. The detailed design of the trail consists of four distinct considerations: (1) Trail Mechanics, (2) Trail Longevity, (3) Application of Design Guidelines, and (4) Constructability (Figure 4-1, *Trail Implementation Flowchart*). Trail design guidelines for tread materials, tread widths, drainage designs, and trail amenities are subject to modification in response to site-specific constraints and opportunities identified during the feasibility analysis.

## 4.1 TRAIL MECHANICS

The beauty of a trail and the way a trail compels a person to enjoy and explore the natural world is at the core of the trail experience. The first consideration in designing a trail is mechanics. The best type of trail is not only aesthetically pleasing but also designed to sustain the mechanical forces induced by weather, compaction, plants, animals, and humans. The consideration of these mechanical forces is critical to the development of a detailed design that is compatible with the inherent environmental conditions, thus maximizing durability and longevity of the trail for recreational purposes while minimizing trail maintenance and reconstruction. Of particular importance is the consideration of trail mechanics in relation to the factors that affect the level of trail erosion and water damage, such as tread watershed size, compaction, and displacement (Table 4.1-1, *Trail Mechanics*). In addressing trail mechanics, this section uses numerous trail structure terminology that is illustrated in Figure 4.1-1, *Trail Structure Terminology*. Soil erosion on trails is caused primarily by the forces of water and wind, as well as physical displacement by plants, animals, and humans. Trail erosion removes soil from the tread and leaves behind ruts in the trail. Although soil erosion is inevitable, proper trail alignment minimizes the risk of erosion.

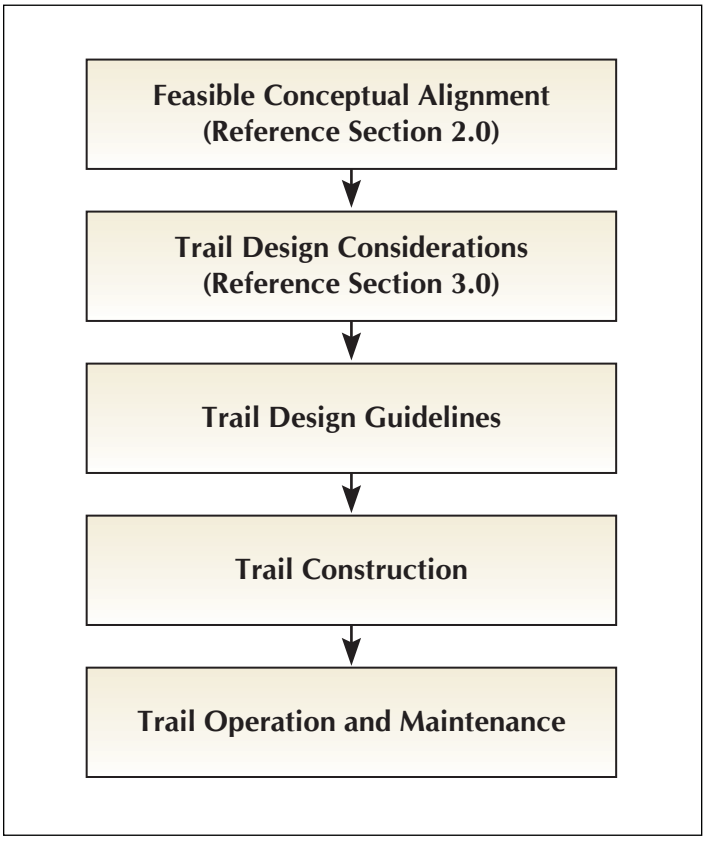



**Figure 4-1**
**Trail Implementation Flowchart**

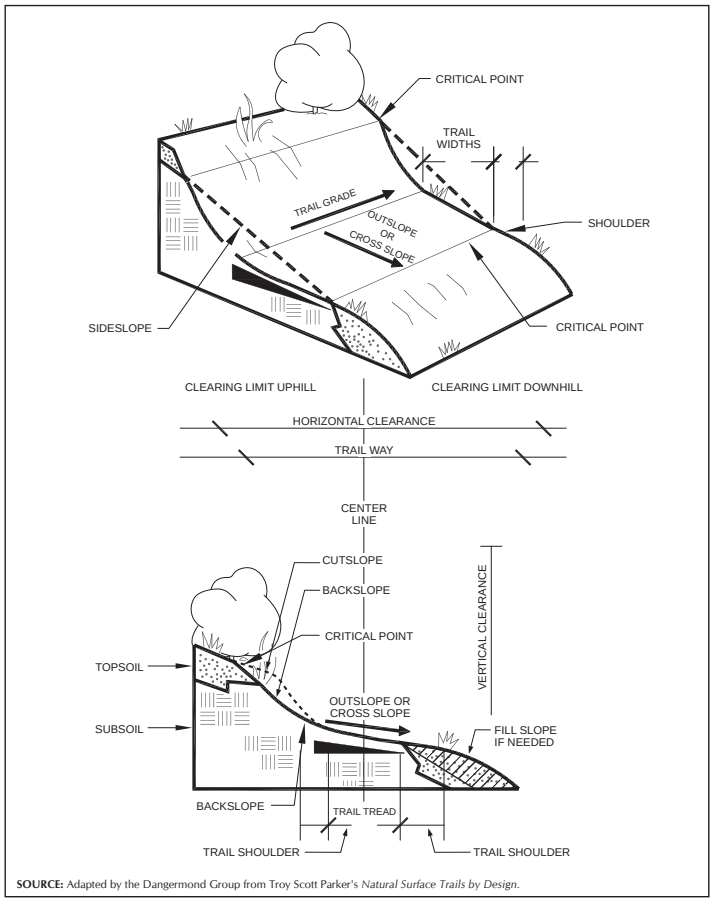



**Figure 4.1-1**
**Trail Structure Terminology**

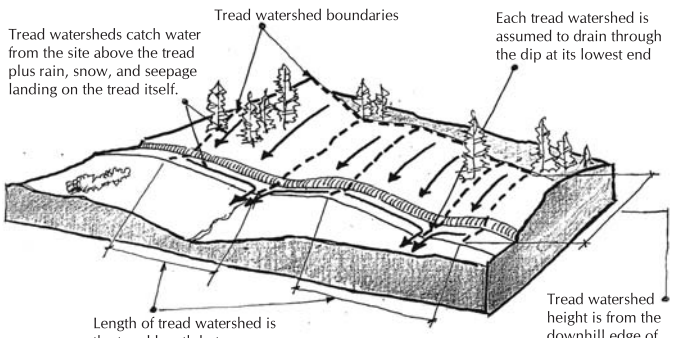
### 4.1.1 Tread Watershed

The largest factor affecting the natural forces acting on a trail is the tread watershed for the trail (Figure 4.1.1-1, *Tread Watershed*). A trail's tread watershed is the portion of a trail segment

## TABLE 4.1-1
## TRAIL MECHANICS

| Tread Watershed Factor | Decreased Erosion and Water Damage Risk | Increased Erosion and Water Damage Risk |
|---|---|---|
| Tread watershed size | Smaller tread watershed | Larger tread watershed |
| Watershed slope | Shallow slopes | Steeper slopes |
| Runoff potential | Low runoff potential (thick forest litter) | High runoff potential (little cover, rocky) |
| Splash erosion | Tree canopy over tread | Tread open to sky |
| Tread width | Narrower tread | Wider tread |
| Weather, climate, microclimate | Light rains only, slow snowmelt | Downpours, heavy snows, rapid snowmelt |
| Water sources | No water sources, constant and/or limited water sources, low water table, water easily anticipated and accommodated | Unpredictable or highly variable water sources, high water table, water not easily drained or accommodated, floodplain |
| Tread texture | Compacted tread surface that is not easily displaced, some larger particles/rocky content, dry or moderately dry tread | Easily displaced and/or graded materials (all one size), no particles, too many round particles, wet or saturated tread |
| Trail use (compaction and displacement) | Low trail use, low displacement modalities, low likelihood of tread crest/dip failure | High trail use, high displacement modalities, higher likelihood of tread crest/dip failure |
| Tread grade | Shallow grades | Steeper grades |
| Tread length | Shorter tread length | Longer tread length |
| Dip trail longevity | Minimal sediment, quick drainage, wide outflow, minimal tread displacement, sufficient size | Too much sediment, slow drainage, narrow outflow, high displacement, insufficient size |

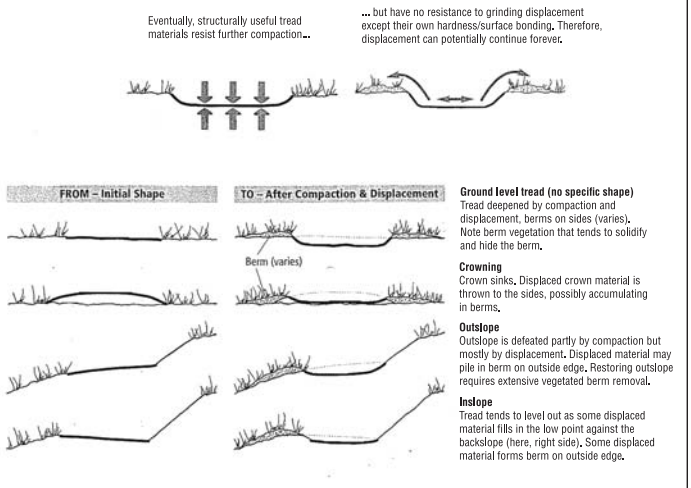
**SOURCE:** Parker, Troy Scott. 2004. *Natural Surface Trails by Design*. Boulder, CO: Nature Shape, LLC.




A tread watershed is the trail tread between a local high point (crest) and the next local low point (dip), plus the land area that drains onto this tread segment. The watershed length is set by the locations of the local crests and dips in the tread. Compaction and displacement reduce the outslope of the trail. As a result, there would be an increase in the likelihood of water flowing down the trail and draining solely through the dips. Placing dips close together during the original trail construction serves as insurance against tread failure when the outslope decreases due to compaction and displacement. Because the tread watershed includes both the trail tread and the slope that drains onto it, place dips closer together where cross-slopes are steep. Slope and trail surfaces along with their vegetative cover are factors that contribute substantially to the runoff potential of tread watersheds.

**SOURCE:** Adapted by the Dangermond Group from Troy Scott Parker's *Natural Surface Trails by Design*.

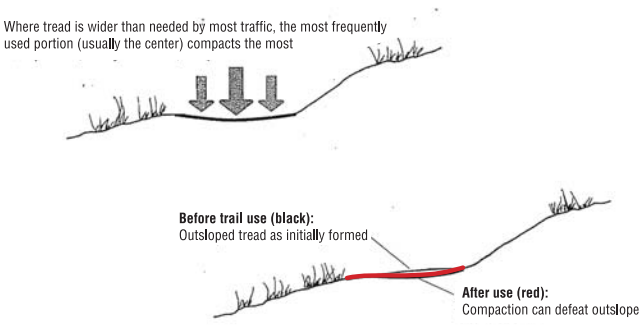
**Figure 4.1.1-1**
**Tread Watershed**




The shape of a trail tread is altered by compaction, displacement, and erosion. Compaction is limited, but displacement is a continual process with tread materials strongly affecting the ability of tread surfaces to hold their shape. On grades, compaction and displacement increase, and displaced particles move slowly down the trail. Compaction, displacement, and erosion reduce the outslope of a trail, resulting in reduced trail drainage.

**SOURCE:** Adapted by the Dangermond Group from Troy Scott Parker's *Natural Surface Trails by Design*.

**Figure 4.1.1-1**
**Effects of Compaction and Displacement on Trail Tread**




The majority of trail treads sink from compaction by all types of users, causing the outslope (built into trails to increase drainage) to fail. Damage to the outslope of newly constructed trails occurs rapidly. Newly constructed trails require more maintenance than established trails.

Compaction makes the tread more resistant to displacement, erosion, and mud; however, it also reduces the absorptive capacity of the soil, increasing its erosion potential due to increased water flow ponding.

**SOURCE:** Adapted by the Dangermond Group from Troy Scott Parker's *Natural Surface Trails by Design*.

**Figure 4.1.2-1**
**Compaction of Trail Tread**

between a local high point (crest) and a local low point (dip) along the trail, plus the land area above the trail that drains onto that segment of the trail. The length of the watershed is the distance between crest and the dip of that segment of trail. The side slope of the tread watershed, the soil type, and the vegetative cover contribute to the runoff potential of tread watersheds. As the outslope is lost due to compaction and displacement, water increasingly flows down the trail draining through the dips in the trail segment. Therefore, placing dips close together during initial trail construction can anticipate this condition. Steeper side slopes will increase the amount of water within the tread watershed, thereby making it necessary to place the dips closer together.

The shape of a trail is altered by compaction, displacement, and erosion. Compaction is normally limited to new trail segments, but displacement is a continual process with tread materials strongly affecting the ability of tread surfaces to hold their shape. On grades, compaction and displacement increase, and displaced particles move slowly down trail. Compaction, displacement, and erosion reduce the outslope of a trail, resulting in reduced trail drainage (Figure 4.1.1-2, *Effects of Compaction and Displacement on Trail Tread*).

## 4.1.2 Compaction

Overbuilding the outslope[1] of a trail by 1 to 2 degrees, or crowning the center of the trail slightly, can offset the initial compaction caused by heavy use. An alternative strategy is mechanical soil compaction as a final step in building the trail. Sandy soils do not compact easily, and clay or other amendments can be added to sandy soils to reduce their susceptibility to erosion. Mechanical compaction should only be completed in areas where it is feasible to supply the water needed to complete the compaction process.

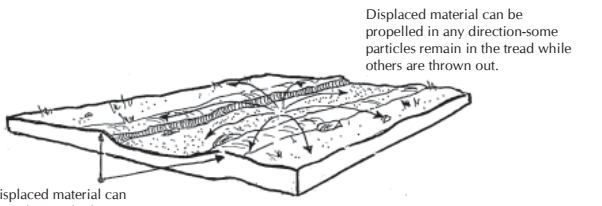
The majority of trail treads sink from compaction by all types of users, causing the outslope to fail (Figure 4.1.2-1, *Compaction of Trail Tread*). The outslope is the transition from the edge of the trail to a lower elevation that allows surface runoff to flow off the edge of the trail. On firm dry soils, such as clays and silt, users can actually help compact a newly built trail tread. Clay and silt have chemical and mechanical properties that will cause them to bond and compact from pressure caused by walking, horseback riding, or bicycling.

## 4.1.3 Displacement

Ideally, build new trails at the beginning of the dry season, so that users can compact it without displacement. Alternatively, mechanically compact the trails when building. In addition to walking, people have devised a variety of vehicles for traveling on trails. A simple way to understand the erosive forces that people have on trails is to study where the force of the foot or tire is directed. On a flat trail, the weight of a person is directed straight down into the trail tread (vertically). However, when a person begins to move, whether on foot, a bicycle, or a horse, a portion of the force is also directed either in front or behind that person (horizontally). If the trail tread is sloped, the direction of the horizontal force will be downhill. If the person is riding a bicycle, more of the force of the tire will be directed

[1] An outslope tilts the outer edge of a hillside trail down and away from the inner, higher edge and allows water to drain away without eroding the trail itself.

horizontally. At steady speeds, the horizontal force is minimal. However, when the bicycle accelerates, the horizontal force increases and the wheel will dig into the trail tread, throwing soil behind them. Generally, people are not strong enough to accelerate a bicycle appreciably when riding up a steep slope.




SOURCE: Adapted by the Dangermond Group from Troy Scott Parker's *Natural Surface Trails by Design*.

**Figure 4.1.3-1**
**Displacement of Trail Tread**

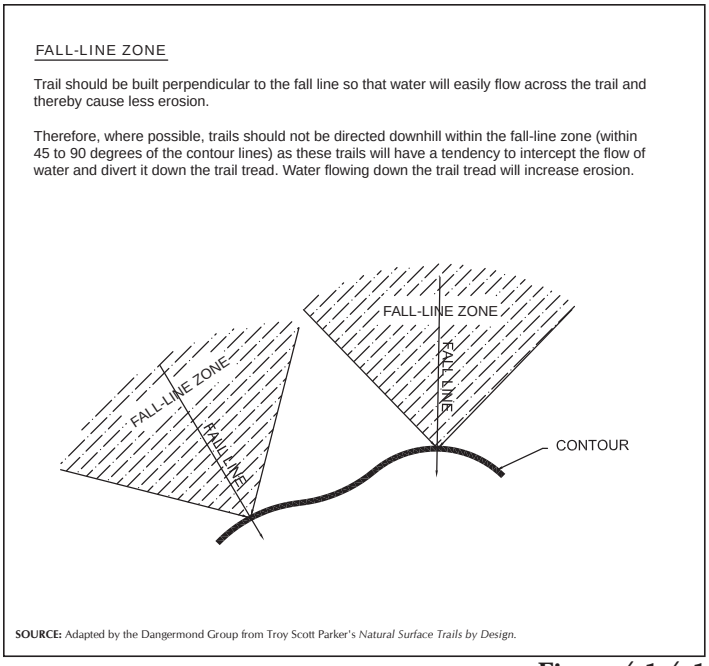
On dry, firm soils, compaction will occur with minimal displacement of soils to either side (Figure 4.1.3-1, *Displacement of Trail Tread)*. However, user compaction is likely to occur in the center of the trail tread and may result in a shallow rut running down the center of the trail. On wet clay and silt soils, user impacts may help compact the trail tread, but due to the plasticity of these soils when wet, users also contribute to soil displacement. In this limited case, if there is even moderately heavy use, due to the combination of compaction and extrusion, a rut will likely form down the center of the trail, creating a trough with the extruded soil building up along the sides. A trough will intercept water from the slope and cause it to flow down the trail tread, contributing further to erosion and rut formation.

## 4.1.4 Erosion

Creating trails with a smaller tread watershed helps to reduce erosion. A trail that undulates with the landscape will have more frequent high and low points; therefore, tread watersheds for theses types of trails will be smaller than the tread watersheds of steadily climbing trails, such as fall-line zone trails. Intentionally aligning trails to take advantage of the natural contours of the landscape helps to create smaller tread watersheds. In addition, trails built along contours require fewer switchbacks and are less likely to be stacked one on top of the other, separated by short vertical distances. Because stacked trails percolate water downward onto the trail treads below, a series of stacked trails effectively constitutes one larger tread watershed and must be avoided wherever possible.

Wherever practicable, design trail segments perpendicular to the fall line to allow surface runoff to flow across the trail and to minimize the area subject to erosion. In the County of Los Angeles, water from rainfall is a primary contributing factor to trail erosion. The County averages 15 inches of rain per year. However, the mountainous areas of the County receive much more rain, with portions averaging 33 inches.[2] The desert portions of the County receive approximately 4 inches, and the plains near the coast receive approximately 12 inches. The vegetation found in the foothill areas of the County typically consists of shrubs, which do not provide a canopy to reduce the intensity of the impact of rain on a trail.

Wherever possible, avoid aligning trails with the fall line and fall-line zone. When trails are aligned with the fall-line zone, they have the tendency to intercept the flow of water and direct the water along the trail tread, resulting in maximum exposure to erosion. The fall line is the path of least resistance that is taken by surface runoff, and it lies perpendicular (90°) to the contours of the land. Water will also tend to follow any path that lies within the fall-line zone, which extends approximately 45° to each side of the fall line (Figure 4.1.4-1, *Fall Line*). The fall line of the slope is the steepest path down the slope, and unless directed elsewhere, water will flow down the fall line.




SOURCE: Adapted by the Dangermond Group from Troy Scott Parker's *Natural Surface Trails by Design*.

**Figure 4.1.4-1**
**Fall Line**

Similarly, trails alignments through stable soils with high clay and silt fragments have the greatest capacity to withstand the erosive capacity of wind. Generally, trail surfaces built on stable soils such as clay and silt are more resistant to wind erosion, whereas trail surfaces built on sand or sandy loam soils have greater susceptibility to wind erosion. Wind works in two ways: (1) wind can directly displace soil by blowing it away, and (2) sand or gravel particles picked up by wind can scour the trail tread.

[2] County of Los Angeles Department of Public Works. Accessed 6 April 2006. "Water Resources Precipitation Page." Web site. Available at: http://www.ladpw.org/wrd/precip/

Wind and water in combination are particularly damaging because of the individual damage caused by each, and because wet soils are especially vulnerable to erosion caused by the scouring action of rain that falls at an angle to the trail. Therefore, trail designers need to refine the conceptual trail alignment to utilize areas outside fall-line zones and to use stable soils wherever possible.

## 4.2 TRAIL LONGEVITY

The second consideration in the trail design process is trail longevity. Trails designed to withstand the erosive effects of water, wind, and users have increased longevity. The design of a durable, lasting trail works with the undulation (up and down) and meandering (back and forth) of the landscape to direct water off the trail as quickly as possible. The consideration of the Half Rule, the 10-Percent Rule, Minimal Use of Switchbacks, Outsloping of the Trail, Maximum Sustainable Grade, Controlling Water on a Trail, and Gaining Altitude on a Trail will optimize trail longevity. However, trail longevity must be balanced with accessibility. In specific projects where trails will be designated and designed for accessibility, as specified in Appendix I, *Trail Accessibility Guidelines*, trail grade should be 5 percent or less and no more than 30 percent of the trail should exceed 8 percent grade, and the trail grade should not exceed 8 percent for more than 200 feet, 10 percent for more than 30 feet, and 12.5 percent for more than 10 feet.

### 4.2.1 The Half Rule

**Guideline:** Design the trail grade at less than 50 percent of the grade of the sideslope traversed by the trail (Figure 4.2.1-1, *Half Rule*).

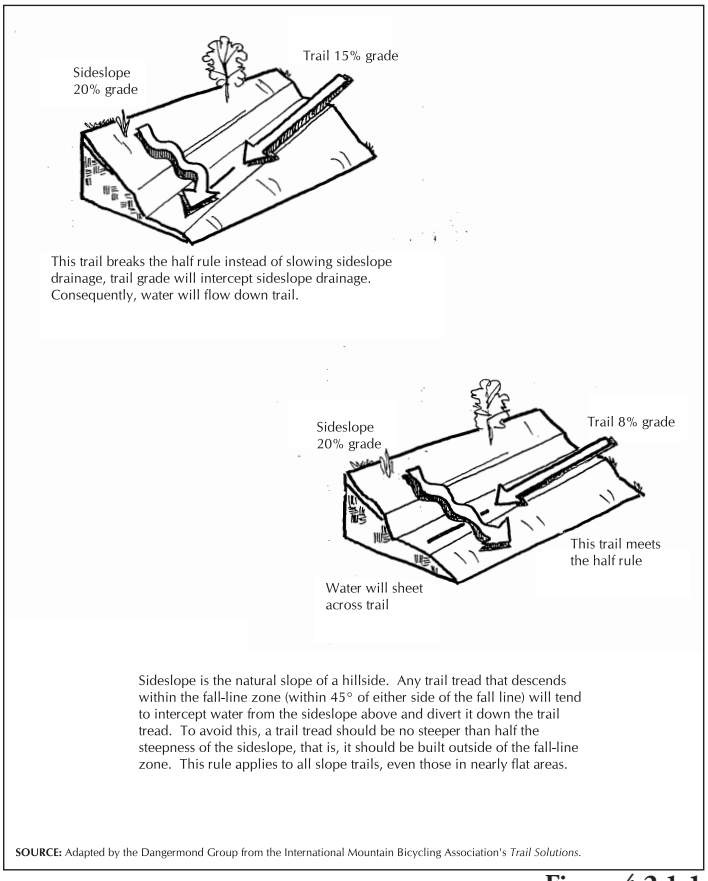



**Figure 4.2.1-1**
**Half Rule**

Sideslope is the natural slope of a hillside.[3] Any trail tread that descends within the fall-line zone (within 45° of either side of the fall line) will tend to intercept water from the sideslope above and divert it down the trail tread. To avoid this, design the trail tread to be no steeper than half the steepness of the sideslope; that is, build the trail tread outside of the fall-line zone. Thus, if a sideslope has a 20-percent grade, than the trail tread should not exceed 10-percent grade. Avoiding the fall-line zone by keeping the trail tread at no more than 50 percent of the sideslope grade is particularly important when building trails on low sideslope grades because, at low grades, water will move more slowly and remain on the trail longer. The duration of soil saturation increases the susceptibility to erosion by trail users.

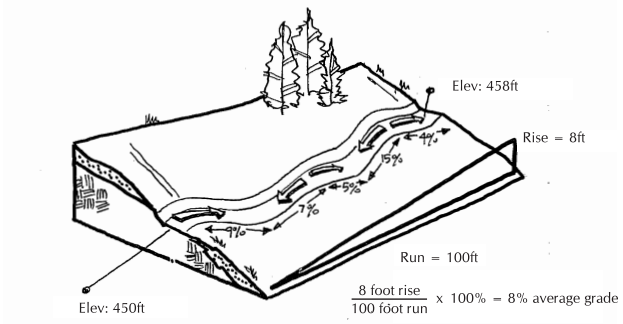
On well-built trails that undulate and meander with the contours of the landscape, the trail tread slope will vary. However,

[3] U.S. Department of Transportation, Federal Highway Administration. "Special Structures" Trail Construction and Maintenance Notebook. Available at: http://www.fhwa.dot.gov/environment/fspubs/00232839/page10.htm

on trail segments to be built with steep sideslopes, utilize the half rule up to the maximum sustainable grade. For example, a trail with a portion having a 30-percent sideslope will have a trail grade as high as 15 percent. However, trail grades should not exceed 15 percent since that is the maximum sustainable grade. In areas of excessive sideslopes, the use of switchbacks will be necessary, as switchbacks will enable the trail to be built at less than a 15 percent grade.

### 4.2.2 The 10-Percent Rule

**Guideline:** Design the trail such that the average trail grade (or critical climbing segment on long trails) is equal to or less than 10 percent (Figure 4.2.2-1, *Average Trail Segment Grade*).




Aligning a trail segment with an average tread grade of 10 percent or less increases the sustainability of the trail. Using the average trail segment rule provides an easy way to compute the approximate length of trail that will be needed to reach the top of a grade at a sustainable slope when plotting trails on a topographic map.

Average grades of 10 percent or less allow the trail to rise and fall without resulting in overly steep sections. Most soils will sustain tread grades of 10 percent or less.

SOURCE: Adapted by the Dangermond Group from the International Mountain Bicycling Association's *Trail Solutions*.

**Figure 4.2.2-1**
**Average Trail Segment Grade**

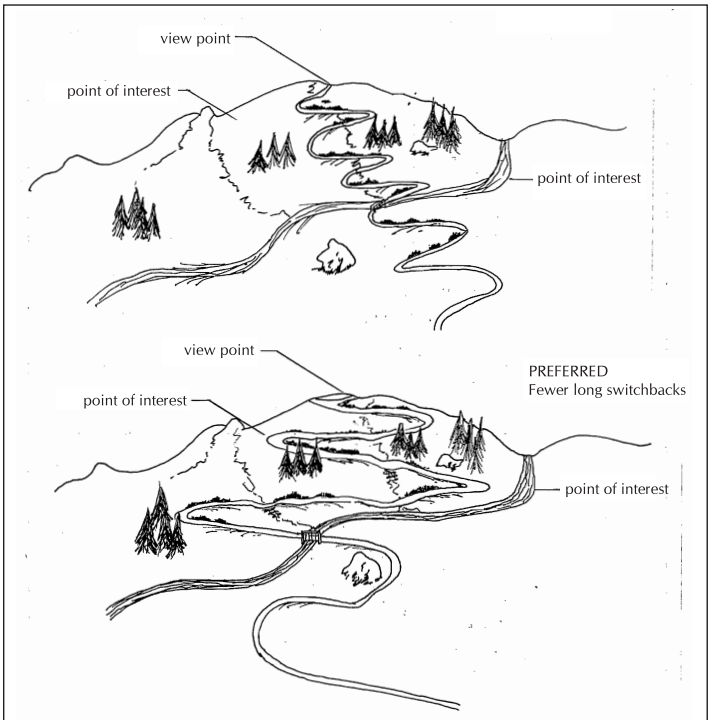
Aligning a trail segment with an average tread grade of 10 percent or less increases the longevity and durability of the trail. Using the "average trail segment rule" provides an easy way to compute the approximate length needed to reach the top of a grade at a sustainable slope when plotting trails on a topographic map. Specifically, each 10 feet of elevation gain requires a run of at least 100 feet.

$$\text{Average Grade (percent)} = \frac{\text{Rise}}{\text{Run}} \times 100$$

Because water moves faster on steeply sloped trail treads, its erosive capacity is increased. Limiting the average grade of the trail tread to 10 percent or less will help limit erosion. In addition, limiting a trail to a 10-percent grade will provide a trail that is accessible to more users.

### 4.2.3 Minimal Use of Switchbacks

**Guideline:** Reduce the number of short, stacked switchbacks when traversing steep terrain; use fewer long switchbacks instead (Figure 4.2.3-1, *Switchbacks*).




Traversing the slope and following the natural contours of the land result in a trail with fewer switchbacks. This approach avoids the dangers of steep, stacked switchbacks. Trails that traverse the slope are less disruptive to the sideslope and its vegetation, and are less likely to undermine the slope. Also, they appear more natural, offer more opportunities for connecting to interesting places, and are open to better views.

SOURCE: Adapted by the Dangermond Group from Hesselbarth and Vachowski's *Trail Construction and Maintenance Notebook*.

**Figure 4.2.3-1**
**Switchbacks**

Traversing the slope and following the natural contours of the land result in a trail with fewer switchbacks. This approach avoids the danger of steep, stacked switchbacks. Trails that traverse the slope are less disruptive to the sideslope and its vegetation, and are less likely to undermine the slope. They also appear more natural, offer more opportunities for connecting to interesting places, and are open to better views.

### 4.2.4 Outsloping of the Trail

**Guideline:** Construct trails with an outslope of 2 to 5 percent. County preference is for 2-percent outslope (Figure 4.2.4-1, *Outslope*)

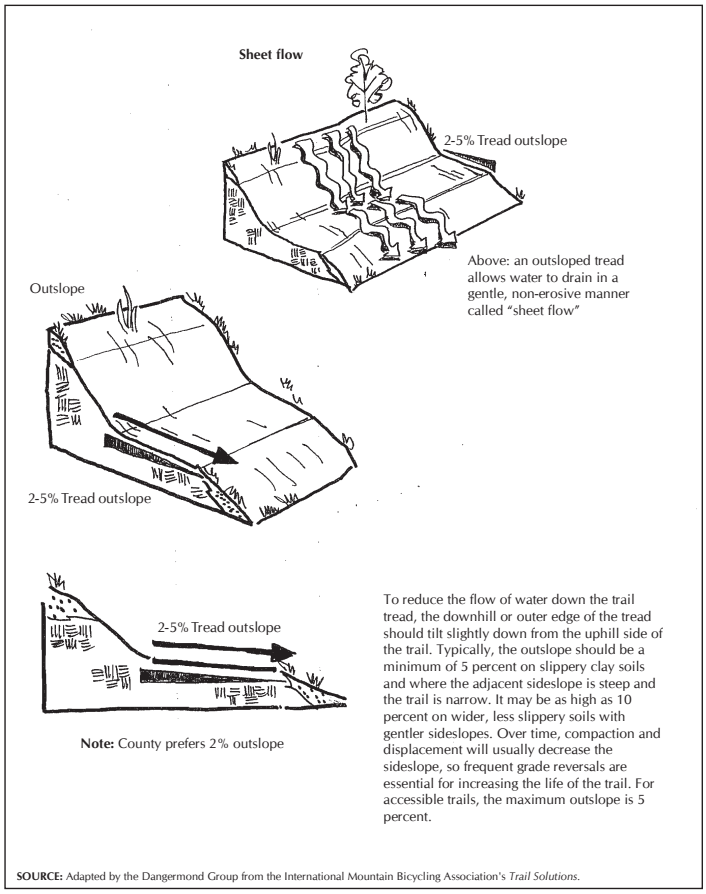



**Figure 4.2.4-1**
**Outslope**

As water drains onto the trail tread from the sideslope above, even when the trail is built within 45° of the contours (outside of the fall-line zone), there will still be a tendency for water to be intercepted and diverted down the trail tread. To reduce the flow of water down the trail tread, the downhill or outer edge of the trail should tilt slightly down from the uphill side of the trail. In general, 2 percent provides an adequate sideslope in steep terrain that makes it safe and comfortable for users. However, on a new hand-built trail where moderate to heavy use is anticipated during the rainy season, the trail may be built with up to 4 percent of outslope to overcompensate for the compaction and displacement that is likely to occur. Typically, an outslope should be a minimum of 5 percent on slippery clay soils and where the adjacent sideslope is steep and the trail is narrow. Over time, compaction and displacement will usually decrease the sideslope, so frequent grade reversals are essential for increasing the life of the trail.

An exception to this guideline is used for switchbacks. Water can flow perpendicularly across a series of switchbacks, causing damage to the trail. A solution is to inslope the uphill side of the trail, above the hairpin turn of the switchback, to direct water off the trail (see Section 5.0, Trail Operation and Maintenance, regarding construction of switchbacks).

### 4.2.5 Maximum Sustainable Grade

**Guideline:** Trail grades should reflect the conditions of the trail, including soils, precipitation, erosion and use, and generally should not exceed 15 percent for up to 300 feet.

The maximum sustainable grade of a trail varies and depends on many factors, including soils, type and number of users, rainfall, tread watershed size, and trail difficulty level. Trail segments that exceed 10-percent grade will not be as durable or lasting and therefore should not be used frequently.

Soils

The characteristics of soils play a large role in determining the maximum practical grade of a trail. As seen in Table 4.2.5-1, *Properties and Behaviors of Common Tread Materials*, soils present a variety of characteristics that determine soil stability under wet and dry conditions.

Decaying vegetative materials have no chemical or mechanical binding properties. As these materials decay, they will compact to a thin slippery layer, ill-suited to steep slopes. Clay and silt form chemical and mechanical bonds that make them resistant to erosion when they are dry and compacted. On wet steep slopes, these soils can form slip planes that result in mudslides. These soils are also subject to downhill displacement by users. Grains of sand do not bond chemically; however, the more ragged the grains, the better they hold together. They can be stable on gentler slopes, especially when wet. Ragged gravel has similar properties to sand. Although these soils tend to be permeable to water, trail erosion is likely to occur before water can percolate into the soil because water moves with greater velocity on steeper slopes. Combination soils such as loam are the most sustainable, with the bonding properties of clay and the permeable properties of sand and decayed vegetative matter.

User Impacts

User impacts increase on trails with steeper grades due to the force required to travel uphill and the force required to slow down the speed of descent while traveling downhill. The steeper the trail tread, the greater the potential damage from users.

Precipitation and Vegetative Cover

The duration, volume, and intensity of rainfall affect the maximum sustainable grade of the trail. Although annual rainfall in the County is relatively low, individual rainfall events can be quite intense, dropping a lot of water quickly, with substantial force, and creating splash erosion on the trail tread. The steeper the grade, the more crucial it is to have vegetative cover on both the sideslope and the trail tread to substantially increase the ability of soils to absorb and hold water. Tree and shrub

## TABLE 4.2.5-1
## PROPERTIES AND BEHAVIORS OF COMMON TREAD MATERIAL

| Material and Particle Size | Properties and Characteristics | Behavior in Trail Tread |
|---|---|---|
| Clay (0.002 mm) | Clay is very fine with a sandwiched structure that is ionically charged in the middle. Clay results in a slippery tread and is subject to slippage between layers on sloped surfaces. | Clay is stable when dry, but slippery when wet. It holds water well. Clay, such as that used in cat litter, can be used as a soil binder when mixed with less stable soil types. |
| Silt (0.05 to 2.0 mm) | Silt is fine- to medium-textured sediment from broken rock. Silts with larger particles tend to be less muddy when wet. | Silt is variable. In general, it tends to be stable when dry and slippery when wet. Silt can be dusty when dry. It can be added to less stable soil types as a binder. |
| Sand (0.05 to 2.00 mm) | Sand is coarse-textured broken rock that drains very well. Sand has little resistance to erosion and displacement due to its lack of ionic charge and binders. The more ragged the grains of the sand, the less likely it is subject to displacement and erosion. | Pure sand treads displace and erode easily. Sand can increase drainage and compaction resistance when added to other trail materials. |
| Loam (0.002 to 2.0 mm) | The most common soil, loam is a mix of clay, silt, and sand. Depending on the mixture, loam can provide a stable, well-drained surface. | A well-balanced loam is smooth, firm, and stable on treads when dry. |
| Gravel (2 mm to 6 cm) | Gravel is broken rock without binders. It provides good bearing strength. Angular particles provide some stability, which partially offsets its low binding properties. | Gravel increases bearing strength and load resistance when added to other soil mixtures. Gravel creates a rough bumpy trail that may encourage users to walk off the trail. |
| Cobbles (6 cm to 20 cm)<br>Stones (20 cm to 48 cm) | Cobbles and stones are rocks that need smaller particles, dust, and compaction to fill voids and provide binding. However, cobbles and stones provide strength and load resistance. Rounder stones are easier to walk on. | Cobbles and stones add even more bearing strength and load resistance when added to other soil mixtures. They create a rough bumpy trail that may encourage users to walk off the trail. |
| Crushed stone / decomposed granite (size varies) | Crushed stone is mechanically crushed rock. Heavier stone such as decomposed granite provides greater resistance to displacement. Rock stones are easier to walk on. | Crushed stones have variable behavior, resistance to compaction, and moderate resistance to displacement. Crushed stones are easily eroded by moving water, but do not get muddy. Decomposed granite is commonly used in newly built trails, not in preexisting trails. |
| Humus (organic soil, no size) | Organic product of vegetation decay with no binders and little mineral content, which compacts to a thin layer over time. | Humus ruts easily. Humus is also easily displaced unless bound by roots. It is not generally recommended for use as tread. |

**SOURCE:** Adapted by the Dangermond Group from Parker, Troy Scott. 2004. *Natural Surface Trails by Design*. Boulder, CO: Nature Shape, LLC.

canopies intercept water before it reaches the ground, allowing the water to evaporate from the leaves. In addition, much of the water that penetrates the soil is removed by the capillary action of the vegetative roots, and is transpired into the air.

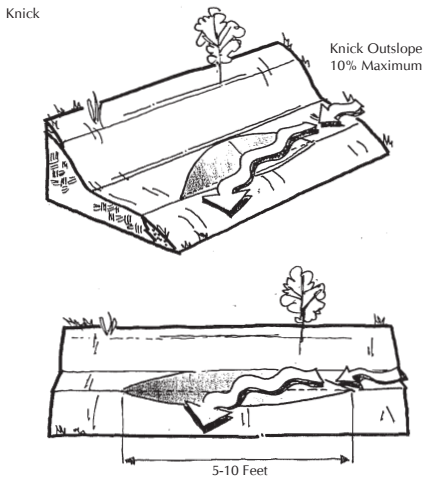
### 4.2.6 Controlling Water on a Trail

The best way to control water on a trail is by manipulating the tread watershed size by controlling the distance between low and high points of trail segments (Figure 4.1.1-1). On a rolling landscape, align the trail so that it undulates with the landscape to automatically produce high and low points on the trail, thereby creating smaller tread watersheds. Other methods used to control water on a trail include knicks, grade reversals, and water bars.

Knicks

**Guideline:** Design knicks into straight flat sections of trails to drain water from locations that are likely to be subject to puddling (Figure 4.2.6-1, *Knicks*).

A knick is a semi-circular, graded section of trail, between 5 and 10 feet in diameter and sloped about 10 percent to the outside. Knicks work well on non-cohesive soils such as sand, pumice, and decomposed granite and are generally built into gentler sections of the trail where water tends to puddle. Decomposed granite is used when building new trails, not on pre-existing trails. By effectively creating a low point on the trail, they provide drainage relief. As a safe practice, place knicks where they will be visible to all trail users. Never place knicks on or just past curved sections of the trail. Users, and particularly mountain bicyclists, will usually anticipate knicks by migrating toward the shallower, uphill side of the trail to pass across knicks.



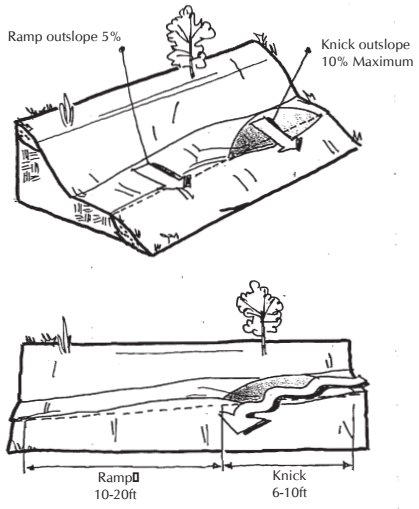

A knick is a semi-circular, graded section of trail, between 5 and 10 feet in diameter and sloped about 10 percent to the outside. Knicks are generally built into gentle sections of the trail where water tends to puddle, and work well on non-cohesive soils such as sand, pumice, and decomposed granite. Knicks should never be built on curved sections of the trail.

**SOURCE:** Adapted by the Dangermond Group from the International Mountain Bicycling Association's *Trail Solutions*.

**Figure 4.2.6-1**
**Knicks**

Rolling Grade Dip

**Guideline**: Design rolling grade dips into straight inclined sections of trails to divert water from trail tread (Figure 4.2.6-2, *Rolling Grade Dip*).




A rolling grade dip is a knick combined with a 10- to 20-foot ramp downhill of the knick. The dip should be longer than the average length of a bicycle (9 feet). The ramp is constructed from the excavated dirt and should be outsloped at 5 percent. On unstable soils, the ramp should be reinforced with subsurface rocks, and clay should be added to the soil for additional binding capacity. Alternatively, the entire rolling grade dip should be carved out of the trail tread.

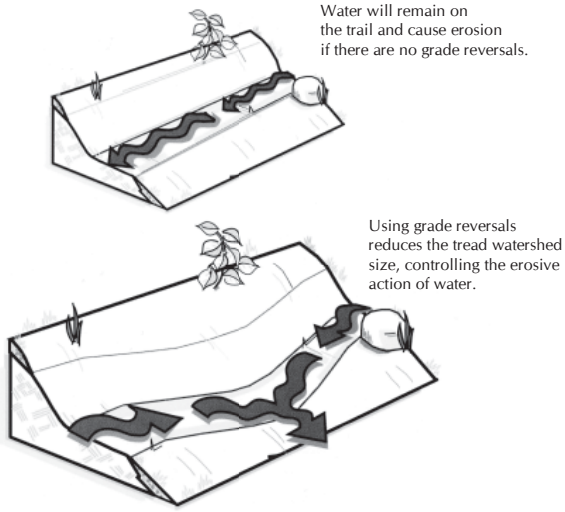
**SOURCE:** Adapted by the Dangermond Group from the International Mountain Bicycling Association's *Trail Solutions*.

**Figure 4.2.6-2**
**Rolling Grade Dip**

A rolling grade dip is a knick combined with a 10- to 20-foot ramp downhill of the knick. Design the dip to be longer than the average length of a bicycle (9 feet). Construct the ramp from the excavated dirt; outslope the ramp at 5 percent. On unstable soils, reinforce the ramp with subsurface rocks. Add clay to the soil for additional binding capacity. Alternatively, carve the entire rolling grade dip out of the trail.

Grade Reversals

**Guideline:** Control the erosive action of water by using grade reversals to reduce tread watershed size (Figure 4.2.6-3, *Grade Reversals*).




SOURCE: Adapted by Sapphos Environmental, Inc. from the International Mountain Bicycling Association's *Trail Solutions.*

**Figure 4.2.6-3**
**Grade Reversals**

A grade reversal is a segment along the trail where the trail levels out and then changes direction, dropping in elevation for 10 to 50 linear feet before rising again. Grade reversals can also be utilized as resting intervals. Build grade reversals into trails where the contours of the land naturally undulate, working with the natural flow of water down existing swales and ravines. Grade reversals create low points for the trail segment and therefore set the boundaries for tread watersheds. A careful assessment of the expected amount of water to drain from the slope determines the frequency of use of grade reversals. The use of frequent grade reversals creates smaller tread watersheds.

Another method for working with contours to get water off the trail is to take advantage of the meanders of the contours. Rounding a corner provides an opportunity for water to exit the trail. The combination of outslopes and meanders on the trail encourages water to exit the trail at curves. One caution is to keep tread watersheds short so that the amount of water washing off the trail at corners will not wash out the trail.

In addition to providing trail drainage, both undulations and meanders add to the natural feel of a trail and provide interest for the users.

Water Bars

**Guideline:** Install water bars to divert water off the trail.

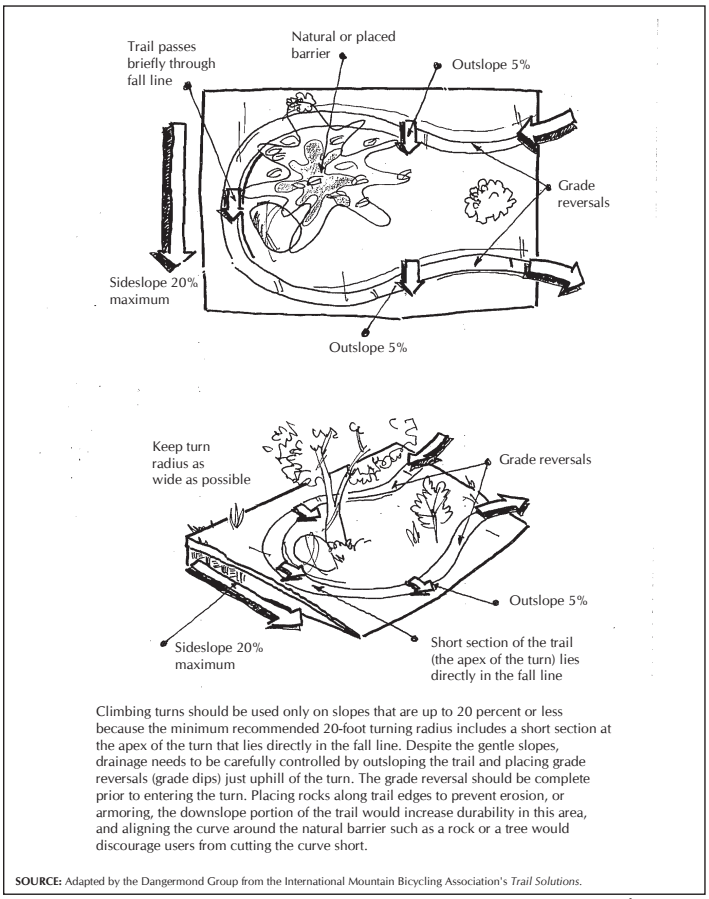
The use of water bars depends on the outslope, the inslope, and existing conditions of the proposed trail site. Water bars are usually formed by placing large stones or wood logs across the trail thread at a 20 percent to 30 percent angle from the normal right angle. Water moving down the trail is turned off the trail when it comes into contact with the water bar. Water stones or wood logs should be keyed or anchored in place with other stones or with 5/8-inch screws drilled in the logs and set approximately 3 feet in the ground. Water bars should be installed slightly above the trail tread and should be flushed with the top of the downhill slope of the trail tread.

## 4.2.7 Gaining Altitude on a Trail

Aligning trails with the contours of the landscape results in a durable trail. However, there are many reasons for aligning segments of a trail at angles to the contours. Destinations such as views, water features, rock formations, or mountain passes may require an uphill climb, and this may require the trail to reverse directions several times while climbing the slope. Although the half, 10-percent, and maximum sustainable grade rules provide guidance for aligning and building durable trails at angles to the contours, obstacles such as property lines, water features, rocks, and bogs may require the trail to reverse directions. Well-designed and well-placed climbing turns and switchbacks provide a practical way to redirect the trail.

## Climbing Turns

Guideline: Redirect trails with climbing turns on trail segments with grades of 7 percent or less, where the half, 10-percent, and maximum sustainable grade rules are not feasible (Figure 4.2.7-1, *Climbing Turns*).




Climbing turns should be used only on slopes that are up to 20 percent or less because the minimum recommended 20-foot turning radius includes a short section at the apex of the turn that lies directly in the fall line. Despite the gentle slopes, drainage needs to be carefully controlled by outsloping the trail and placing grade reversals (grade dips) just uphill of the turn. The grade reversal should be complete prior to entering the turn. Placing rocks along trail edges to prevent erosion, or armoring, the downslope portion of the trail would increase durability in this area, and aligning the curve around the natural barrier such as a rock or a tree would discourage users from cutting the curve short.

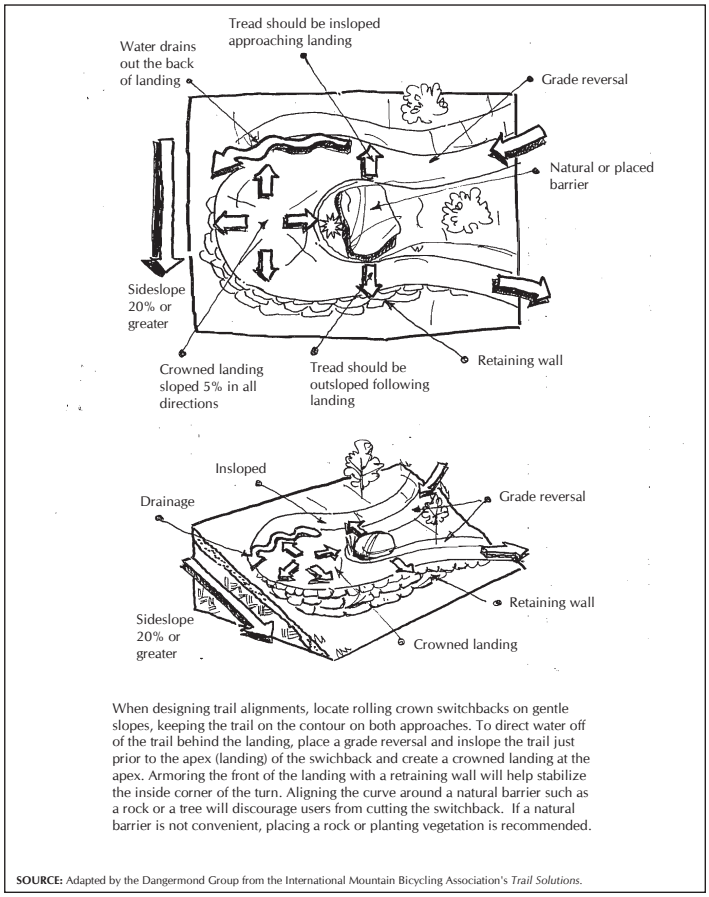
**SOURCE:** Adapted by the Dangermond Group from the International Mountain Bicycling Association's *Trail Solutions*.

**Figure 4.2.7-1**
**Climbing Turns**

Use climbing turns on slopes that are 7 percent or less because the minimum recommended 20-foot turning radius includes a short section at the apex of the turn that lies directly in the fall line. Despite the gentle slopes, drainage needs to be carefully controlled by outsloping the trail and placing grade reversals (grade dips) just uphill of the turn. Placing rocks along trail edges to prevent erosion (also known as armoring) along the downslope portion of the trail will increase durability in this area, and aligning the curve around a natural barrier such as a rock or a tree will discourage users from cutting the curve short. When aligning the trail, selecting a level area for the turning platform will greatly improve the stability of the climbing turn. Nonetheless, construct the downhill portion of the turning platform by filling with excess soil. A stable base of adequately compacted soil for the turning platform is easily achieved when using machinery to build a trail. However, retaining walls are required for inadequately compacted soils when building a trail by hand.

## Rolling Crown Switchbacks

Guideline: Use rolling crown switchback to turn trail segments back uphill, where the half, 10-percent, and maximum sustainable grade rules are not feasible (Figure 4.2.7-2, *Rolling Crown Switchback*).




When designing trail alignments, locate rolling crown switchbacks on gentle slopes, keeping the trail on the contour on both approaches. To direct water off of the trail behind the landing, place a grade reversal and inslope the trail just prior to the apex (landing) of the swichback and create a crowned landing at the apex. Armoring the front of the landing with a retraining wall will help stabilize the inside corner of the turn. Aligning the curve around a natural barrier such as a rock or a tree will discourage users from cutting the switchback. If a natural barrier is not convenient, placing a rock or planting vegetation is recommended.

**SOURCE:** Adapted by the Dangermond Group from the International Mountain Bicycling Association's *Trail Solutions*.

**Figure 4.2.7-2**
**Rolling Crown Switchback**

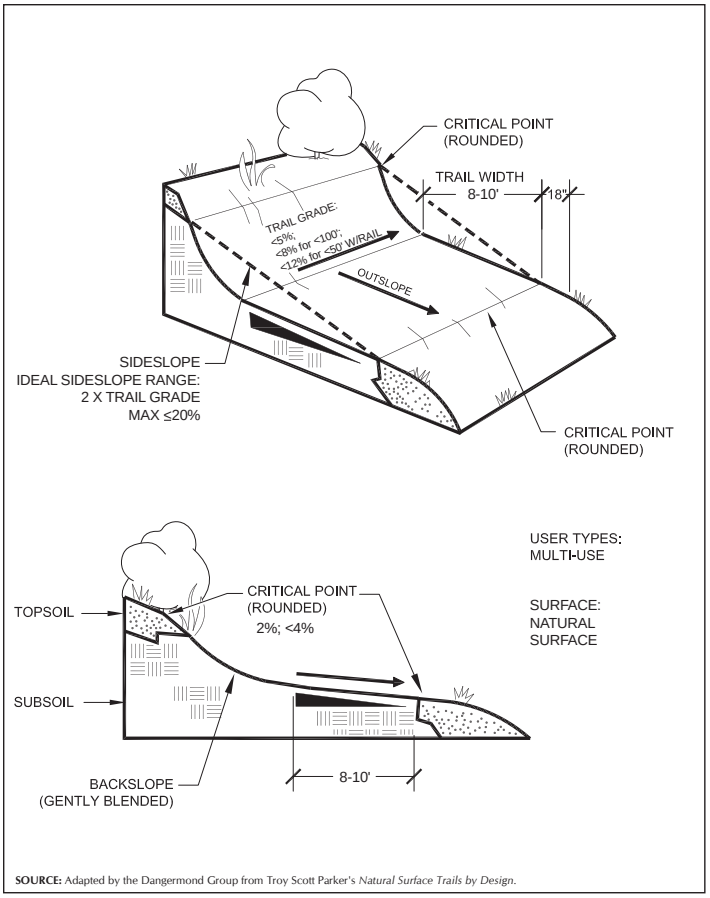
When designing trail alignments, locate rolling crown switchbacks on the flattest area possible, keeping the trail on the contour on both approaches. To direct water off the trail behind the landing, create a grade reversal, inslope the trail just prior to the apex (landing) of the switchback, and create a crowned landing at the apex. Armoring the front of the landing with a retaining wall is necessary on hand-built trails. Depending on the steepness of the sideslope and the stability of the soil, this may not be necessary when using machinery to construct the trail. As with climbing turns, aligning the curve around a natural barrier such as a rock or a tree will discourage users from cutting the switchback. Include the placement of a rock or planting of vegetation in the design of the climbing switchback where there is not a conveniently located natural barrier.

## 4.3 APPLICATION OF DESIGN GUIDELINES

The third consideration in the trail design process is the application of standard design guidelines. This section covers trail design guidelines for the various classifications of trails, water crossings, retaining structures, signs, and other appurtenances. These design guidelines facilitate the consistent design of high-quality County trails that are readily recognized by residents and visitors. To achieve this, it is important to maintain consistency throughout the trail network through standardization of design; quality of construction of trails, parking lots, rest areas, bridges, and other structures; and clear and consistent signs.

### 4.3.1 Trail Guidelines

There are four categories of trail development within the County. The guidelines for each category are designed to accommodate a variety of users, sites, and trail materials (Table 4.3.1-1, *Trail Classification Guidelines*). There are differences with certain guidelines specific to the type of user. For each trail classification, a diagram has been provided that depicts the design guidelines for that particular trail classification (Figure 4.3.1-1, *Recreational Pathway*; Figure 4.3.1-2, *Urban Pedestrian Path*; Figure 4.3.1-3, *Natural Trail* 1; Figure 4.3.1-4, *Natural Trail 2*; and Figure *4.3.1-5, Natural Trail 3*). This manual focuses on natural surface trails and therefore does not include guidelines for the Class I Bikeways referenced in the Highway Design Manual.[4]




**SOURCE:** Adapted by the Dangermond Group from Troy Scott Parker's *Natural Surface Trails by Design.*

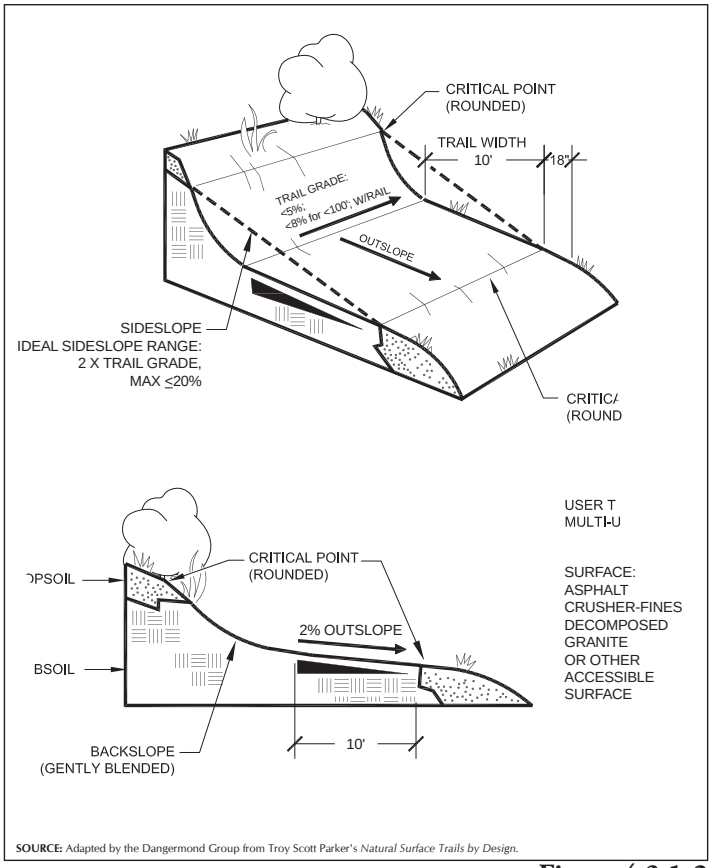
**Figure 4.3.1-1**
**Recreational Pathway**

**TABLE 4.3.1-1**
**TRAIL CLASSIFICATION GUIDELINES**

| Trail Classification | Trail Grade (percent) | Surface | Tread Width (feet) | Outslope (percent) |
|---|---|---|---|---|
| Urban Pedestrian Path | <5%<br><8% for <100′ with rail | Asphalt*<br>Crusher fines*<br>Decomposed granite | 10 to 11 2 | % |
| Recreational Pathway | <5%<br><8% for <100′<br><12% for <50′ | Natural surface 8 | to 10 2 | %<br><4% |
| Natural Trail 1 < | 5%<br><8% for <150′<br><12% for <50′ | Natural surface 7 | to 10 2 | %<br><4% |
| Natural Trail 2 < | 5%<br><8% for <100′<br><12% for <50′ | Natural surface 5 | to 8 | 2%<br><4% |
| Natural Trail 3 < | 5%<br><8% for <200′<br><12% for <50′<br><15% for <20′ | Natural surface 2 | to 3 | 2%<br><5% |

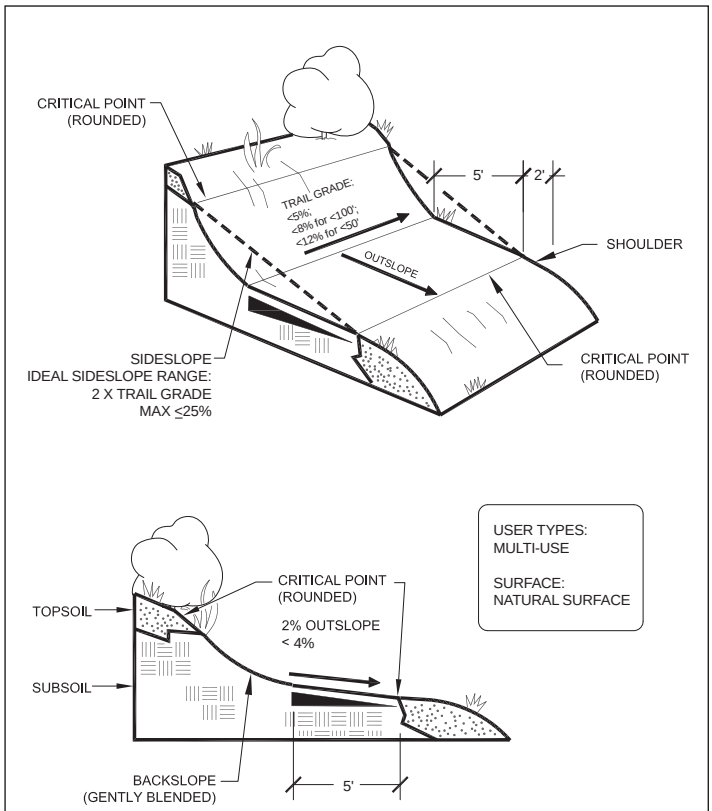
**NOTE:** *Asphalt and crusher fines used in trail surfaces cannot be road based and cannot contain toxic chemicals.

[4] California Department of Transportation. 1 February 2001. *Highway Design Manual, Chapter 1000, Bikeway Planning and Design*. Sacramento, CA. Available at: http://www.dot.ca.gov/hq/oppd/hdm/pdf/chp1000.pdf



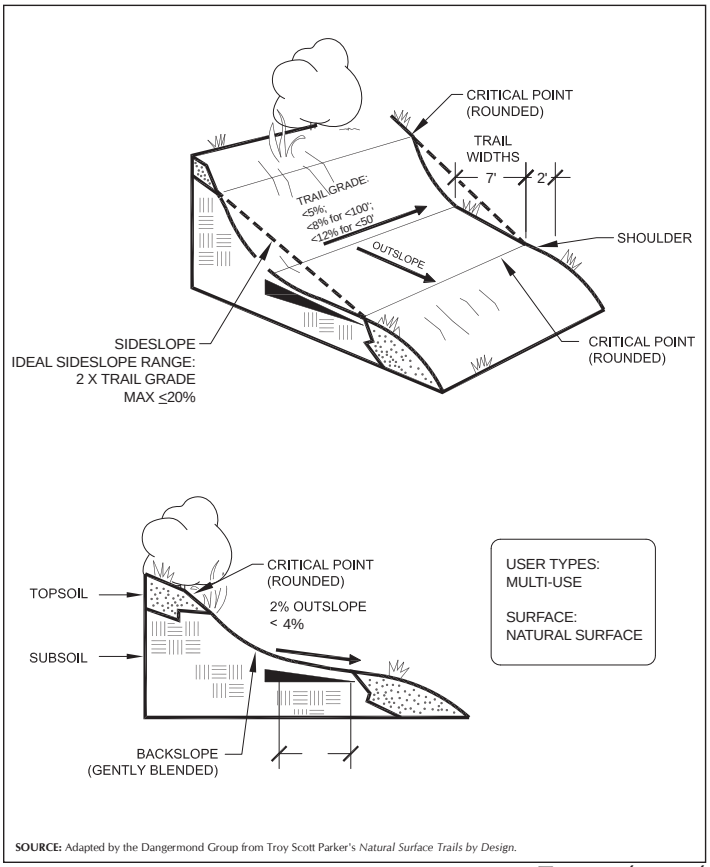

**SOURCE:** Adapted by the Dangermond Group from Troy Scott Parker's *Natural Surface Trails by Design.*

**Figure 4.3.1-2**
**Pedestrian Path**



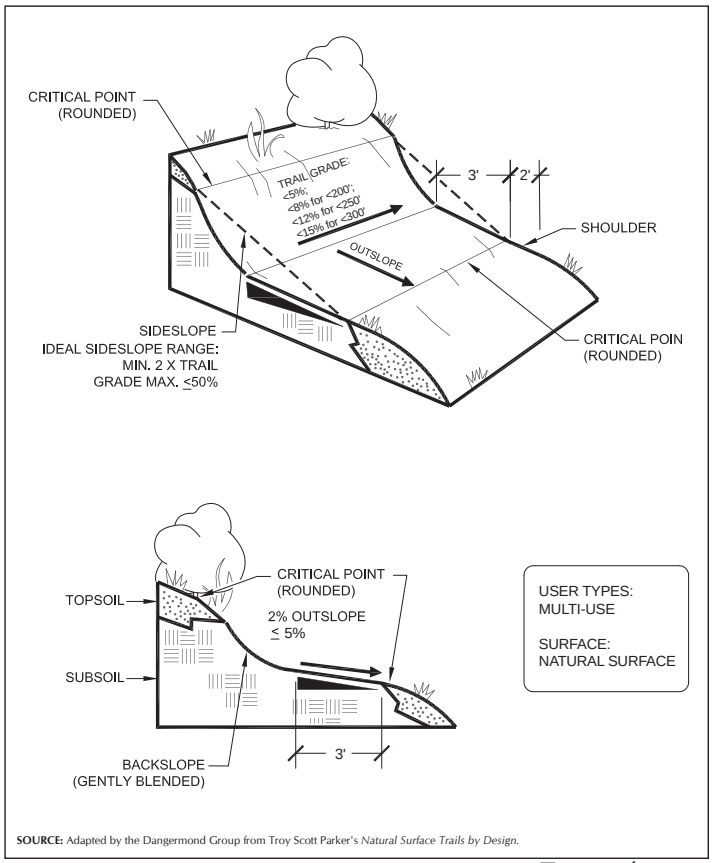

**SOURCE:** Adapted by the Dangermond Group from Troy Scott Parker's *Natural Surface Trails by Design.*

**Figure 4.3.1-3**
**Natural Trail 1**




**SOURCE:** Adapted by the Dangermond Group from Troy Scott Parker's *Natural Surface Trails by Design.*

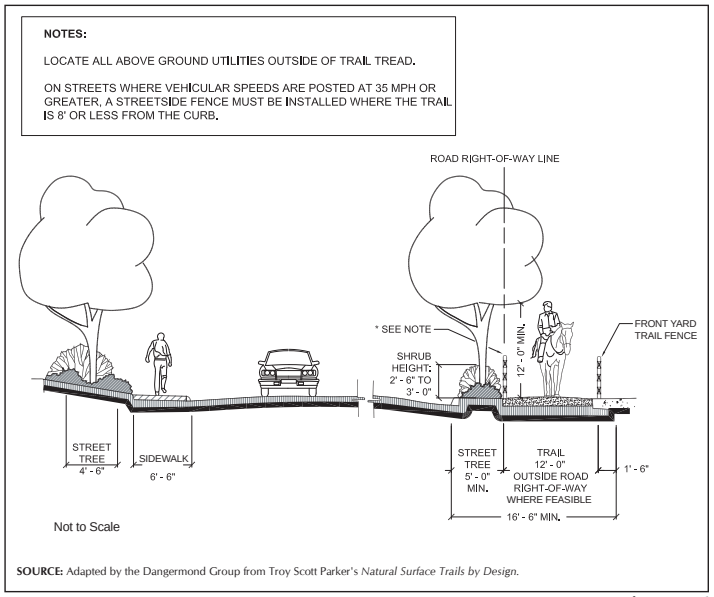
**Figure 4.3.1-4**
**Natural Trail 2**




**SOURCE:** Adapted by the Dangermond Group from Troy Scott Parker's *Natural Surface Trails by Design.*

**Figure 4.3.1-5**
**Natural Trail 3**

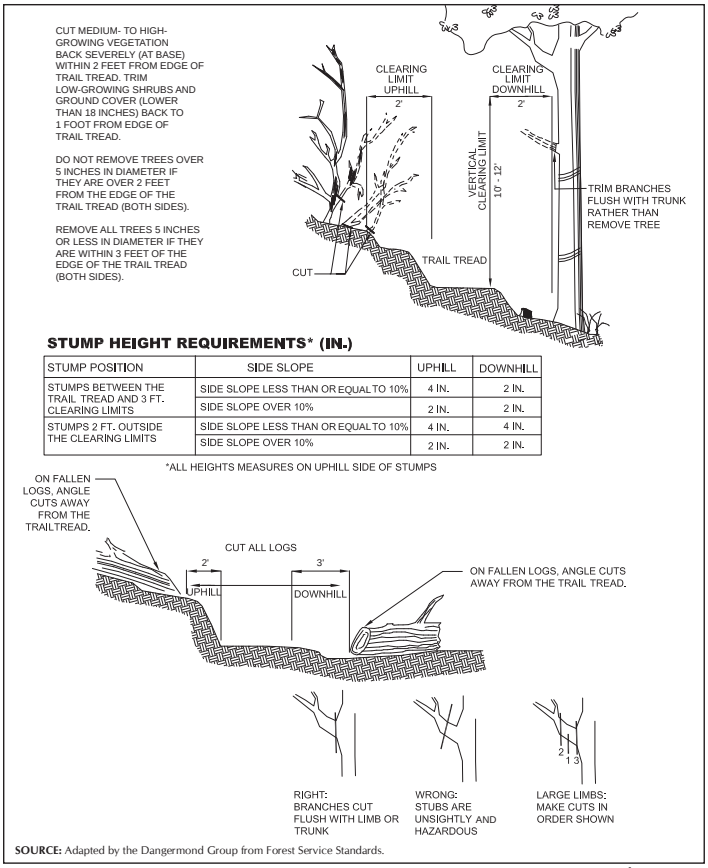
For trails that are adjacent to streets, the guidelines will be slightly modified to accommodate a larger trail width of 10 feet (Figure 4.3.1-6, *Multiuse Front Yard Trail on Secondary Roadway).*




**SOURCE:** Adapted by the Dangermond Group from Troy Scott Parker's *Natural Surface Trails by Design.*

**Figure 4.3.1-6**
**Multiuse Front Yard Trail on Secondary Roadway**

For all trail classifications, the clearing limits to the sides of the trail should be 2 feet, and the vertical clearance should be 10 feet for trails that exclude equestrian and 12 feet for trails that include equestrian (Figure 4.3.1-7, *Clearing Limits*).




**SOURCE:** Adapted by the Dangermond Group from Forest Service Standards.

**Figure 4.3.1-7**
**Clearing Limits**

It is the County's objective to have trails within the County be multi-use, which the County defines as including equestrians, hikers, and mountain bikers. In order to accommodate these users, it is recommended that trails be a minimum of 5 feet wherever possible; however, this does not preclude trails that are 3 feet wide from being designated a multi-use trail. Where trails are narrower than 5 feet or where 5-foot-wide trails will experience a high level of traffic, it is recommended that wider turnout areas of 6 to 10 feet be provided every quarter mile to allow for passage of trails users. In addition, it is recommended that where narrower trails cross terrain with excessive sideslope, typically greater than 45 degrees, the trail width be expanded to a minimum of 6 feet.

It is recommended that trails that are multi-use allow users sufficient line of sight to react to other trail users. The following line of sight guidelines are recommended:

1. Minimum +/- 85 feet for trail grades of 5–10 percent
2. Minimum +/- 50 feet for trail grades of 10–12 percent and at blind turns[5]

### *4.3.1.1 ADA Compliance*

In 2002, the Federal Register published Americans with Disabilities Act (ADA) guidelines pertaining to recreation.[6] However, the guidelines do not cover outdoor facilities such as trails. The Architectural and Transportation Barriers Compliance Board (Access Board) is currently developing new guidelines for outdoor developed areas that will cover access to trails in addition to other outdoor areas. As of February 2008, the comment period for the Proposed *Guidelines for Federal Outdoor Developed Areas* (Guidelines) had ended and the final version was being developed.[7] According to the proposed Guidelines, trails that will have to be compliant with the ADA are those designed specifically for pedestrian use and multiuse, where pedestrian travel is one of the designated uses for which the trail was created. However, the guidelines will not be applicable to trails designated for another use, such as mountain biking or equestrian, whether or not pedestrians will be utilizing the trails. Way-finding signs for these types of trails is necessary. The Arroyo Pescadero Trail in Whittier provides proper way-finding signs (Figure 4.3.1.1-1, *Arroyo Pescadero Accessible Trail*).The guidelines also recognize that full compliance with the guidelines will frequently be limited by environmental constraints.[8]

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5 Santa Monica Mountains Area Recreational Trails (SMMART) Coordination Project. September 1997. Final Summary Report.

6 Architectural and Transportation Barriers Compliance Board. 3 September 2002. "ADA Accessibility Guidelines for Recreation Facilities." Federal Register, 36 CFR Part 1191 (Docket No. 98-5) RIN 3014-AA16. Available at: http://www.access-board.gov/recreation/final.htm

7 U.S. Access Board. Accessed 1 February 2008. "Public Provides Input on Guidelines for Federal Outdoor Sites." Available at: http://www.access-board.gov/news/outdoor-comments.htm

8 U.S. Access Board. Accessed 1 February 2008. "Proposed Ar-


**Figure 4.3.1.1-1**
**Arroyo Pescadero Accessible Trail**

On September 15, 2010, the Federal Register published revised final regulations for ADA guidelines, known as the Final Rule.[9] Effective March 15, 2011, the Final Rule makes distinctions between wheelchairs and "other power-driven mobility devices" that should be considered in the design of a trail. Wheelchairs and other devices designed for use by people with mobility impairments must be permitted in all areas open to pedestrian use.[10] "Other power-driven mobility devices" are devices not designed for disabled individuals but can be used by mobility impaired people as their mobility device. "Other power-driven mobility devices" are permitted for use in all areas open to pedestrian use as well, unless the LACO-DPR demonstrates use of the "other power-driven mobility devices" would alter programs, services, activities, create a threat, or create a safety hazard on the trail.

The U.S. Department of Agriculture Forest Service (Forest Service) has taken a proactive approach to providing accessible trails and has published trail accessibility guidelines, which are based on the final report on *Accessibility Guidelines for Outdoor Developed Areas* from the Regulatory Negotiating Committee for the Architectural and Transportation Barriers Compliance.[11, 12] The Forest Service Trails Accessibility Guidelines applies to new trails and major changes to trails within the lands controlled by the Forest Service. The trail guidelines provided in Table 4.3.1-1 take into account the Forest Service Trails Accessibility Guidelines. A synopsis of the applicable Forest Service access guidelines and exceptions are included in Appendix I.

The Uniform Federal Accessibility Standards (UFAS) defines a facility or site as being accessible if it complies with federal standards set by the Access Board and "can be approached, entered, and used by physically disabled people."[13]

## 4.3.2 Water Crossing Guidelines

Incorporating outslopes and rolling grade dips into the trail design greatly reduces the amount of water channeling down a trail. Design trail alignments to avoid streams and wetlands in order to reduce potential impacts to those areas. Design the trail alignments, and related culverts and bridges, to avoid and minimize impacts to stream and wetland ecosystems to the maximum extent practicable. These ecosystems are protected by state and federal laws and subject to the regulatory jurisdiction of the U.S. Army Corps of Engineers and the California Department of Fish and Game. The California Coastal Commission has additional regulatory authority in the coastal zone. Undertake all feasible engineering solutions to maintain the baseline hydrologic conditions. In areas where a trail must traverse areas of surface water, consider design options such as the use of prefabricated clear-span bridges, culverts, underdrains, or puncheons.

### *4.3.2.1 Bridges*

One means of crossing a channel and water is via a bridge. Bridges that span the stream are preferable to in-stream crossing. Bridges can take the form of small structures spanning a few feet to large structures spanning greater than 10 feet (Appendix J, *Design Guidelines*). Larger bridges are typically custom designed and manufactured, and are typically made of wood, metal, or composite materials. Design guidelines for large bridges (in terms of spacing of railings and location of footings outside of stream channels) should conform to those provided for a small bridge. Additionally, bridges must be designed to withstand the weight of the trail users, especially in equestrian trails. Bridges on equestrian trails must bare the weight of the horse and rider.

### *4.3.2.2 Culverts and Underdrains*

In areas with continuous or seasonal small amounts of water flows in channels, a culvert may be a better option than a bridge due to the cost of construction. However, do not attempt the use of culverts for medium to large streams, or any

chitectural Barriers Act Accessibility Guidelines for Outdoor Developed Areas." Available at: http://www.access-board.gov/outdoor/nprm/

[9] U.S. Department of Justice. Americans with Disabilities Act. "Revised ADA Regulations: Implementing Title II and Title III." Available at: http://www.ada.gov/regs2010/ADAregs2010.htm

[10] U.S. Department of Justice. Americans with Disabilities Act. "Highlights of the Final Rule to Amend the Department of Justice's Regulation Implementing Title III of the ADA." Available at: http://www.ada.gov/regs2010/factsheets/title3_factsheet.html

[11] U.S. Department of Agriculture Forest Service. 5 May 2005. *Draft Forest Service Trails Accessibility Guidelines*. Contact: Forest Service, Mail Stop 1125, 1400 Independence Avenue, SW, Washington, DC 20250. Available at: http://www.fs.fed.us/recreation/programs/accessibility/

[12] Architectural and Transportation Barriers Compliance Board. 30 September 1999. *Accessibility Guidelines for Outdoor Developed Areas: Final Report*. Available at: http://www.access-board.gov/outdoor/outdoor-rec-rpt.htm

[13] Project Play and Learning in Adaptable Environments. 1993. *Universal Access to Outdoor Recreation: A Design Guide*. Berkeley, CA: Project Play and Learning in Adaptable Environments.

stream located in a sensitive habitat area. The size of the culvert pipe used is dependent on the volume of the flow of water and should be able to accommodate the peak flow. Utilize a minimum culvert pipe size of 24 inches in diameter. A typical design for a culvert is included in Appendix J.

In areas along a trail where water is pooling, another option is the installation of an underdrain system to increase the ability of water to flow through the trail tread and off the trail. A typical design for an underdrain is included in Appendix J.

Design culverts and pipes with an exit point that dissipates the flow and velocity of water, thus reducing the erosive potential of the discharged water. Use rocks harvested during construction of the trail to install rock spillways to dissipate water flows at culvert and pipe exit points. Details for a rock spillway are in included in Appendix J.

#### *4.3.2.3 Puncheon*

Design trails to avoid wetlands wherever possible. Use puncheon type trails to traverse unavoidable wetland areas, such as bogs and other permanently wet soils. A puncheon consists of an elevated wood boardwalk on posts that reduces the impacts of a trail on the natural hydrological regime of the area. An alternative to installing a puncheon is installing a tread, such as a large rock or log that does not pose a hazard to users and is capable of withstanding the flow of water for typically intermittent flows. In all cases, disturbance of an existing hydrologic regime should be reduced to the maximum extent possible. Appendix J includes details for the construction of a puncheon.

### 4.3.3 Trail Guidelines Specific to Environments

#### *4.3.3.1 Coastal Trails*

In designing coastal trails, the trail environments consist of stable and unstable terrain, fragile vegetation, and micro-environments. When determining the placement of the trail, avoid areas that would potentially impact sensitive habitats by using raised boardwalks or sand ladders. The County of Los Angeles recommends that trail builders consult the U.S. Forest Service's manual on Wetland Trail Design and Construction for appropriate construction methods in sensitive coastal environments.[14] Visual appeal is also an important design factor in coastal trails. Therefore, when additional structures are incorporated into the design of the trail, the structures should be kept low to the ground and use materials that blend with the landscape and are durable to avoid intruding trail users' vision.

As a result, construction of trails on unstable surfaces or environments that could become unstable with the construction of a trail should be avoided. An example of an existing coastal trail in the County of Los Angeles is the Abalone Cove Trail in Rancho Palos Verdes (Figure 4.3.3.1-1, *Abalone Cove Coastal Trail*).

**Figure 4.3.3.1-1**
**Abalone Cove Coastal Trail**

#### *4.3.3.2 Urban Trails*

Urban trails, due to their locations in highly populated areas, are utilized by many people at different fitness levels for a range of reasons. Therefore, safety is the most important consideration in designing urban trails. It is important that urban trails are designed in accordance with traffic engineering standards. The Metropolitan Transportation Authority Congestion Management Plan (CMP) and the Transportation element of the County of Los Angeles General Plan should be consulted to determine the traffic impacts of a trail. In addition, way-finding signs ensure the safety of urban trails. The purpose of urban trail signs is to indicate the required change in traffic, the behavior required of the trail users, and the need to switch gears at intersections. [15]

[14] U.S. Department of Agriculture Forest Service. 2001. *Wetland Trail Design and Construction*. Available at: http://www.fhwa.dot.gov/environment/fspubs/01232833/index.htm

[15] City of Los Angeles. Department of city Planning. February 2004.*Guide to Trail and Horsekeeping Specifications, New Construction, Private Property Easements, and Public Right of Way*. "Development of Trails." Prepared by the Foothill Trails District Neighborhood Council Ad Hoc Trails Committee.

Fencing is also important in the design of urban trails. Fencing identifies the route of the trail as well as alerts motorists when trails are in the proximity of streets. Fencing should be shorter than 50 percent of the trail easement width and outside the trail tread and easement. Fencing over 30 inches in height should have a second rail to prevent ponies from ducking under a high top rail.[16] Fencing should also be smooth to prevent injuries to trail users. An example of an urban trail is the Walk for Health Trail in Kenneth Hahn State Recreation Area (Figure 4.3.3.2-1, *Walk for Health Urban Trail*).

**Figure 4.3.3.2-1**
**Walk for Health Urban Trail**

### *4.3.3.3 Desert Trails*

The greatest challenge in designing desert trails is erosion. In the desert, water causes erosion, which can be detrimental if the erosion occurs on trails. On non-desert trails, as indicated in Section 4.2, Trail Longevity, trail grade should be 5 percent or less and no more than 30 percent of the trail should exceed 8 percent grade, and the trail grade should not exceed 8 percent for more than 200 feet, 10 percent for more than 30 feet, and 12.5 percent for more than 10 feet. However, in desert trails, to prevent erosion the grade should be between 5 percent and 7 percent.[17]

Soil types are critical in the longevity of desert trails. In loose soils with low shear strength, minimal grades and buttressing features, such as crib walls and grade reversals should be incorporated where feasible.[18]

Another concern with desert trails is identifying the trail for trail users. As there is generally less vegetation and an abundance of exposed rock within the desert the alignment of the trail is not as readily apparent as it is in other environments. Therefore, it is recommended that the trail be marked with postings every quarter mile to help prevent users from straying from the trail as is done along the portions of the Pacific Crest Trail in the Mojave Desert (Figure 4.3.3.3-1, *PCT in the Mojave).*

**Figure 4.3.3.3-1**
**PCT in the Mojave**

[16] City of Los Angeles. Department of City Planning. February 2004.Guide to Trail and Horsekeeping Specifications, New Construction, Private Property Easements, and Public Right of Way. "Development of Trails." Prepared by the Foothill Trails District Neighborhood Council Ad Hoc Trails Committee.

[17] Flint, Mark. *Desert Trails: Designing and Building Trails in a Harsh and Demanding Environment*. "Design."

[18] Flint, Mark. *Desert Trails: Designing and Building Trails in a Harsh and Demanding Environment*. "Design."

### *4.3.3.4 Foothill Trails*

The issue of most concern related to the design and construction of foothill trails is erosion. Preventing erosion will ensure the safety of all trail users and increase the longevity of the trail. When designing and constructing foothill trails, refer to all erosion guidelines. Specific erosion guidelines can be found in Section 4.1.4, Erosion, of this Trails Manual.

## 4.3.4 Multi-Agency Trails

Trails within the County of Los Angeles are likely to cross into jurisdictions surrounding the County of Los Angeles, such as the numerous connections both to City of Los Angeles and occasional connections with the other 87 cities in the County and the U.S. Forest Service. Other jurisdictions may have trail policies or standards that differ from those within the County of Los Angeles. For example, a multi-use trail may go from the County of Los Angeles, where pedestrians, equestrians, and mountain bikers are allowed, to the City of Los Angeles, where only pedestrians and equestrians are permitted. When planning a trail, initially, it is recommended that outreach be made to the agencies involved with the goal of maintaining continuity for the duration of the trail. However, in situations where there will be differences either in the users allowed or in the trail design, such as a decrease in the trail width, it is recommended that the trail provide way-finding signs at the trailhead to notify users before they set out of the upcoming changes along the trail. In addition, in situations where there is a change in the users allowed, it is recommended that a turnout area be provided to allow for trail users to safely turnaround.

## 4.3.5 Retaining Structure Guidelines

Use retaining structures to remediate areas expected to be temporarily unstable during construction, as well as inherently unstable site conditions. In areas of excessive slope, typically greater than 45 degrees, a retaining structure may be required. However, certain geologic materials, such as granitic rocks, bedrock, and older alluvium sediments, may be able to withstand slopes greater than 45 degrees. Design the placement of retaining structures consistent with the slope of the surface terrain, the underlying geologic structure, parent material and surface soils, and the space available for trail construction. In certain site-specific instances, a geotechnical engineer may be required to provide additional recommendations on design and placement of retaining structures for the protection of structures or life. Trail retaining structures can take the form of rock walls or I-beam walls as specified in Appendix J. Utilize a traditional retaining wall to protect trails and appurtenant structures from the movement of soils.

## 4.3.6 Signs

Signs include the use of all informational graphics and text displays located along trail corridors. Signs may be located in or on the ground, or suspended or attached to a structure. County


Example Highway Informational Sign


Example Regulatory Permitted Use Sign

Example Informational Wayside Exhibit

**Figure 4.3.6-1**
**Highway Regulatory and Information Signs**

trail signs are broken down into highway, regulatory, and informational types (Figure 4.3.6-1, *Highway, Regulatory, and Informational Signs*). This section provides a brief description and purpose of each sign type, as well as the recommended location and frequency for their placement. A detailed description of each individual sign type, including visual examples, is provided in Appendix K, *Way-Finding Signs*.

Integrate the appropriate sign type into the trail design. Well-designed signs serve many purposes:

- Provide positive exposure to attract more users
- Orient and educate the user to the trail
- Reassure the user that he or she is on the right trail and will not get lost
- Help with safety issues such as road crossings
- Alert users to unusual trail conditions (e.g., storm damage, hazards, trail closings)
- Provide information about geographic, environmental, biological, and historic features, and other types of interpretive way-finding signs where appropriate
- Describe etiquette for all users
- Indicate mileage

- Provide information for emergency responders (trail identification system)
- Demonstrate that, in natural areas, human impact should be minimized

### *4.3.6.1 Highway Signs*

Design must conform to the standards of the various agencies that regulate highway signs (e.g., state, county, municipalities).

Information Signs

**Description and Purpose:** Information signs provide basic trail information to motorists and trail users at the initial highway approach to the trailhead, public recreation area, and places of cultural interest. Design the signs so that approaching motorists are able to read the sign from the roadway and well in advance of the highway exit ramp.

**Location and Frequency:** Posting of signs falls under the jurisdiction of the relevant highway regulatory agency, such as the California Department of Transportation (Caltrans) or U.S. Department of Transportation. Coordinate with the appropriate highway agency regarding all highway signs.


**Figure 4.3.6-2**
**Trail Intersection Signs**

Warning Signs

Description and Purpose: Warning signs provide a warning to motorists and trail users of approaching trail and street intersections (Figure 4.3.6.1-1, Trail Intersection Signs). Provide clear way-finding signs for both motorist and trail users well in advance of the intersection.


**Figure 4.3.6.1-2**
**Trail Crossing Sign**

**Location and Frequency:** Place signs at every street and trail intersection. Posting of signs falls under the jurisdiction of the relevant highway regulatory agency, such as Caltrans or the U.S. Department of Transportation. Coordinate with the appropriate highway agency regarding all highway signs (Figure 4.3.6.1-2, *Trail Crossing Sign*).

### *4.3.6.2 Regulatory Signs*

Regulatory signs, produced by the County of Los Angeles, delineate the permitted uses on the trail, the operator of the trail, and the boundaries of the trail easement.

Permitted Use (Usage Control) Signs

**Description and Purpose:** Permitted use signs provide information to trail users about permitted and non-permitted uses of the trail. An example of a permitted use sign is located at Bonelli Park in San Dimas (Figure 4.3.6.2-1, *Bonelli Park Permitted Use Sign*).

**Location and Frequency:** Post signs at all access points.


**Figure 4.3.6.2-1**
**Bonelli Park Permitted Use Sign**

Etiquette Signs

**Description and Purpose:** Etiquette signs provide reminders of polite trail behavior for all trail users.

**Location and Frequency:** Post signs before narrow, blind, or contentious sections of trail where trail user conflicts are likely, such as between bicyclists and equestrians. An example of an etiquette sign is located at Bonelli Park in San Dimas (Figure 4.3.6.2-2, *Bonelli Park Etiquette Sign*).


**Figure 4.3.6.2-2**
**Bonelli Park Etiquette Sign**

"Crossing Private Lands" Signs

**Description and Purpose:** There may be a need for "Crossing Private Lands" signs near the interface between a trail network and adjacent communities.
**Location and Frequency:** Post signs in and at edges of neighborhoods or private land that the trail crosses.

Boundary Signs

**Description and Purpose:** Boundary signs alert trail users and landowners to the presence of a trail easement.
**Location and Frequency:** Post signs at all beginnings and endings of easements along trails.

Temporary Connector Signs

**Description and Purpose:** Connector signs identify temporary trail segments and encourage their use.
**Location and Frequency:** Post signs at the junctures of existing trails and temporary trails.

### *4.3.6.3 Informational Signs*

Informational signs produced by the County provide information to trail users, including the locations of entrances, information on the surrounding natural resources, distances of a trail, distances to key destinations, and locations of connector trails.

Entrance Signs

**Description and Purpose:** Entrance signs mark the official entrance to a trail or recreational area. Examples of entrance signs in the County of Los Angeles are located at the Abalone Cove Trail in Rancho Palos Verdes and the Sara Wan Trail at Corral Canyon Park in Malibu (Figure 4.3.6.3-1, *Abalone Cove Entrance Sign*, and Figure 4.3.6.3-2, *Sara Wan Trail Entrance Sign*).

**Location and Frequency:** Post signs perpendicular to the road and at all primary trailhead locations.

Trailhead Information Kiosk Signs

**Description and Purpose:** Use trailhead information kiosk signs to provide general information about the trail, navigational aids, and safety bulletins. An example of a Trailhead Information Kiosk Sign in the County of Los Angeles is located at the Arroyo Pescadero Park (Figure 4.3.6.3-3, *Arroyo Pescadero Kiosk*). Trailhead information signs should indicate the number


**Figure 4.3.6.3-1**
**Abalone Cove Entrance Sign**

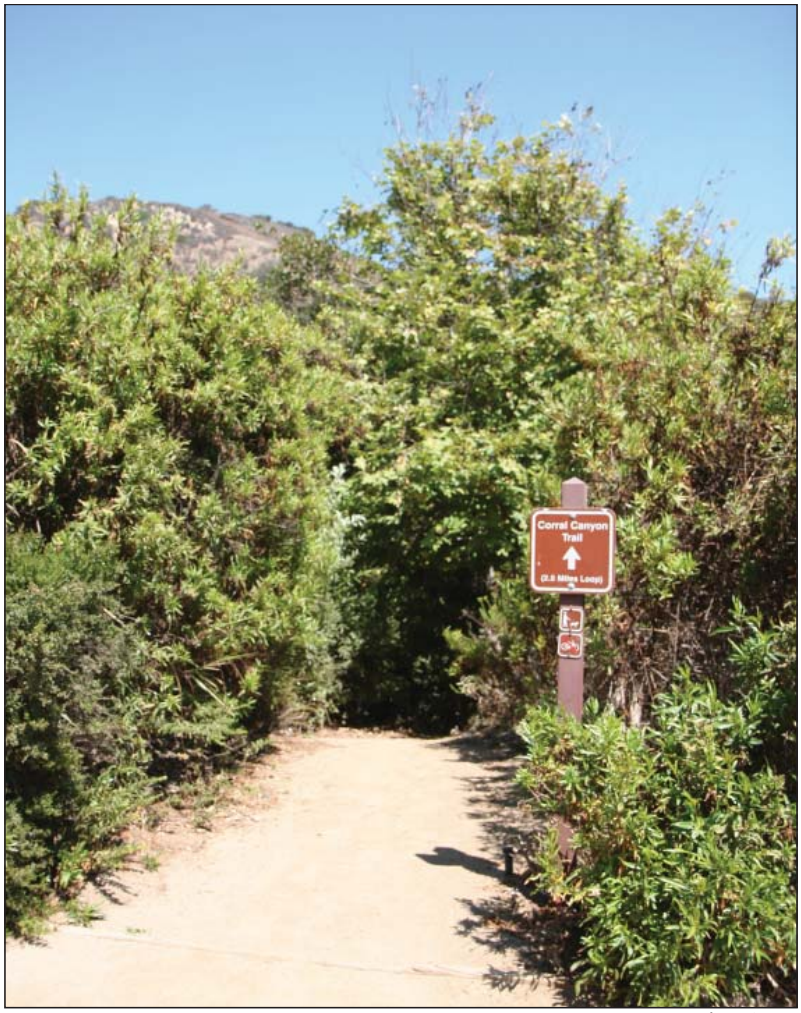


**Figure 4.3.6.3-2**
**Sara Wan Trail Entrance Sign**


**Figure 4.3.6.3-3**
**Arroyo Pescadero Kiosk**

to contact in case of an emergency and provide a name of the trailhead that can be given to emergency responders.

**Location and Frequency:** Post signs at all primary trailhead locations within 50 feet of where the trail leaves the parking lot.

Reassurance Markers

**Description and Purpose:** Reassurance markers provide en route reassurance of trail identity and visually mark the trail line in areas where the trail blends seamlessly with the surrounding area.

**Location and Frequency:** Post signs at points of confusion or at every 0.25 mile. Place signs on alternating sides of the trail. Post signs at eye level (62 inches above the ground surface).

Direction Change/Juncture Indicators

**Description and Purpose:** Direction change/juncture indicators alert trail users to a change in direction or juncture with another trail, and may include destinations and distances, features, regulations, warnings, and closures.

**Location and Frequency:** Post signs at ambiguous trail turns and at all junctures with other trails. Orient signs to face users approaching from all likely directions. Use signs sparingly and post within sight of a reassurance marker.

Interpretive Signs

**Description and Purpose:** Provide interpretive signs that display information regarding the natural or cultural resources of a particular site, trail, or scenic vista.

**Location and Frequency:** Post signs at important interpretative features along regional or local trails, or at regular intervals along interpretative loop trails.

Wayside Exhibits

**Description and Purpose:** Wayside exhibits describe interesting land features, plant and animal communities, historic events, and points of interest. An example of a wayside exhibit in the County of Los Angeles is located at the Arroyo Pescadero Trail in Whittier (Figure 4.3.6.3-4, *Arroyo Pescadero Wayside Exhibit*).

**Location and Frequency:** Reserve wayside exhibits for major features located in high-traffic areas.


**Figure 4.3.6.3-4**
**Arroyo Pescadero Wayside Exhibit**

Destination Signs

**Description and Purpose:** These signs show directions and distances to various destinations accessed by the trail network.

**Location and Frequency:** Post destination signs at trailheads, major junctions, and spur trails (to water).

Adopter Signs

**Description and Purpose:** Adopter signs acknowledge the volunteers who are responsible for trail maintenance along a designated section of the trail.

**Location and Frequency:** Post adopter signs on road crossing signs or at beginning of designated clean-up areas.

Destination Signs

**Description and Purpose:** These signs show directions and distances to various destinations accessed by the trail network.

**Location and Frequency:** Post destination signs at trailheads, major junctions, and spur trails (to water).

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**Description and Purpose:** Adopter signs acknowledge the volunteers who are responsible for trail maintenance along a designated section of the trail.

**Location and Frequency:** Post adopter signs on road crossing signs or at beginning of designated clean-up areas.

### *4.3.6.4 Trail Network Graphics and Maps*

Include trail network graphics and the County logo on County regulatory and informational signs:

Confirmation/Identification Signs (Trail Logos)

**Description and Purpose:** Trail logos are graphic symbols used throughout the trail network to create consistency, identify the trail network, and orient trail users. Logos can also be standalone badges or blazes affixed to a post or a tree.

**Location and Frequency:** Include trail logos on all major signs throughout the trail network. Post blazes at eye level.

You-Are-Here Indicators

**Description and Purpose:** You-are-here indicators are optional markers that are included on interpretive signs or information kiosks to correlate the present physical location of a particular kiosk on a general trail map.

**Location and Frequency:** Symbolize you-are-here indicators, and include the symbol on the map legend.

## 4.3.7 Road Crossings

Design trail alignments that avoid road crossings where there is a potential for conflict between vehicles and trail users. The installation of a safe road crossing requires signs and sidewalk modifications, which can add substantial costs to a trail that intersects a street. There are two typical options for street crossings: at grade with the road or under the road through a culvert. Although expensive, bridges may be necessary in some settings to avoid the hazards of at-grade road crossings. Design all road crossings consistent with requirements of the applicable regulatory oversight body. The County of Los Angeles Department of Public Works, Division of Traffic and Lighting is the regulatory oversight body in the unincorporated territory of the County. In addition, the County of Los Angeles Department of Parks and Recreation requires the use of a bush hammer (or equivalent) technique on the portion of the trail crossing the road surface to provide stability for trail users. However, road crossings on roadways under federal, state, or local jurisdiction must be coordinated with the appropriate authority, and plans and guidelines for the road crossing must be submitted for plan check and approval. Any at-grade road crossing must allow for proper sightlines for both vehicles and trail users prior to the crossing. For trail users, place signs 100 feet before the crossing. For vehicles, place signs 500 feet before the crossing. Illustrations of street crossings at intersections, mid-block, and placement of bush hammer (or equivalent) are included in Appendix J.

In locations that provide a significant risk of conflict between trail users and vehicles, utilize a culvert undercrossing. The construction guidelines for the culvert undercrossing must meet applicable county and state codes. A licensed structural engineer must complete the design of a culvert undercrossing. A typical illustration of a culvert undercrossing is included in Appendix J.

## 4.3.8 Parking

Consider compatibility with the outdoor recreational experience and site characteristics when designing parking areas. In general, provide parking for trail users at 5- to 15-mile intervals.

The design of parking areas must consider the applicability of nine elements (Appendix J):

- Provide highway, street, or road signs that indicate turnouts for trailheads and parking.
- Select a parking surface that is natural and permeable. Avoid the use of gravel that has the potential to nick and scratch the paint on vehicles when kicked up.
- Install guardrails where needed to define parking edges for safety reasons.
- Use natural logs or poles to define parking bumper stops and lot edges.
- Install post bollards at trailheads to mark trailhead entrances and discourage vehicular (including motorcycle) encroachment from the parking area into the trail area.
- Install and maintain a trailhead information kiosk.
- Place picnic tables, trash receptacles, and toilets where possible.
- Allow 300 square feet per car for a 90-degree parking lot (the most space efficient). A 90-degree parking area should have stalls 9 feet wide and 18 feet deep with a 24-foot lane for entering and exiting the parking lot. Allow for ADA-compliant parking.
- Provide parking spaces for the anticipated occupancy load of the trail, with a minimum of five spaces, where site conditions permit. Allow for ADA minimum requirements of parking ratios (a minimum of 1 accessible parking space for 1 to 25 spaces; a minimum of 2 accessible parking spaces for 26 to 50 spaces; and a minimum of 3 accessible parking spaces for 51 to 75 spaces).[19]

[19] U.S. Access Board. September 2002. *ADA Accessibility Guidelines*

### *4.3.8.1 Equestrian Parking Area and Staging Area Design*[20]

*Staging Areas*

Popular equestrian sites need staging areas where it is easy and safe to unload, groom, and saddle stock. An example of a staging area in the County of Los Angeles is located at Bonelli Park in San Dimas (Figure 4.3.8.1-1, *Bonelli Park Staging Area*). This means providing extra length and width in parking spaces. Extra length allows riders to unload stock and tie them at the rear of the trailer. Extra width allows stock to be tied at the trailer's side. These additional guidelines should be considered where space permits and where trail users with horse trailers, trucks, or carriers are expected (Appendix J):

- Provide staging areas a minimum of 600 square feet per horse trailer and a maximum of 1- to 2-acre locations for high use locations adjacent to trail access points and where site conditions permit
- Provide entry structures with a lockable gate; the type of lockable gates used should depend on security requirements, type of material used, and location of the structure.
- Provide pull through or peripheral parking with minimum 40-foot-long stalls
- Provide a minimum of at least four hitching rails per staging locations as site conditions permit; each hitching rail should be 15 feet long by 4 feet high, of 3-inch steel pipe, and cemented 30 inches in the ground
- Provide an exercise ring when space and site conditions permit
- Provide trash cans and picnic tables at each location (four per site)
- Separate from other trail user parking
- Clearly indicate traffic circulation pattern so that there is room for loading and unloading
- Install a hardened (permeable) surface that safely accommodates equestrian uses
- Provide appropriate vertical clearance (maximum legal height for trailers is 13 feet, 6 inches)
- Provide parking spaces for anticipated occupancy load of the trail with a minimum of five spaces, where site conditions permit

**Figure 4.3.8.1-1**
**Bonelli Park Staging Area**

*Open Parking Areas*

Some riders prefer a parking area that does not have defined parking spaces. This allows drivers to arrange vehicles in a manner that best suits their needs. When space is plentiful and riders want flexibility, an open parking area is appropriate for a group camp or trailhead. Where possible, locate open parking areas in a large, sparsely vegetated area with a slope no steeper than 4 percent.

Riders want to park facing the exit as they arrive, orienting their vehicles for an easy departure. The parking area should be large enough for undefined parking spaces 28 feet by 78 feet and aisles that are 15 feet wide per lane. The generously sized parking area will allow many parking configurations. Designers may plan one parking configuration and riders may park in a very different way.

A variation of the open parking area concept incorporates several small parking areas. The small areas help break up the expanse of a large parking area and may be more attractive. In a group camp, having more than one parking area provides flexibility. A few different groups could use the site simultaneously or one large group could occupy all the parking areas.

*Small Parking Areas*

The circulation pattern includes a loop turnaround to prevent vehicles from becoming trapped when all parking spaces are full. Because the parking area is not paved, arrows cannot mark the direction of traffic flow. Designers can use a counter-clockwise traffic flow that takes advantage of the familiar right-hand driving pattern. Landscape islands guide vehicle traffic and determine parking orientation. Directional signs may be a helpful addition, along with wheel stops (Appendix J).

*Parking Delineation*

Because paved equestrian parking areas are not recommended, delineating the parking spaces becomes a challenge. Many

*for Buildings and Facilities*. Section 4.1.2 (5) (a): "Accessible Sites and Exterior Facilities: New Construction." Available at: http://www.access-board.gov/adaag/html/adaag.htm#4.1

[20] U.S. Department of Transportation, Federal Highway Administration. Equestrian Design Guidebook for Trails, Trailheads and Campgrounds. Available at: http://www.fhwa.dot.gov/environment/fspubs/07232816/page14.htm

agencies don't delineate parking spaces. Where delineation is necessary, striping is just one of several alternatives.

### 4.3.9 Restrooms

Incorporate restrooms into trailhead and parking locations where water lines and sewage conveyance is possible. In areas without available water, design restrooms to be pit toilets as per USDA Forest Service guidelines (Appendix J).

### 4.3.10 Landscaping

Design plantings around trailheads and revegetation along trails in a manner that is consistent with the plant communities and species identified in the feasibility analysis. In general, design trails to avoid environmental impacts, while ensuring public safety and preserving community character. When designing the landscape, take into account the ability to provide fencing for safety, security, and delineation of the trail (Appendix J).

Where appropriate, use landscaping to screen a trail from adjacent residences, providing privacy to residents and enhancing the quality of the recreational experience. Where feasible, screen the first story of adjacent residences from a trail with plantings of native vegetation (Appendix J).

Design trail landscaping in a manner that facilitates resource conservation:

- Delineate trail edges in areas where there are fragile plant communities adjacent to the trail.
- Provide access to interesting features so that users will not take shortcuts.
- Block potential shortcut routes with landforms or vegetation.
- Landscape the trail to control erosion and ensure slope stability.
- Work with natural vegetation patterns to feather trail edges.
- Prevent invasion by nonnative species.
- Preserve vegetation adjacent to the trail as much as possible in order to protect the aesthetic quality of the trail.
- Utilize species from plant communities native to the trail area.
- Use plant materials that are indigenous to the local native plant communities. Avoid the use of non-native species to the maximum extent practicable.
- Discourage use of herbicides and pesticides, unless required to eradicate non-native pest plants identified on the California Exotic Pest Plant Council list.
- Encourage responsibility for maintaining the planting along the trail and for monitoring the progress of new planting areas.
- Group plant material to simulate natural stands.
- Plant canopy trees to unify an area and choose a dominant tree type that is indigenous to the area.
- Arrange plant material by similar water needs.
- Use fire protection efforts that will not jeopardize the stability of slopes.
- Mitigate visual impact by planting areas adjacent to parking and residential lots at a greater density than on interior slopes.
- Arrange plantings in an informal manner to create a more natural setting.
- Prohibit denuding of slopes.
- Balance fire mitigation with habitat conservation and slope protection.

### 4.3.11 Drinking Water

Provide drinking water sources at all trailheads and, where possible, every 5 miles along a trail, for human, horse, and pet use (Appendix J).

### 4.3.12 Bicycle Racks

Provide bicycle racks at trailheads for large regional trails. Provide bicycle racks in areas where transitions occur from Class I Bikeways to natural surface trails. Consider installing bicycle racks in areas where portions of a trail prohibit bicycle use. A typical bicycle rack is illustrated in Appendix J.

### 4.3.13 Shade Structures

Provide shade structures every 1 to 3 miles along trails in desert environments or in sparsely vegetated locations where shade is not readily available.

### 4.3.14 Equestrian Amenities

Provide equestrian amenities at popular equestrian trailheads and where feasible. Guidelines for horse tie-ups and horse troughs are included in Appendix J. Additional equestrian amenities can include mounting platforms or manure disposal bunkers.

### 4.3.15 Equestrian Arenas

Provide equestrian arenas that are a minimum of 150 feet wide and 300 feet long; smaller arenas should be 150 feet wide and 100 feet long, and oval shaped. Arenas should be provided for public equestrian events and training for the Equestrian Mounted Units, Marshall Canyon Mounted Unit, Bonelli Park Mounted Unit, Whittier Narrows Mounted Unit, and the Sheriff Mounted Units. Arena panels should be constructed with pipe panels that consist of 12-foot-long or 24-foot-long with 1 7/8-inch outer diameter pipe. Drive gates should be 2

3/8-inch pipe material, and support posts should be 2 3/8-inch steel pipe galvanized 15-gauge wall or .073. 6-foot 6-inch–high posts should be cemented in ground with 60 sacks of cement with a 2,500-pound per square inch (PSI) mix.

### 4.3.16 Bleachers

Provide bleachers at all arenas for equestrian events and training purposes and install permanently with concrete anchors. Stationary bleachers should have a minimum 5-row seating capacity, with double foot planks on every row, and 2-inch by 10-inch anodized aluminum seat planks that have a 4.5-foot aisle with aluminum hand rails and standard fence railing on three sides.

## 4.4 TRAILHEADS AND TRAIL SUPPORT FEATURES

Trailheads not only provide users with access to a trail but also provide users with safety and educational information about the trail network. Trailheads may include other appurtenances such as parking, kiosks, drinking fountains, restrooms, and resources for various user types, such as tie-ups for equestrian users.

Design new and major renovations, alterations, and improvements to trailhead and appurtenances consistent with guidelines:

- Construct trailhead structures to be of scale and character appropriate to the trail area; their location shall be environmentally sensitive and integrated with the site
- Emphasize the natural setting and use natural materials indigenous or local to the site when designing trailhead facilities
- Design replacement structures to contribute to the environment without loss or degradation of habitat or open space
- Use the same color palette for all structures in the same trail segment
- Use sustainable materials when feasible
- For trails that are designed to be accessible, construct trailheads in conformance with ADA guidelines

Locate trailheads at the beginning of trails and at points where major trails intersect. Design trailheads and kiosks to provide users with readily identifiable entrances and information regarding trail accessibility (Appendix I).

### 4.4.1 Motorized Vehicle Trail Barriers and Trail Gates

To ensure the safety of trail users and the integrity of the natural environment, many trails prohibit the use of motorized trail vehicles (MTVs). Trail barriers and trail gates are typically erected at most trail access points to physically prevent the passage of MTVs, such as all-terrain vehicles, motorcycles, off-highway vehicles, and snow machines. However, many trail barrier and gate designs may also block trail access for individuals who rely on personal mobility devices (PMDs). Therefore, vehicle gates and barriers that are currently being used may not comply with the newest ADA/ABA Accessibility Guidelines. It has become necessary to develop trail barriers and gates that will prevent MTVs from using recreation trails while allowing access by hikers, bikers, equestrians, and people with mobility impairments that use wheelchairs and other adaptive equipment.

The objective of a trail barrier or trail gate is to (1) prevent motorized vehicle access, (2) allow access to all non-motorized users and PMDs, and (3) be consistent with accessibility legislation. The feasibility of vehicle barrier design is based on the attributes that distinguish MTVs from PMDs such as movement characteristics (e.g., direction, turning radius), spatial characteristics (e.g., height, length, width, area and volume), and input from trail and rehabilitation experts. Effective trail vehicle barrier designs should take into consideration the following aspects:

- Materials used
- Size
- Installation and maintenance procedures
- Durability
- Type of environments in which the design is used
- Cost

People with disabilities are often prevented from using trails that prohibit motorized vehicles. Land management agencies are required to provide accessible facilities, but certain gate designs that are accessible to PMDs, such as wheelchairs, may also permit access by small motorized vehicles (e.g., snow machines, motorcycles). As a result, land managers must choose between providing access to people with disabilities and protecting the trail environment from degradation through motorized vehicle use.

The design of a trail barrier or trail gate will depend on the designs' suitability for various trail environments, accessibility to users with and without disabilities, and effectiveness in preventing MTV access.

***Trail Barrier***

A trail barrier is intended to allow all trail users, with or without mobility impairments, to have access to trails. The trail barrier should be designed to allow trail access to manual and powered wheelchairs and scooters, while restricting all terrain vehicles (ATVs) and motorcycles from accessing trails.

*Inverted Bollard*

An example of a trail barrier is the inverted bollard. This design typically has concrete bollards on 4-inch steel posts. The system consists of steel posts and forms to allow the installer to pour the concrete into the form upside down to create each inverted bollard. A steel framework would be mounted into the ground requiring hand excavation or use of a mini-excavator to a depth of at least 18 inches. The steel framework would then be installed into the ground, and the inverted bollards would be placed into position and pinned underground. Concrete would be poured into and around the anchor points of the steel framework (see Appendix J). Surfacing material would then be installed up to the trail tread surface.

***Trail Gates***

Appendix J provides examples of several trail gate designs that can be implemented to restrict access to MTVs while allowing access to non-motorized users and PMDs:

- Timber Kissing Gate with Wheelchair Accessibility
- Timber Kissing Gate Modification for Existing Fence Opening with Wheelchair Accessibility
- Chicane for Wheelchair Accessibility
- Horse-Friendly Forest Road Closure Gate with Horse and Wheelchair Accessibility
- Horse Gate with Wheelchair Accessibility
- "V" Horse Gate with Wheelchair Accessibility

### 4.4.2 Trail Kiosks[21]

A kiosk is a small outdoor structure that incorporates trail maps, route data, and specific site historical and environmental information for trail users. The amount of way-finding signs will be determined by trailhead size, its projected use, and location.

***Level One Kiosks***

Level one kiosks will be located primarily at the beginning and end of a route. These kiosks are intended to function as stand-alone structures that provide shade, seating, trail information, and site-specific data. This type of kiosk is useful at sites with existing structures where way-finding signs are otherwise difficult to incorporate. The design of this type of kiosks typically has four sides that will allow users to view trail maps and data simultaneously (see Appendix J).

***Level Two Kiosks***

Level two kiosks are primarily located at major trail connections or intersections that allow users access to associated routes. The size of this type structure is typically smaller than level one kiosk in order to better blend with sites that are smaller in size and that offer less visual competition than larger sites. This type of kiosks should be located in close proximity to the trail for the convenience of trail users that are en route (see Appendix J).

***Level Three Kiosks***

Level three kiosks are typically located at rest areas for trail users and periodically throughout the trail system. They should be located immediately adjacent to the trail for convenient use. This type of kiosk should occur approximately every 2 to 3 miles according to the trail type and the terrain being traveled. Level three kiosks will help keep trail users aware of their location, intended destination, and their related distances (see Appendix J).

## 4.5 CONSTRUCTABILITY

The fourth consideration in the trail design process is the constructability of the trail in relation to available labor, time, equipment, and materials.

### 4.5.1 Trail Construction Team

The trail plans and guidelines need to consider the construction scenario and schedule in relation to the proposed composition of the trail construction team. Maintenance and construction of County trails can involve a range of resources, including County staff, contractors, work crews from agencies such as the California Department of Forestry (CDF), California Department of Corrections (CDC), the California Youth Authority (CYA), and the California Conservation Corps (CCC), as well as volunteers.[22] Trail contractors often utilize a small crew of three and machinery such as mini excavators to build trails. A professional, three-person trail crew using machinery can typically build a trail at a rate of 500 to 700 feet per day, but only 200 feet per day without machinery. The use of a professional team with machinery can add up-front cost in terms of hiring an experienced, qualified operator, but may ultimately be the most cost-effective due to significant reductions in total labor requirements when using only hand labor.

[21] Bucher, Willis & Ratliff. *Northland Trails Vision Plan Design Criteria*. Available at: http://www.co.platte.mo.us/northlandtrails/designcriteria.pdf Pages 53-55.

[22] Bell, Roger. 2002. "New Models for Trail Contracting." *Trail Tracks*, 31(1): 6–9.

#### *4.5.1.1 Trail Construction Professionals*

Trail designs and maintenance that require precise compliance with specifications for percent grade, outsloping, and switchbacks are best accomplished using trail construction professionals with the required qualifications. Ensure that trail construction professionals have demonstrated expertise and experience in constructing trails:

- Crew team leads must have at least 50 miles of trail construction and maintenance experience, and no less than 10 miles of new construction experience.
- Crew must be supported by at least one individual with sufficient survey skills to ensure that trail grades, outslopes, and other erosion control features conform to specifications.
- Operator must have experience with the specified construction equipment.
- Crew must have sufficient knowledge of soils and soil compaction to ensure the achievement of performance standards.

Professional trail construction teams may be composed of County staff and augmented by contractors on an as-needed basis. A list of trail contractors with experience in the County of Los Angeles can be obtained from the County Department of Parks and Recreation.

#### *4.5.1.2 Trail Construction Volunteers*

The County trail system has benefited greatly through the generous donation of time and materials by volunteers. The County may wish to augment professional trail and construction crews with volunteers. Brief and train trail construction volunteers regarding plans and guidelines to ensure the most effective contributions to the project. Ensure that volunteers undergo the County volunteer-training program and sign waivers for working as a volunteer. While there are a variety of site-specific issues that need to be addressed for each project, there are standard briefing issues that must be addressed for all projects involving the use of volunteers:

- Project goals and objectives
- Trail design or maintenance plans and guidelines
- Environmental constraints and related safeguards
- Chain of command
- Proper use of equipment
- Safety
- Emergency point-of-contact

Project initiation briefings ensure the provision of volunteers with accurate instructions on trail construction and maintenance. Supervision by qualified professionals ensures that volunteer trail construction and maintenance efforts are consistent with the design plans and guidelines. A list of possible volunteer organizations to utilize in a trail project can be obtained from the County Department of Parks and Recreation.

### 4.5.2 Construction Scenario

The trail plans and guidelines need to consider the construction scenario and schedule in relation to the timing of the rainy season and the steps required to construct a trail. Wherever possible, schedule trail construction and maintenance in accordance with County codes. Schedule daily construction activities for Monday through Saturday (excluding federal holidays) between the hours allowed by the County Noise Ordinance. In locations with steep sideslopes, loose soils and rocks, areas prone to destabilization, large retaining structures, or areas that require excessive annual maintenance work, grading and earthwork should be performed under the supervision of an engineering geologist or soils engineer to ensure proper subgrade preparation, selection of satisfactory materials, and placement and compaction of structural fills and to ensure that appropriate recommendations are made to remediate the site-specific conditions.

Wherever possible, schedule grading activities outside the normal rainy season of October 15 to April 15, which is applicable for most of the County, thus minimizing the potential for increased surface runoff and the associated potential for soil erosion. Estimate the number and type of equipment to be used in the plans and guidelines for the trail construction or maintenance project based on the maximum width of the trail.

There are seven basic steps required to construct a trail:

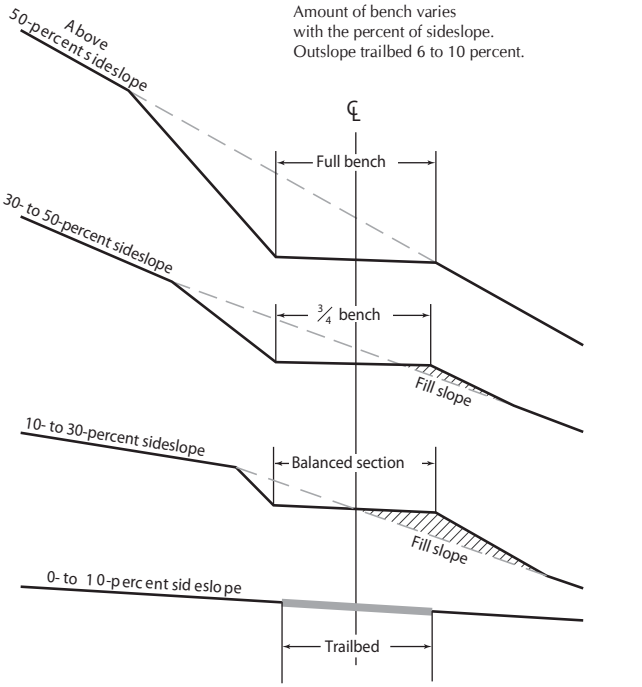
1. Flag the trail
2. Clear the trail corridor
3. Construct the trail tread
4. Construct switchbacks and climbing turns
5. Compact the trail
6. Construct crossings and retaining structures
7. Construct trailheads, way-finding signs, and appurtenant structures

#### *4.5.2.1 Flag the Trail*

Flag the designated trail corridor with flagging tape or pin flags. Design the corridor to be 1 foot wider on each side than the desired width of the trail tread. Walk the initial path and check the grade with a clinometer to evaluate any potential problem areas that will not allow the trail's grade to fall within the accepted parameters. Use pin flags to delineate the final path before construction begins. Place pin flags on the downslope side of the trail if construction will occur by hand, and on the upslope side of the trail if construction will occur with machinery.

### *4.5.2.2 Clear the Trail Corridor*

The initial clearing of the trail includes preliminary removal of vegetation and major debris such as large stones. This process will allow the digging of the trail tread to move forward easier. When utilizing hand tools, clear vegetation prior to construction. However, machinery removes the vegetation while digging the tread.




Typical trailway cross sections. Full-bench construction will create the fewest problems, especially on steep sideslopes.

**SOURCE:** USDA Forest Service. 2004. *Trail Construction and Maintenance Notebook*. Washington D.C.

**Figure 4.5.2.3-1**
**Trail Tread Construction Types**

### *4.5.2.3 Construct the Trail Tread*

Wherever practicable, balance the required cut and fill within the trail segment to minimize the need for import or export of soil. Trail treads are created by carving soil out of the sideslope above the trail (cut), by piling soil on the slope to create a platform (fill), or by a combination of both (cut and fill) (Figure 4.5.2.3-1, *Trail Tread Construction Types*).

*Cut Trails*

The most stable choice is to cut the trail tread out of the slope, providing a full bench trail. However, there are conditions that limit the width of trails built by this method. Carving soils out of the side of a hill is arduous work if done by hand, and requires either larger equipment or more passes when done by machine. In addition, a wider trail requires deeper cuts into the sideslope, resulting in steeper sideslopes, and creating a steeper and less stable backslope.[23] To provide room to adjust the backslope to a sustainable grade, specify a deeper cut into the slope in the trail design. Alternatively, include a retaining wall in the trail design to hold back the backslope. Where cutting specified in the design requires greater disturbance of the upslope vegetation, the plans and guidelines or maintenance plan must provide for supplemental slope and erosion control measures until adequate slope vegetation exists (Figure 4.5.2.3-1).

*Fill Trails*

Fill soils are always less stable than cut soils, and a wider trail requires more fill. The steeper the sideslope, the more susceptible unstable soils will be to erosion and mudslides. Keeping the trail narrow reduces the amount of fill required. Alternatively, use a retaining wall on the downhill side to support the fill soil (4.5.2.3-1).

*Cut-and-Fill Trails*

A combination of cut and fill reduces the limitations of each technique. However, trails wider than 6 feet will have the unacceptable characteristics of each, particularly on steep slopes (Figure 4.5.2.3-1).

### *4.5.2.4 Construct Switchbacks and Climbing Turns*

In portions of a trail where the required grade of the trail cannot be achieved without the use of switchbacks or climbing turns, installation should occur as described in Section 4.2.7, Gaining Altitude on a Trail. The use of switchbacks and climbing turns should be limited.

### *4.5.2.5 Compact the Trail*

The final step in the construction of the trail tread is the compaction of the trail. This will reduce erosion of the trail tread. In addition, accessibility is increased because compacted trail surfaces provide a more sturdy tread capable of supporting greater forces. Mechanical compaction will not be feasible in natural areas where water is not easily available; therefore, in these areas, natural compaction will occur with normal trail building equipment and use over time. Check that all trail debris is removed and that no low obstacles, such as branches or roots, have been left in the trail corridor.

### *4.5.2.6 Construct Crossings and Retaining Structures*

Construct crossings such as culverts, bridges, and retaining structures during the construction of the trail tread. Construct these on a case-by-case basis following the design guidelines outlined in Appendix J.

[23] The backslope is the bank on the uphill edge of the trail thread.

#### *4.5.2.7 Construct Trailheads, Way-finding Signs, and Appurtenant Structures*

The final step is to construct trailheads, way-finding signs, and appurtenant structures such as restrooms to provide recreational users with optimal resources.

### 4.5.3 Construction Tools

#### *4.5.3.1 Hand Tools and Equipment*

A variety of tools and equipment are available to lay out, construct, and maintain trails. Location, physical site characteristics, and individual preferences often dictate the type of tools and equipment chosen for various tasks. Choosing the correct tools for the job, using them effectively and safely, caring for them, and storing them properly are all important aspects in trail construction.

There are several categories for tools used in constructing and maintaining trails, which include tools for grading, sawing, chopping, grubbing, digging and tamping, pounding and hammering, lifting and hauling, peeling, and shaping.

There are 10 essential hand tools for construction of a trail:[24]

- Clinometer: Use a clinometer to measure the percent grade between two points, enabling determination of the steepness of the trail.
- Flagging ribbon or wire-pin flag: Use flagging ribbon to highlight trail alignment during trail construction. Specify removal of all ribbons and tapes at completion of trail construction.
- Pulaski: Use a Pulaski for loosening dirt, grubbing brush, cutting roots, and sculpting. Avoid the specification of Pulaskis in rocky soils.
- McLeod: Use a McLeod, a flat, square-shaped blade with a cutting edge on one side and a rake on the other. The McLeod is a useful tool for completing a trail tread.
- Rockbar (or pry bar): Use a rockbar for prying heavy objects from the trail's path (e.g., boulders or logs).
- Tape measure: Use a tape measure, or equivalent or better measuring device, for accurate measurements of trail width and headway.
- Level: Use a manual or digital level for the inspection of outslope trail treads that meet specifications for shedding water and preventing erosion.
- Hand pruner, lopper, and folding saw: Use hand pruners, loppers, and folding saws for cutting and removing branches, protruding roots, and other vegetation for a clear trail tread.
- Shovel: Use a shovel for excavating dirt and debris. There are many blade shapes and handle lengths for shovels. Different tasks call for specific blades and handle lengths.
- Sledgehammer: Use a stone sledge for crushing rocks. Use a driving sledge to drive spikes or pins, which is a less common task for trail construction.

#### *4.5.3.2 Mechanical Tools*

Specifying the use of mechanical tools for trail construction reduces the required time and labor for trail construction. Small earthmoving machines provide increased speed and consistency of trail construction, even in tough areas such as rocky terrain. In developing the plans and specification for trail construction and maintenance projects, evaluate the potential cost efficiencies achieved with earthmoving equipment. The choice of utilizing mechanical equipment may also be dependent on the site conditions. The information presented below is a brief description of mechanized tools. A more formal application is presented in International Mountain Bicycling Association's Trail Solutions.[25]

The most important mechanized tool is the earthmoving equipment; the two major types are mini-dozers and mini-excavators:

- Mini-dozers: Mini-dozers provide a ride-on, scaled-down version of the typical dozer that is capable of pushing vast amounts of dirt, rocks, and debris. However, trails constructed on steep sideslopes requiring more maneuverability may limit the use of a mini-dozer.
- Mini-excavators: Mini-excavators are also tracked like dozers, but they have an arm that allows dirt to be moved in a bucket. The arm can be swung around, thus allowing a full bench trail to be moved quickly.

[24] International Mountain Bicycling Association. 2004. *Trail Solutions*. Boulder, CO: International Mountain Bicycling Association. Pp. 108–109.

[25] International Mountain Bicycling Association. 2004. *Trail Solutions*. Boulder, CO: International Mountain Bicycling Association. Pp. 108–109.

Other mechanized equipment is used for maintaining and constructing trails:

- Woodchippers: Towable type, gas powered
- Stump grinders: Towable type, gas powered
- Auger drills: Portable type, gas powered
- Skiploader tractors: Rubber wheeled, gas powered
- Water pumps: Portable type, gas powered
- Dump trucks: Stakebed type, gas powered
- Jackhammers: Portable type, air or gas powered
- Pole pruners: Portable type, gas powered
- Hedge trimmers: Portable type, gas powered

Additional mechanized tools useful in trail building include motorized wheelbarrows, chainsaws, and brush mowers. Motorized wheelbarrows allow for large and heavy rock and debris loads to be carried easily and quickly.

# SECTION 5.0
# TRAIL OPERATION AND MAINTENANCE

The management, maintenance, and operation of trails within the County of Los Angeles (County) may include local, county, and state management, and in some cases, federal management. The most important reason to properly maintain a trail is to maximize the safety of those using the trail and minimize the local landowners' concern regarding liability. Regular, routine annual maintenance ensures trail safety but also prolongs the life of the trail. Important maintenance and operation activities to consider include signs, sight distance and clearance for right-of-way, surface and tread repair, drainage, sweeping and cleaning, debris removal, upkeep of structural integrity, and proper illumination. Each strategy should maximize the trail's potential.

## 5.1 TRAIL OPERATION

These trail operation guidelines are based on guidelines from established agencies and sources.[1] Trails under County of Los Angeles jurisdiction are considered parks (County Code 17.04.130).

### 5.1.1 Hours of Operation

Pursuant to the County Code, parks, including trails, may be utilized between the hours of 8 a.m. and midnight. **THE HOURS OF OPERATION ARE AT THE DISCRETION OF THE DIRECTOR AND ARE TYPICALLY SIGNED DAWN TO DUSK (COUNTY CODE 17.04.330).**

### 5.1.2 Trail Users

A goal of trail planning within the County is to design trails for use by hikers, equestrians, and bicyclists. However, occasions arise where multiple uses will not be appropriate for a trail. In such instances, single-use trails, such as hiking or biking trails may be appropriate.

On multiuse trails, trail users must yield to other users following established guidelines:

- Hikers yield to equestrians.
- Mountain bicyclists yield to hikers and equestrians.
- Access for motorized vehicles on trails is limited to authorized vehicles, such as County maintenance vehicles and emergency response vehicles (County Code 17.04.370 and 17.04.1170):
- Motorized vehicles are restricted to designated parking areas and paved public roads.
- Unauthorized motorized vehicles are prohibited, including dirt bikes and all-terrain vehicles (ATVs). Ordinance Code 17.04

Bicycles may be ridden on designated multiuse trails and bicycle trails unless otherwise posted. Certain regulations and suggestions also apply to the use of trails by bicyclists:

- Bicycles are not permitted to be ridden in areas posted as No Bicycles. However, bicycles may be walked or carried in these areas.
- State law requires that all bicyclists under age 18 wear an approved helmet while riding on trails and roadways.
- Helmets are encouraged for riders of all levels and ages.
- Riders should call out "on your left" or "on your right" depending upon direction of passing or sound a warning when overtaking other trail users.
- Riders should slow at blind curves and other areas with limited sight distances.

Equestrians may only lead or ride a horse, mule, donkey, or other similar animal on designated trails or in designated equestrian areas. Certain regulations and suggestions also apply (County Code 17.04.420):

- Horses, mules, donkeys, or other similar animals are not permitted, either ridden or walked, in areas posted as No Horses.
- Helmets are encouraged for riders of all levels and ages.

To clarify the distinction between motor vehicles and wheelchairs the following definitions of "Motor vehicles" and "wheelchairs" are provided:

- Motorized Vehicles: "Motor vehicles" means any multi-wheeled, treaded, or sled-type vehicle that is propelled by a motor engine, including any vehicle commonly known as a "motorized recreation vehicle" (County Code 17.04.110).

[1] East Bay Regional Park District. 17 May 2005. Ordinance 38, Chapter 1: "Definitions." Contact: East Bay Regional Park District, 2950 Peralta Oaks Court, P.O. Box 5381, Oakland, CA 94605. Available at: http://www.ebparks.org/district/ord_38/ord_38TOC.htm#chapterone.

- Wheelchair: "Wheelchair" means a device designed solely for use by a mobility impaired person for locomotion, that is suitable for use in an indoor pedestrian area.

### 5.1.3 Physical Resources

Operation standards for physical resources protect biological, geological, and cultural resources:

- Park property, vegetation, and animals, including sensitive plants; animals; and geological, archaeological, or historic objects are protected by law. Do not disturb or remove any of these features (County Code 17.04.340 and 17.04.470).
- Littering and dumping is prohibited. Any person who violates the littering laws may be arrested or issued a citation (County Code 17.04.500 and 1118.15).
- Dogs must be kept on leashes at all times on trails (County Code 17.04.410).
- A person shall not bring into a park any animal except as hereafter specifically provided or as otherwise permitted by the director (County Code 17.04.400).
- Do not feed or harm wildlife. They should be viewed from a distance (County Code 17.04.470).

### 5.1.4 Parkland Uses

Parkland uses cover group and individual activities that take place on or near trails, such as camping, picnicking, fishing, and hunting.

- Fires are only permitted in signed and designated areas (County Code 17.04.590).
- Fireworks or other combustible materials are not permitted along any trail (County Code 17.04.520 and 17.04.610).
- Camping is not permitted along County trails (County Code 17.04.380 and 17.04.390).
- Fishing requires a state license (County Code 7.04.560).
- Possession or acting under the influence of alcoholic beverages or drugs is not permitted (County Code 17.04.440 and 17.04.450).
- Nudity is not permitted along County trails (County Code 17.04.480)
- Assemblies, performances, special events, or similar gatherings may require a prior authorization.
- Paint ball guns or rifles (County Code 17.04.600)
- Firearms, or bows and arrows, or other weapons are not permitted on County trails except in designated areas (County Code 17.04.620 and 17.08.300).
- Trail users and visitors are responsible for knowing and following trail rules.

### 5.1.5 Emergency Response

Emergency response to County trails will be provided by various agencies, depending on the location. In many cases, the closest public safety agency will respond, which may include County sheriffs, local police, or national forest personnel.

### 5.1.6 Closure Policy

Trails will be signed as closed when conditions no longer provide for the safe passage of authorized users. Trails and interactions with nature have inherent risks due to continuously changing natural conditions. Therefore, a trail will be closed only when risks are elevated above the inherent risk involved with hiking, bicycling, or riding a horse on a trail. The length of time that a trail is expected to be closed will be shown along with the agency name and contact information at each end of the closed trail segment.

### 5.1.7 Modification to Operation Guidelines

Operation guidelines are subject to change with approval by the Director of the Department of Parks and Recreation.

## 5.2 TRAIL ASSESSMENT

Conduct the trail assessment process to ensure all trails are inventoried and the conditions are documented prior to conducting maintenance. This section outlines the process that can be utilized for trail assessment. In addition, the Universal Trail Assessment Process (UTAP), developed to determine which users may access a trail and the level of accessibility of a trail, is a useful tool in assessing trails, documenting maintenance needs, and determining schedules. The results of the UTAP process may also be useful for providing way-finding signs indicating the conditions of the trails ahead, which is helpful for individuals with disabilities. The UTAP process has been found to be useful, but the documentation requirements can be time and resource intensive. Therefore, this process may only be war-

ranted for particular trails or portions of trails. The UTAP process is utilized by the U.S. Department of Agriculture Forest Service and by California State Parks.

As an alternative to the full UTAP process for trail assessment, a reduced assessment and repair form has been included in this document for use in assessing the type of repair, the crew and tools required, and the budget necessary (Figure 5.2-1, *Sample Trail Assessment and Repair Sheet*; Figure 5.2-2, *Trail Work Log;* and Figure 5.2-3, *Trail Work Log Key*). Blank forms for photocopying are included in Appendix L, *Trail Assessment and Maintenance Forms*. The three forms are to be used in conjunction to document needed maintenance and repair locations and types when conducting an assessment or when a repair is reported by other trail users. The Trail Assessment and Repair Sheet should be filled out at the site to record the extent and type of problem requiring repair. The form provides space to describe the maintenance issue and develop strategies to repair while taking notes on the trail, the location, sketches of the problem and solution, and the tools that will be required. The Trail Assessment and Repair Sheet includes an area to determine the type of repair (or feature) and the action to be taken, both of which should use as a reference the trail work log key. The Trail Assessment and Repair Sheet in combination with the trail work log key provides those conducting repairs with the necessary information required to assess the time, materials, and cost of the repair. An estimate of the trail repair cost can be based on the information contained in Section 2.5.3.1, *Construction Cost Considerations*, and Appendix E, *Trail Construction Costs.*

### 5.2.1 Trail Surfaces

Non-motorized trails are classified according to surface materials and width, as determined by anticipated use patterns and amount of side-hill disturbance involved in construction. In general, trails are made wider when they are located close to urban centers, in an open space area with topography conducive to wider trail tread, or when there are many anticipated users. The County of Los Angeles System of Riding and Hiking Trails includes a variety of County Trails with variable widths and surfaces.

### 5.2.2 Trail Assessment

Regular maintenance is essential to ensuring user safety and extending the useful life of the trail system. Lack of such maintenance could lead to serious deterioration, which could increase, rather than reduce, long-term upkeep costs. All trails benefit from routine maintenance. In addition, the lack of regular maintenance damages the natural resources and outdoor recreation opportunities, and may create a safety hazard.

Map and inventory trail features using global positioning system (GPS) and geographic information system (GIS) technology, and enter these features into a maintenance management system database that tracks data on scheduling, time and cost estimates for repairs, actual work accomplished, and needs for large-scale repairs or desired reroutings. This database needs to be updated frequently based on monthly or at least quarterly inspections that note changes in trail conditions that may alter initial estimates.

An up-to-date maintenance database will assist with determining the amount and frequency of trail work needed, which reflects local conditions and trail types. Therefore, it is essential that each trail be identified by its type and by any special conditions that affect maintenance needs, such as weed growth, steepness, erosion potential, and stream crossings. A four step process maybe utilized to assess trail conditions:

Step 1: Create a Trail Assessment and Repair Sheet

A sample trail assessment and repair sheet can be found at the end of this section. The purpose of the sheet is to prevent the ambiguity of maintenance work. It specifically identifies the trails needs and communicates those needs to others who would be performing the maintenance. This information can then be added to the maintenance database.

Step 2: Walk or Ride the Trail

Inspect trails on a routine basis to identify current conditions, erosion, and any water drainage devices that need repair. In addition, evaluate structural features such as fencing, restrooms, kiosks, and way-finding signs.

Begin walking or riding the trail from the trailhead in order to identify any maintenance or repairs required along the trail. A GPS device or a measuring wheel is recommended for recording the distance and location of a needed repair. Whenever a location along the trail is in need of maintenance or repair, use the assessment sheet to identify the nature of the problem, the severity of the problem, location from the trailhead, and other necessary information. Prioritize repairs that would pose risks to visitors.

Step 3: Confer with the Land Manager

If applicable, for portions of a trail easement through private land holdings, discuss the trail maintenance and repair projects with the landowner prior to scheduling any maintenance or repairs. The assessment sheet will help describe the problems and develop a strategy and a timeline to complete the maintenance and repairs.

Step 4: Assign Work Crews

Assign a crew of workers to each maintenance project. Provide the crew with special training on how to perform the work, including how to identify potential hazards, most efficient methods of repair, what can be handled by in-house staff, and what may require the services of private contractors. Based on this information, staff should be in a position to develop annual costs for equipment, supervision, in-house labor, and outside contractor work, and thus arrive at the County's trail program budget projections.

## SAMPLE TRAIL ASSESSMENT AND REPAIR SHEET

| Trail Name/Number: | Location (include Marker#): |
|---|---|
| Priority: | Crew Leader: |

**Problem:**

_____
_____
_____
_____
_____
_____

**Repair Methods Description:**

_____
_____
_____
_____
_____
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| Sketch Existing Trail: | Sketch Repair: |
|---|---|
| | |

| Crew Members: | Tools Required: |
|---|---|
| | |
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| Feet from Trail Marker | Feature (see Trail Work Log Key) | Action (see Trail Work Log Key) | Size Feature | | | No. of Units | Total Estimated Cost |
|---|---|---|---|---|---|---|---|
| | | | L | H W | | | |
| | | | | | | | |
| | | | | | | | |

**Figure 5.2-1**
**Sample Trail Assessment and Repair Sheet**

## TRAIL WORK LOG

| Feet (from Marker) | Action (see Trail Log Key) | Feature (see Trail Log Key) | Size | | | Units | Comment | Total |
|---|---|---|---|---|---|---|---|---|
| | | | L | H | W | | | |
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**Figure 5.2-2**
**Trail Work Log**

| Feature | Action | Unit | Comment |
|---|---|---|---|
| Asphalt placed | Install/Maintain | cy | |
| Bench | Maintain/Replace | ea | as specified |
| Bridge | Construct/ Reconstruct | Linear Ft | Varies by design |
| Bridge | Maintain | Linear Ft | as specified |
| Bridge | Remove | Linear Ft | Varies by design |
| Bridge - Mid-span supports | Construct/ Reconstruct | | as specified |
| Causeway | Construct/ Reconstruct | cy | |
| Climbing Turn | Construct/ Reconstruct | ea | |
| Concrete | Install | cy | |
| Culvert | Install/Remove | Linear Ft | Varies by type & design |
| Culvert - Rock | Construct/ Reconstruct | cubic ft. | |
| Down Trees | Remove | diameter | |
| Drainage Dip | Construct/ Reconstruct | ea | foot excavation |
| Drainage Lense | Construct/ Reconstruct | cy | |
| Ford | Construct/ Reconstruct | cubic ft. | |
| Hand Rail Removal | Remove | Linear Ft | |
| Hand Rails | Construct/ Reconstruct | Linear Ft | |
| Puncheon | Construct/ Reconstruct | Linear Ft | |
| Puncheon | Maintain | Linear Ft | as specified |
| Retaining Wall - Causeway rock walls | Construct/ Reconstruct | cy/ton | |
| Retaining Wall - Cellular Confinement | Construct | cy/ton | |
| Retaining Wall - Cribbed Abutments | Construct/ Reconstruct | cy/ton | |
| Retaining Wall - Geotextile Fabric | Construct | sq. ft. | |
| Retaining Wall - Mortared Rock | Construct/ Reconstruct | yds/ton | |
| Retaining Wall - Mortared Rock | Maintain | | as specified |
| Retaining Wall - Rock | Construct/ Reconstruct | cy | |
| Retaining Wall - Turnpike walls | Construct/ Reconstruct | sq. ft | |
| Retaining Wall - Wood | Construct/ Reconstruct | sq. ft | |
| Riprap - rock, dry wall | Construct/ Reconstruct | cubic ft. | drains, tread, step landings |
| Sign | Maintain/Replace | ea | as specified |
| Slide Removal | Remove | cubic ft. | |
| Soil Stabilizer Placed | Install/Maintain | sq. ft | |
| Split Rail Fence | Remove | Linear Ft | |
| Step | Maintain | ea | as specified |
| Step Removal | Remove | ea. | |
| Steps - Cable | Construct/ Reconstruct | ea | |
| Steps - Cut Out Stringer | Construct/ Reconstruct | ea | |
| Steps - Full Crib | Construct/ Reconstruct | ea | |
| Steps - Mortared Rock | Construct/ Reconstruct | cy/ton | |
| Steps - Rock | Construct/ Reconstruct | cy/ton | |
| Steps - Wood | Construct/ Reconstruct | ea | |
| Steps - Wood Interlocking Double | Construct/ Reconstruct | ea | |
| Steps - Wood Interlocking Single | Construct/ Reconstruct | ea | |
| Swale | Construct/ Reconstruct | ea | budget information |
| Switchback | Construct/ Reconstruct | ea. | |
| Trail | Brush | Linear Ft | |
| Trail | Construct | Linear Ft | |
| Trail Narrowing | Remove | sq. ft | |
| Trail Obliteration | Remove | sq. ft | |
| Trail Tread | Reconstruct | Linear Ft | |
| Trio Rehabilitation | Perform | Linear Ft | |
| Turnpike | Construct/ Reconstruct | sq. ft | |
| Wall-less Turnpike | Construct/ Reconstruct | sq. ft | |
| Water Bar - rock | Install/Remove/Maintain | cy/ton | |
| Water Bar - wood | Install/Remove/Maintain | ea | |

**Figure 5.2-3**
**Trail Work Log Key**

With the assessment sheet, have the work crews answer the remaining questions in terms of who is on the crew, who is the leader, where is the work site, what are the tools required, and how to go about repairing the problem.

## 5.3 TRAIL MAINTENANCE

Design a multi-year trail maintenance schedule to ensure the continued up-keep, repair, and necessary replacement of trail sections and features. Update the schedule annually based on trail inspections occurring throughout the year. The schedule should be reflected in budget requests for the agency.

A maintenance management system database can assist the County with tracking trail inventory and with producing and monitoring preventative maintenance work orders for specific maintenance tasks. The database can also generate work orders and allow managers to track hours, costs, and resources used to perform maintenance tasks, as well as account for curative maintenance tasks and renovation projects. Work orders can be initiated in several ways. A citizen may contact the County to report a problem or issue. At the County of Los Angeles Department of Parks and Recreation (LACO-DPR), a request form for maintenance is already in place, although to date, the trail-work request form has not been used. However, if trail maintenance is needed, a request form can be sent to the appropriate crew for action. Preventive maintenance work orders are generated on daily, monthly, and yearly schedules, based on the frequency required. Maintenance staff can generate their own work orders for curative or non-preventive related tasks. Other County staff can request work to be performed and send the request directly to the appropriate crew through direct access to the maintenance database. The database should include aerial photos of the site, along with the number and location of culvert pipes, bridges, switchbacks, and other structures. This information is beneficial when planning maintenance activities on a particular trail network. The maps can also be distributed to the maintenance crews to help identify the exact area that needs to be maintained or repaired.

Maintaining trails are important, but funding trail repairs may be difficult. Possible funding alternatives include annual appropriations, open space and park district bonds and tax assessments, grants from various government and foundation programs, volunteer assistance, developer fees and required proffers, park user fees, and citizen donations. Assign a grant writer as part of the staff, and key the trail coordinator into the development assessment process so that trail maintenance is adequately funded.

Trail repairs may be as minor as fixing potholes in a trail or as major as a complete reconstruction or rerouting of an entire trail section. Low areas that channel water or are subject to inundation during heavy rain events need to be repaired immediately before they become significantly worse and begin to affect surrounding sections. Quickly clean and reestablish culverts and other drainage structures that become clogged.

A guideline to the most common trail maintenance and repair procedures, along with recommended maintenance intervals for each, is provided in Table 5.3-1, *Seasonal Maintenance by Trail Surface*, and Table 5.3-2, *Annual Maintenance by Trail Surface*.

### 5.3.1 Mowing and Spraying

Mowing can be used for certain kinds of recurring vegetation growth, including fire fuel buffers, fire control areas, and poison oak control areas. Schedule mowing and spraying regularly, based on knowledge of how fast such growth occurs so that trail use is not significantly inhibited. With some kinds of fast-growing brush, it may be necessary to consider use of herbicides, but special precaution and certified training must be essential components of any such spraying operations.

### 5.3.2 Tree and Brush Trimming

Pruning is performed for the safety of the trail user and to protect the trail and other associated assets. Workers must be knowledgeable about how to do such pruning in ways that provides for aesthetics and protects the health of the vegetation.

**TABLE 5.3-1**
**SEASONAL MAINTENANCE BY TRAIL SURFACE**

| Trail Surface | Task | Frequency | Methods |
|---|---|---|---|
| Native surface | Mowing of grasses | Three times annually (spring, summer, and fall) | Use a mower or weedwacker unit. |
| Asphalt, boardwalk, compacted decomposed granite, concrete, wood chips, native surface | Inspection of trails by walking | Monthly | Inspect trail surfaces, shoulder areas, trees, bridges, crossings, signs, and amenities. |
| Asphalt, boardwalk, compacted decomposed granite, concrete, wood chips, native surface | Tree and brush pruning | Twice annually | Cut down trees and prune limbs at least 1 foot beyond trail edges and provide a minimum 10-foot height clearance. |

**TABLE 5.3-2**
**ANNUAL MAINTENANCE BY TRAIL SURFACE**

| Trail Surface | Task | Frequency | Methods |
|---|---|---|---|
| Asphalt | Asphalt trails pothole repair | Annually or as needed | Remove and replace old asphalt and compress new asphalt even with trail surface. |
| Concrete | Concrete trails pothole repair | Annually or as needed | Remove and replace old concrete and finish new concrete even with trail surface. |
| Compacted decomposed granite | Gravel trails pothole repair | Annually or as needed | Remove and replace old gravel and compress new gravel even with trail surface. |
| Native surface | Native soils trail replacement | Annually or as needed | Compress soils to be level with the trail surface. |
| Wood chips | Wood chips trails repair | Annually or as needed | Remove and replace old wood chips and compress and rake new chips to be level with the trail surface. |
| Asphalt, boardwalk, compacted decomposed granite, concrete, wood chips, native surface | Leaf and debris removal | Annually (fall) or as needed | Use a tractor-mounted blower. |
| Asphalt, boardwalk, compacted decomposed granite, concrete, wood chips, native surface | Cleaning and repair of culvert pipes | Annually or as needed in late spring | Clean by using a shovel. Repair or replace pipes if any erosion exists. |
| Asphalt, boardwalk, compacted decomposed granite, concrete, wood chips, native surface | Sign and other amenities repair | As needed | Replace or repair damaged posts, signs, benches, and tables. |
| Boardwalk, puncheon bridge, or turnpike trails | Water crossing maintenance | As needed in late spring | Divert water flow, clean eroded area, and replace missing or damaged surface material, and re-compact. Reestablish water flow. |

Proper pruning and brushing allows operators to do a thorough and safe job. Such work usually can be done with clippers, string trimmers, and chainsaws, but in some situations, it may be necessary to chop out root systems or blade off the embedded plant material. Operators must have proper training to operate machinery and knowledge of safety issues in areas such as poison oak, safe disposal, and special equipment needed.

### 5.3.3 Debris Removal

Keeping the trail surface cleared is one of the most important aspects of trail maintenance. Mud and other sediment need to be removed along with fallen leaves, branches, and fallen trees to ensure the safety of the users and to increase the life expectancy of the trail itself. This maintenance task is required for all trail surfaces. For debris removal from the trail surface, follow the same operations for mowing.

### 5.3.4 Culverts

Culverts often become clogged with trash and debris that must be removed before the start of the rainy season or late spring to prevent flooding and undercutting of trail surfaces. Culverts may also need to be upgraded in size or replaced because of deterioration or increased storm water flow resulting from weather or changes in vegetation cover, such as from fires, or from new development in the area.

### 5.3.5 Water Crossings and Bog Areas

Bridges, low water crossings, open box culverts, rock drains, and other drainage structures, including those at switchbacks, need regular inspection and attention. Debris should be removed before the start of the rainy season and on an as-needed basis throughout the non-rainy season. Keeping the trail area free of debris facilitates the free flow of surface run-off, thus minimizing and reducing the risk of flooding and related surface erosion. Eroded areas need to be re-graded as quickly as possible to prevent further deterioration. In badly deteriorated bog areas, the installation of erosion protection measures such as geotechnical soil stabilization materials should be evaluated.

### 5.3.6 Signs and Other Amenities

Kiosks, signs, benches, gates, fencing, bollards, and steps need to be kept in safe and aesthetically pleasing condition. Items that fall into disrepair often become the target of vandals. Prompt repairs are essential; anticipate lifecycle replacement.

### 5.3.7 Graffiti Removal

As discussed above, prompt repairs are essential. Trails without graffiti will be more aesthetically pleasing to trail users, compelling them to use the trails frequently. Trails without graffiti will also ensure the longevity of the trail. Once graffiti has been reported, graffiti removal should be completed as soon as possible within 24 hours.

### 5.3.8 Homeless Encampment Removal

Trail hours of operation prohibit overnight occupation on the trails. Therefore, homeless encampment is prohibited. The proper authorities should be notified when homeless encampment is occurring on trails to ensure removal. Currently, enforcement on trails is provided by the Los Angeles County Sheriff's Department Parks Bureau.

### 5.3.9 Fire Mandated Brush Clearance

In the County of Los Angeles, the Brush Clearance Program is a joint effort between the County of Los Angeles Fire Department and the County of Los Angeles Department of Agricultural Commissioner/Weights and Measures, Weed Hazard and Pest Abatement Bureau (Weed Abatement Division). The Brush Clearance Program enforces the removal of hazardous vegetation in Fire Codes. The Brush Clearance Program should be consulted for fire-mandated brush clearance.

### 5.3.10 Pumping Out Flooded Tunnel Ways (Trailways)

To ensure longevity and prevent erosion and closures of trails, pumping out flooded tunnel ways is vital for trail operation and maintenance.

## 5.4 WORKING WITH VOLUNTEER AND OTHER COMMUNITY BASED GROUPS

Trail groups may provide input into the design, development, and implementation of the trail network. They also provide trail maintenance and report maintenance needs to the staff through volunteer programs. However, recruiting and attracting volunteers can be a difficult task. Some park supervisors may already have organized members from the local community to assist with the maintenance and repair of the trails, whereas other parks may not.

For example, the County of Orange Adopt-A-Park program serves beaches, harbors, and parks in the county. The main objective for the Adopt-A-Park program is to provide volunteers with an opportunity to maintain, repair, and perform various operational functions for the parks in their communities. This could be integrated with the current volunteer program proposed by the County of Los Angeles. The main objective of the Adopt-A-Trail program would be for community volunteers to maintain, repair, and provide various operational functions for the County's trail networks. There are several potential sources of volunteers:

- College students
- High school students
- Girl and Boy Scouts of America
- National service organizations
- Corrections departments
- Cycling clubs
- Hiking clubs
- Equestrian (corral) clubs
- Multi-use trail clubs
- Kiwanis clubs
- Mounted assistance units - trained

Being prepared is essential to the effective and efficient mobilization of work crews. The first step in mobilizing work crews shall consist of clearly articulating the performance goal for the workday and the proposed strategies for attaining the goal. List all actions needed, including meeting with the land manager and organizing availability of tools. Estimate how much time it would take for the volunteer crews to complete each task. Delegate tasks and develop backup plans for things that may go wrong. Provide crew leaders with training in advance of the project initiation. Communicate and promote safe use of tools. Provide a sense of accomplishment; volunteers will return if they feel they have accomplished something. Make it enjoyable and fun, but above all, show appreciation for the efforts of volunteers.

It is essentially that volunteers receive proper training prior to beginning a work effort to ensure that the quality of the work performed is maintained. In addition, when appropriate, the confidentiality of data that volunteer groups may have access to must be maintained. The County of Los Angeles has prepared a manual for working with volunteers that provides further guidance to this process.

# SECTION 6.0
# MANUAL AUTHORS

Multiple authors are responsible for this manual and are recognized below. Many additional individuals contributed information to the production of this document and are thanked for their time and comments.

## 6.1 SAPPHOS ENVIRONMENTAL, INC.

| *Contributor:* | *Title:* | *Area of Responsibility:* |
|---|---|---|
| Marie Campbell | President | QA/QC Review |
| Laura Kaufman | Environmental Compliance Director | QA/QC Review |
| Eric Charlton | Manager of Planning and GIS | QA/QC Review |
| William Meade | Environmental Coordinator | Project Management |
| Edward Belden | Environmental Coordinator | Various Sections |
| André Anderson | Senior Environmental Compliance Specialist | Various Sections |
| Leanna Guillermo | Environmental Analyst | Various Sections and Photography |
| Eugene Ng | Senior Graphic Designer | Graphics and Photography |
| David Lee | Production and IT Manager | QA/QC Review<br>Editing and Production |
| Samantha Ortiz | Senior Technical Editor | Editing and Production |
| Christina Poon | Senior Technical Editor | Editing and Production |

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# SECTION 7.0
# REFERENCES


American Trails. 29 March 2006. Accessed 6 April 2006. *Products, Businesses and Consultants.* Available at: http://www.americantrails.org/resources/consultants/index.html

Architectural and Transportation Barriers Compliance Board. 30 September 1999. *Accessibility Guidelines for Outdoor Developed Areas: Final Report*. Available at: http://www.access-board.gov/outdoor/outdoor-rec-rpt.htm

Architectural and Transportation Barriers Compliance Board. 3 September 2002. "ADA Accessibility Guidelines for Recreation Facilities." *Federal Register*, 36 CFR Part 1191 (Docket No. 98-5) RIN 3014-AA16. Available at: http://www.access-board.gov/recreation/final.htm

Architectural and Transportation Barriers Compliance Board. Accessed 6 April 2006. "Outdoor Developed Areas." Available at: http://www.access-board.gov/outdoor/index.htm

Bass, Ronald E., Albert I. Herson, and Kenneth M. Bogdan. 1999 (with 2001 supplement). *The CEQA Deskbook.* Point Arena, CA: Solano Press Books.

Bell, Roger. 2002. "New Models for Trail Contracting." *Trail Tracks*, *31*(1): 6–9.

Benti, Wynne. 1995. *Favorite Dog Hikes: In and Around Los Angeles*. Bishop, CA: Spotted Dog Press, Inc.

Birkby, Robert C. 1996. *Lightly on the Land: The SCA Trail-Building and Maintenance*. Seattle, WA: The Mountaineers.

Boten, Bill, Architectural and Transportation Barriers Compliance Board, Washington, DC. 11 April 2006. Personal communication via e-mail with Mr. Edward Belden, Sapphos Environmental, Inc., Pasadena, CA.

Byers, Elizabeth, and Karin Marchetti Ponte. 2005. *The Conservation Easement Handbook*. (Second Edition.) Washington, DC: Land Trust Alliance and Trust for Public Land.

California Civil Code, Division 2, Part 2, Title 3, Chapter 2, Section 846. Available at: http://www.leginfo.ca.gov/cgi-bin/calawquery?codesection=civ&codebody=&hits=20

California Department of Conservation. 1 January 1998. Division of Land Resources Program, *Williams Act Program*. Available at: http://www.conservation.ca.gov/DLRP/lca/easement_exchanges/index.htm

California Department of Parks and Recreation. Revised June 1974. *California Outdoor Recreation Resource Plan (CORRP).* Contact: California Department of Parks and Recreation, 1416 9th Street, Sacramento, CA 95814.

California Department of Parks and Recreation. 2005. *2005 California Recreation Policy*. Contact: California Department of Parks and Recreation, 1416 9th Street, Sacramento, CA 95814. Available at: http://www.parks.ca.gov/pages/795/files/rec_policy_final_2005.pdf

California Department of Transportation. 1 February 2001. *Highway Design Manual*, Chapter 1000, Bikeway Planning and Design. Sacramento, CA. Available at: http://www.dot.ca.gov/hq/oppd/hdm/pdf/chp1000.pdf

California Government Code, Title 1, Division 3.6, Part 2, Chapter 2, Article 1, Section 830-831.9. Available at: http://www.leginfo.ca.gov/cgi-bin/calawquery?codesection=gov&codebody=&hits=20

California Resources Agency. June 2003. "California Agency Conservation Easements." In *California Environmental Information Catalog*. Sacramento, CA. Available at: http://gis.ca.gov/catalog/BrowseRecord.epl?id=21063

California State Parks. 1998. *Trails Handbook*. Contact: California State Parks, Statewide Trails Office, P.O. Box 942896, Sacramento, CA.

California State Parks. June 2002. *California Recreational Trails Plan*. Contact: State of California Department of Parks and Recreation, Planning Division, Statewide Trails Office, P.O. Box 942896, Sacramento, CA 94296-0001. Available at: http://www.parks.ca.gov/pages/1324/files/Trails%20Plan%20final%203%206.5.pmd.pdf.

California State Parks, Planning Division. May 2002. "Chasing State and Federal Funding." (Technical Assistance series.) Sacramento, CA. Available at: http://www.parks.ca.gov/pages/795/files/chasing%20state%20and%20federal%20funding.pdf

Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion; President's Council on Physical Fitness and Sports. 1996. *Physical Activity and Health: A Report of the Surgeon General*. Washington, DC: Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion; President's Council on Physical Fitness and Sports.

City of Los Angeles. April 2007. *Los Angeles River Revitalization Master Plan*. Available at: http://www.lariverrmp.org/

County of Los Angeles Department of Parks and Recreation. May 1992. *A Parks and Recreation Strategic Plan for 2010*. Contact: 433 South Vermont Avenue, 4th Floor, Los Angeles, CA 90020.

County of Los Angeles Department of Parks and Recreation. 2001. *Los Angeles County Riding and Hiking Trails.* Contact: 433 South Vermont Avenue, Los Angeles, CA 90020.

County of Los Angeles Department of Parks and Recreation. 2003. *County of Los Angeles Inventory of Park Facilities and Areas of Jurisdiction.* Contact: Department of Regional Planning, Hall of Records, 320 West Temple Street, Los Angeles, CA 90012.

County of Los Angeles Department of Parks and Recreation. April 2004. *Strategic Asset Management Plan (SAMP) for 2020*. Prepared by: County of Los Angeles Chief Executive Office and County of Los Angeles Department of Parks and Recreation, with technical assistance by Sapphos Environmental, Inc.

County of Los Angeles Department of Parks and Recreation. 6 December 2005. "Healthy Parks." Web site. Available at: http://parks.co.la.ca.us/HealthyParks.htm

County of Los Angeles Department of Public Works. Accessed 6 April 2006. "Water Resources Precipitation Page." Web site. Available at: http://www.ladpw.org/wrd/precip/

County of Los Angeles Department of Public Works. June 2006. *San Gabriel River Master Plan*. Available at: http://dpw.lacounty.gov/wmd/watershed/sg/mp/docs/SGR_MP.pdf

County of Los Angeles Department of Public Works. 2006. Accessed on 22 June 2006. "History of the Los Angeles River." Web site. Available at: http://ladpw.org/wmd/watershed/LA/History.cfm.

County of Los Angeles Department of Regional Planning. 1965. *County of Los Angeles General Plan*. Contact: Department of Regional Planning, Hall of Records, 320 West Temple Street, Los Angeles, CA 90012.

County of Los Angeles Regional Planning Commission. 29 July 1965. *Los Angeles County Regional Recreation Areas Plan: A Part of the Recreation Element of the General Plan*. Contact: Department of Regional Planning, Hall of Records, 320 West Temple Street, Los Angeles, CA 90012.

County of Los Angeles Department of Regional Planning. 1986. *Los Angeles County Regional Recreation Areas Plan*. Contact:

Department of Regional Planning, Hall of Records, 320 West Temple Street, Los Angeles, CA 90012.

County of Los Angeles Department of Regional Planning. 2005. *Draft General Plan Conservation/Open Space Element*, "Shaping the Future 2025." Contact: Department of Regional Planning, Hall of Records, 320 West Temple Street, Los Angeles, CA 90012.

County of Los Angeles Metropolitan Transit Authority. 2001. *Long Range Transportation Plan for Los Angeles County*. Contact: Metropolitan Transit Authority, One Gateway Plaza, Los Angeles, CA 90012. Available at: http://www.mta.net/projects_plans/bikeway_planning/default.htm

Department of Treasury, Internal Revenue Service. *Internal Revenue Code § 170. Charitable, etc., contributions and gifts.*2005. Available at: http://www.law.cornell.edu/uscode/html/uscode26/usc_sec_26_00000170----000-.html

East Bay Regional Park District. 17 May 2005. Ordinance 38, Chapter 1: "Definitions." Contact: East Bay Regional Park District, 2950 Peralta Oaks Court, P.O. Box 5381, Oakland, CA 94605. Available at: http://www.ebparks.org/district/ord_38/ord_38TOC.htm#chapterone

ESRI. 2006. *ArcGIS Version 9.1*. (Software.) Contact: ESRI, 380 New York Street, Redlands, CA 92373.

Flink, Charles A., Kristine Olka, and Robert M. Searns. 2001. *Trails for the Twenty-First Century: Planning, Design, and Management Manual for Multi-Use Trails*. Washington, DC: Island Press.

Furuseth, Owen J. and Robert E. Altman. 1990. "Greenway Use and Users: An Examination of Raleigh and Charlotte Greenways." *Carolina Planning Journal*, *16*(2): 37–43. Chapel Hill, NC: University of North Carolina at Chapel Hill, Department of City and Regional Planning.

Governor's Office of Planning and Research. May 1997. "Jurisdictions Whose Subdivision Ordinance Provides for The Quimby Act, Tentative Parcel Maps, and Merger of Lots by Parcel Map." In *The California Planners' Book of Lists*. Sacramento, CA: Department of General Services. Available at: http://ceres.ca.gov/planning/bol/1997

International Mountain Bicycling Association. 2004. *Trail Solutions*. Boulder, CO: International Mountain Bicycling Association.

International Mountain Bicycling Association. 2004. *Trail Solutions*. Boulder, CO: International Mountain Bicycling Association. Pp. 108–109.

Kaplin, Larry, Trust for Public Land, San Francisco, CA. 19 December 2005. Personal communication concerning trail easements with Andrew Hall, Sapphos Environmental, Inc., Pasadena, CA.

Leman, Laurie and Chris. 1992. *Mountain Biker's Guide to Southern California.* Helena, MT: Falcon Press.

National Sporting Goods Association. Last updated 2006. *Sports Participation in 2002: Series 1 and Series II*. Mt. Prospect, IL.

Northern California Regional Land Trust. 2002. Web site. Contact: Northern California Regional Land Trust, 167 East Third Avenue, Chico, CA 95926. Available at: http://www.landconservation.org

Parker, Troy Scott. 2004. *Natural Surface Trails by Design*. Boulder, CO: Natureshape LLC.

Professional Trailbuilders Association. 2006. Accessed on 6 April 2006. *Contractors by Location.* Available at: http://www.trailbuilders.org/location.html

Project Play and Learning in Adaptable Environments. 1993. *Universal Access to Outdoor Recreation: A Design Guide.* Berkeley, CA: Project Play and Learning in Adaptable Environments.

Rice, Andrew. 1999. *Frommer's Great Outdoor Guide to Southern California and Baja*. New York, NY: IDG Books Worldwide.

San Diego County. 2005. *County Trails Program and the Community Trails Master Plan*. Contact: San Diego County Department of Parks and Recreation, Resource Management Division, 5201 Ruffin Road, Suite P, San Diego, CA.

San Diego County, Department of Land Use and Planning. 12 January 2005. *County Trails Program, Community Trails Master Plan*. Available at: http://www.sdcounty.ca.gov/dplu/trails.html

Santa Monica Mountains Area Recreation Trails Coordination Project. September 1997. *Final Summary Report*. Contact: SMMART Coordination Project, c/o Rivers, Trails and Conservation Assistance Program, National Park Service, 600 Harrison Street, Suite 600, San Francisco, CA 94107. Available at: http://www.nps.gov/samo/parkmgmt/smmartreportsept1997.htm

Sapphos Environmental, Inc. 4 August 2006. *Altadena Crest Trail Improvements Feasibility Analysis*. Prepared for: County of Los Angeles. Pasadena, CA.

Schad, Jerry. 2004. *Top Trails Los Angeles.* Berkeley, CA: Wilderness Press.

Southern California Association of Governments. January 1995. *Regional Comprehensive Plan and Guide.* Los Angeles, CA.

State of California. 1975. California Government Code, §66477, "Quimby Act."

State of California. *California Code of Regulations*. Title 14, Chapter 3, "Guidelines for Implementation of the California Environmental Quality Act," Article 20, Section 15377: "Private Project." Sacramento, CA. Available at: http://ceres.ca.gov/topic/env_law/ceqa/guidelines/art20.html

State of California, Santa Monica Mountains Conservancy. 28 June 1990. *Rim of the Valley Trail Corridor Master Plan.* Prepared by: Dangermond & Associates, 2400 O Street Sacramento, CA 95816.

Tracy, Tammy, and Hugh Morris. January 1998. *Rail-Trails and Safe Communities: The Experience on 372 Trails*. Washington, DC: Rails-to-Trails Conservancy. Available at: http://safety.fhwa.dot.gov/ped_bike/docs/rt_safecomm.pdf

U.S. Access Board. September 2002. *ADA Accessibility Guidelines for Buildings and Facilities*. Section 4.1.2 (5) (a): "Accessible Sites and Exterior Facilities: New Construction." Available at: http://www.access-board.gov/adaag/html/adaag.htm#4.1

U.S. Access Board. Accessed 1 February 2008. "Proposed Architectural Barriers Act Accessibility Guidelines for Outdoor Developed Areas." Available at: http://www.access-board.gov/outdoor/nprm/

U.S. States Access Board. Accessed 1 February 2008. "Public Provides Input on Guidelines for Federal Outdoor Sites." Available at: http://www.access-board.gov/news/outdoor-comments.htm

U.S. Census Bureau. Last updated 15 July 2003. State and County QuickFacts, Los Angeles County, California. Web site. Available at: http://quickfacts.census.gov/qfd/states/06/06037.html

U.S. Census Bureau. Last updated 4 January 2006. "Arts, Entertainment, and Recreation." In *Statistical Abstract of the United States: 2004-2005*. Available at: http://www.census.gov/prod/2005pubs/06statab/arts.pdf

U.S. Department of Agriculture Forest Service. 1987. *Angeles National Forest Land and Resources Management Plan*. Contact: Forest Service Pacific Southwest Region, 1323 Club Drive, Vallejo, CA 94592.

U.S. Department of Agriculture Forest Service. September 1996. *Standard Specifications for Construction and Maintenance of Trails, EM-7720-103*. Contact: Forest Service, Engineering Staff, Washington, DC.

U.S. Department of Agriculture Forest Service. April 2004. *Trail Construction and Maintenance Notebook*. Contact: Forest Service Missoula Technology and Development Center, 5785 Hwy, 10 West, Missoula, MT.

U.S. Department of Agriculture Forest Service. 5 May 2005. *Draft Forest Service Trails Accessibility Guidelines*. Contact: Forest Service, Mail Stop 1125, 1400 Independence Avenue, SW, Washington, DC 20250. Available at: http://www.fs.fed.us/recreation/programs/accessibility/

U.S. Department of Justice. Americans with Disabilities Act. "Highlights of the Final Rule to Amend the Department of Justice's Regulation Implementing Title III of the ADA." Available at: http://www.ada.gov/regs2010/factsheets/title3_factsheet.html

U.S. Department of Justice. Americans with Disabilities Act. "Revised ADA Regulations: Implementing Title II and Title III." Available at: http://www.ada.gov/regs2010/ADAregs2010.htm

U.S. Department of Transportation, Federal Highway Administration. *Equestrian Design Guidebook for Trails, Trailheads and Campgrounds*. Available at: http://www.fhwa.dot.gov/environment/fspubs/07232816/page14.htm

U.S. Department of Transportation, Federal Highway Administration. "Special Structures" *Trail Construction and Maintenance Notebook*. Available at: http://www.fhwa.dot.gov/environment/fspubs/00232839/page10.htm

*West's Annotated California Codes*. December 2005. California Revenue and Taxation Code, Sections 421–430.5. Eagan, MN: Thomson West. Available at: http://law.justia.us/california/codes/rtc/421-430.5.html

Wheelock, Walt. 1973. Out of Print. *Southern California Peaks.* Glendale, CA: La Siesta Press.

# APPENDIX A
# HISTORY OF TRAIL DEVELOPMENT

The history of trails in the western United States is primarily an account of trails in the backcountry, far away from cities and towns. Until the last century, the majority of country trail users expected to be on the trail for long periods of time. They were miners, ranchers, foresters, and trappers, and they came well prepared with ample provisions carried by pack animals. Because distances were far, and loads were heavy, most of the trails were built at low to moderate grades—grades preferred by horses, donkeys, and mules. The geography of the rugged western peaks lent themselves to gently climbing trails, which ran along the contour of the slopes, nearly perpendicular to the fall-line. An added advantage to this way of building trails was that, because they were more resistant to erosion, the trails required less maintenance—a service that was hard to provide in the backcountry.[1]

In the late 1800s and early 1900s, as the local trading posts, mining towns, and harbor cities grew, "city folk" sought ways to enjoy the solitude and beauty of nature, and recreational trails became popular.[2] These trails were built to the same standard as the working trails, as noted in an entry from the crew foreman's report of the 1915 construction accomplished on the John Muir Trail in the Sierra National Forest.

> Tread, 30 inches minimum width. Plenty of turnouts provided in dangerous places. Grade in no case except under extraordinary conditions exceeding 15 percent. The exceptions so far as noted were extremely few.[3]

Carrying on this tradition, in the 1930s, local trails were built or improved through federal Works Progress Administration (WPA) programs. Examples of this work can be seen scattered throughout the foothills along creek beds, trails, and in campgrounds. Natural rock from the area was used to build walls, stairs, and small dams. Many of the trails built through the WPA programs still exist in good condition today and require minimal maintenance. Good examples of WPA work can be found in the foothills north of the Los Angeles Basin.

The County of Los Angeles (County) covers more than 4,000 acres of area that cover vast topographic differences, including numerous climatic regions from coastlines, alpine mountain regions, and deserts. The County provides residents and visitors with access to numerous outstanding and unique recreational resources from the Angeles National Forest to the Santa Monica Mountains National Recreation Area (Figure A-1, *Santa Monica Mountains National Recreation Area*; Figure A-2, *Angeles National Forest*). Also within the County are a combination of 18 state parks, state recreational areas, and state historical parks. The ability for individuals to access the multiple recreational assets within the County can be greatly enhanced through the development of trail standards and plans to develop new and connecting trails. The County has approximately 300 miles of trails under its jurisdiction (Figure A-3, *Los Angeles County Existing and Proposed Regional Trail Network*).

**Figure A-1**
**Santa Monica Mountains National Recreation Area**

**Figure A-2**
**Angeles National Forest**

1 Birkby, Robert C. 1996. *Lightly on the Land: The SCA Trail-Building and Maintenance*. Seattle, WA: The Mountaineers.

2 Birkby, Robert C. 1996. *Lightly on the Land: The SCA Trail-Building and Maintenance*. Seattle, WA: The Mountaineers.

3 Birkby, Robert C. 1996. *Lightly on the Land: The SCA Trail-Building and Maintenance*. Seattle, WA: The Mountaineers.

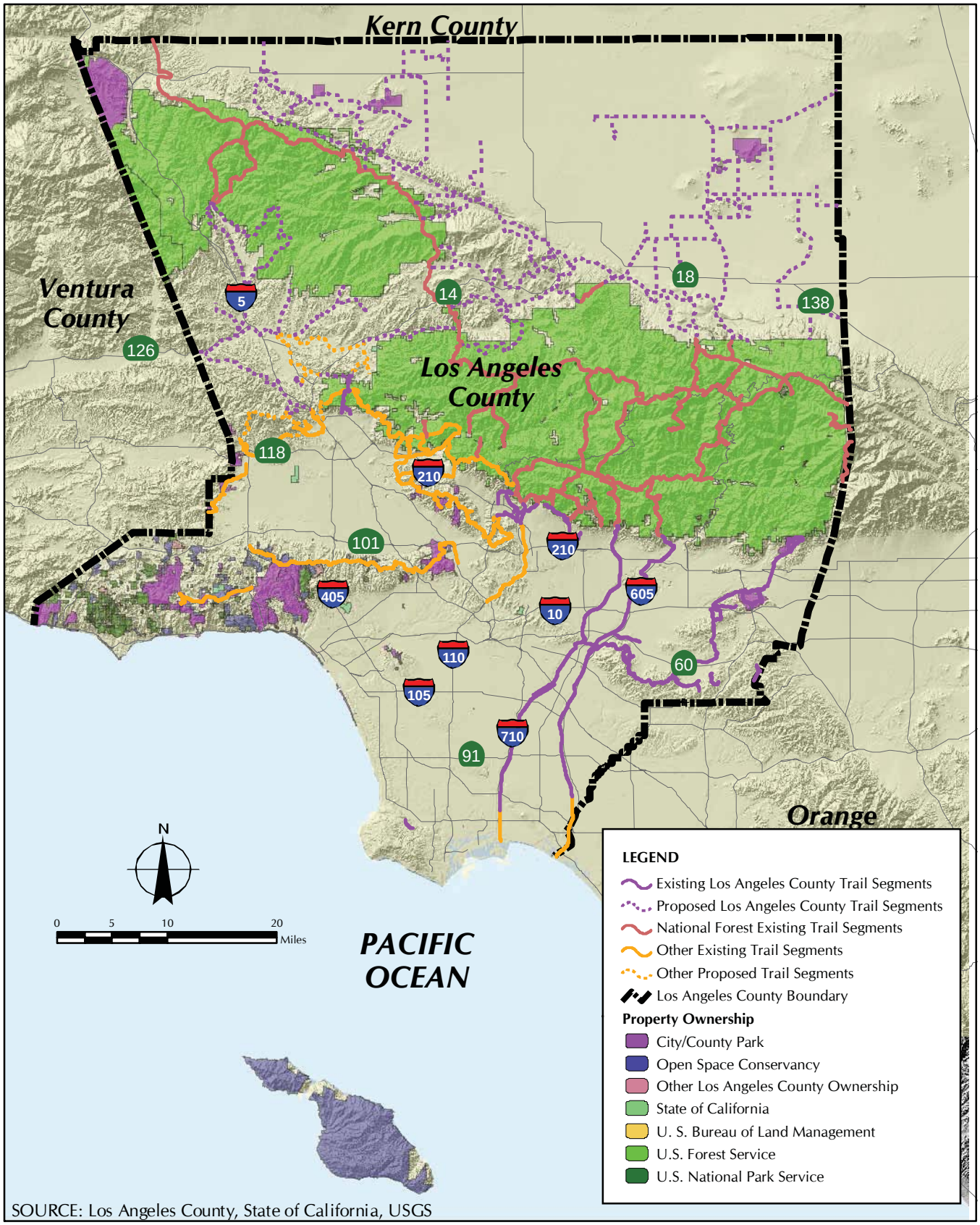


**Figure A-3**
**Los Angeles County Existing and Proposed Regional Trail Network**

Since the 1950s, trails within the County have become a very valued resource as has the conservation of open space. One of the largest County recreational trail assets is the 22-mile LARIO trail system, which was developed along the flood control channels of the Los Angeles River and Rio Hondo Channel, and which provides a major regional trail with access to seven parks adjacent to the Los Angeles River and Rio Hondo Channels. The LARIO trail is maintained by the County Department of Public Works and Department of Parks and Recreation.[4]

To assist the public in using the County trail system, the Riding and Hiking Trails of Los Angeles County[5] map was published in 1992 and was included in the Parks and Recreation Strategic Plan for 2010.[6] The Riding and Hiking Trails of Los Angeles County was updated in 2001 and provides the name and locations of major trails within the County, including those operated by the County, various other agencies, and the forest service.[7]

The conservation of open space within the County has been enhanced with the initiation of the Santa Monica Mountains National Recreation Area and the Santa Monica Mountains Conservancy. The Santa Monica Mountains National Recreation Area, the world's largest urban national park, was designated on November 10, 1978. More than 70 government agencies, including the County of Los Angeles, in collaboration with private landowners work together to provide places for people to live, work, and recreate while protecting the natural and cultural resources in the mountains and on the seashore. This cooperative effort has initiated the construction of the Backbone Trail, a 65-mile-long trail intended to unite the patchwork of public parklands. The Santa Monica Mountains Conservancy was established in 1980 by the California State Legislature. The mission of the conservancy is to work together with citizens; community-based organizations; federal, state, and local government; and other park agencies to buy back, preserve, protect, restore, and enhance land in Southern California in order to form a publicly accessible interlinking system of urban, rural and river parks, open space, trails, and wildlife habitats.

Another significant trail plan within the County was the Rim of the Valley Trail Corridor Master Plan, which provided a plan for the development of a trail system by the Santa Monica Mountains Conservancy around the San Fernando/La Crescenta Valleys. This trail, which is to be known as the Rim of the Valley Trail,[8] will encircle the San Fernando and La Crescenta Valleys unifying various parts of the corridors recreational system.

The County has continued to pursue additional trail planning and the provision of recreational trails through the development of the Antelope Valley Backbone Trail System and the Santa Clarita Backbone Trail System. These systems, finalized in 2006, were developed to ensure future trails are developed in a connected manner throughout the Antelope and Santa Clarita Valleys.

The Recreational Trails Plan produced by the California State Parks is developed to provide guidance for establishing and maintaining California's trail systems, including integrating with local agencies trail systems.[9] The first California Recreational Trails Plan was produced in 1978. The 1978 California Recreational Trails Plan directed the creation of trail corridors and provided a general guide for the future growth of California's trail system. The California Recreational Trails Plan was updated in 2001 and provides trail goals for the state in terms of funding, inventorying, planning, and encouraging use of the trails from multiple users. In addition, the plan includes the 2000 California Trail Corridors (Figure A-4, *California Trail Corridors*), which updates the 1978 Hiking and Equestrian Trails in California. The updated map includes nine trail corridors in the County, including the Pacific Coast, the Pacific Crest, the Backbone Trail, the Rim of the Valley, the LARIO, the San Gabriel River, the Santa Clara River, the Whittier-Ortega Corridor, and the Juan Bautista de Anza National Historic Trail.

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4 County of Los Angeles Department of Public Works. 2006. Accessed on 22 June 2006. "History of the Los Angeles River." Web site. Available at: http://ladpw.org/wmd/watershed/LA/History.cfm

5 County of Los Angeles Department of Parks and Recreation. 1992. *Los Angeles County Riding and Hiking Trails*. Contact: 433 South Vermont Avenue, 4th Floor, Los Angeles, CA 90020.

6 County of Los Angeles Department of Parks and Recreation. May 1992. *A Parks and Recreation Strategic Plan for 2010*. Contact: 433 South Vermont Avenue, 4th Floor, Los Angeles, CA 90020.

7 County of Los Angeles Department of Parks and Recreation. 2001. *Los Angeles County Riding and Hiking Trails*. Contact: Contact: 433 South Vermont Avenue, 4th Floor, Los Angeles, CA 90020.

8 State of California Santa Monica Mountains Conservancy. 28 June 1990. *Rim of the Valley Trail Corridor Master Plan*. Prepared by: Dangermond & Associates, 2400 O Street Sacramento, CA 95816.

9 California State Parks. June 2002. *California Recreational Trails Plan*. Contact: State of California Department of Parks and Recreation, Planning Division, Statewide Trails Office, P.O. Box 942896, Sacramento, CA 94296-0001. Available at: http://www.parks.ca.gov/pages/1324/files/Trails%20Plan%20final%203%206.5.pmd.pdf


**SOURCE:** California State Parks. June 2002. *California Recreation Trails Plan*. Sacramento, CA.

**Figure A-4**
**California Trail Corridors**

# APPENDIX B
# TRAIL RESOURCES

This section contains lists of recommended sources for additional information such as trail building books and guides, means to find contractors, other agencies' trail standards, and additional local resources for information. It is understood that each region and or local area will obtain information regarding local resources.

## B.1 SUGGESTED SOURCES OF INFORMATION

### B.1.1 Recommended Books and Guides

***Construction and Maintenance***


Birchard, William, Jr., Robert Proudman, and Michael Dawson. 2000. *Appalachian Trail Design, Construction, and Maintenance*. (Second Edition.) Harpers Ferry, WV: Appalachian Trail Conservancy.

Birkby, Robert C. 1996. *Lightly on the Land: The SCA Trail-Building and Maintenance*. Seattle, WA: The Mountaineers.

Demrow, Carl, and David Salisbury. 1998. *The Complete Guide to Trail Building and Maintenance*. (Third Edition.) Boston, MA: Appalachian Mountain Club.

Fink, Charles A., Kristine Olka, and Robert M. Searns. 2001. *Trails for the Twenty-First Century: Planning, Design, and Management Manual for Multi-Use Trails*. Washington, DC: Island Press.

Fink, Charles A., Robert M. Searns, and Loring Lab Schwarz. 1993. *Greenways: A Guide to Planning, Design, and Development*. Washington, DC: Island Press.

Hesselbarth, Woody, and Brian Vachowski. 1996. *Trail Construction and Maintenance Notebook*. (9623-2833-MTDC.) Missoula, MT: U.S. Department of Agriculture, Forest Service, Technology & Development Program.

International Mountain Bicycling Association. 2004. *Trail Solutions*. Boulder, CO: International Mountain Bicycling Association.

Parker, Troy Scott. 20 January 1994. *Trails Design and Management Handbook*. (Open Space and Trails Program, Pitkin County, Colorado.) Boulder, CO: Natureshape LLC.

Parker, Troy Scott. 2004. *Natural Surface Trails by Design*. Boulder, CO: Natureshape LLC.

U.S. Department of Agriculture. 1996. *Standard Specifications for Construction and Maintenance of Trails*. (EM-7720-103 and EM-7720-104.) Washington, DC: U.S. Department of Agriculture, Forest Service.

***General Trail Information Books***

Byers, Elizabeth, and Karin Marchetti Ponte. 2005. *The Conservation Easement Handbook*. (Second Edition.) Washington, DC: Land Trust Alliance and Trust for Public Land.

***Guides to Existing Trails***

Adkison, Ron. 1986. *The Hiker's Guide to California.* Billings, MT: Falcon Press.

Benti, Wynne. 1995. *Favorite Dog Hikes: In and Around Los Angeles*. Bishop, CA: Spotted Dog Press, Inc.

Brown, Ann Marie. 1997. *California Waterfalls.* San Francisco, CA: Foghorn Press.

Brown, Ann Marie. 1998. *Easy Hiking in Southern California: 100 Places Anyone Can Hike This Weekend.* San Francisco, CA: Foghorn Press.

Chester, Tom. *Hikes in the San Gabriel Mountains and the Angeles National Forest.* Available at: Tchester.org/sgm/hikes.html

Douglass, Don and Delaine Fragnoli, eds. 1998. *Mountain Biking Southern California's Best 100 Trails.* Bishop, CA: Fine Edge Productions.

Gagnon, Dennis R. 1992. *Hike Los Angeles.* Vol. 2. Santa Cruz, CA: Western Tanager Press.

Immler, Robert. 1990. *Mountain Bicycling around Los Angeles.* Berkeley, CA: Wilderness Press.

Immler, Robert. 1987. *Mountain Bicycling in the San Gabriels.* Berkeley, CA: Wilderness Press.

John W. Robinson. 1998. *Trails of the Angeles: 100 Hikes in the San Gabriels.* Berkeley, CA: Wilderness Press.

Leman, Laurie and Chris. 1992. *Mountain Biker's Guide to Southern California.* Helena, MT: Falcon Press.

McKinney, John. 1998. *Day Hiker's Guide to Southern California.* Santa Barbara, CA: Olympus Press.

Owens, Glen. 1999. *Six Historical Hiking Trails to Mount Wilson.* Arcadia, CA: Big Santa Anita Historical Society.

Rice, Andrew. 1999. *Frommer's Great Outdoor Guide to Southern California and Baja*. New York, NY: IDG Books Worldwide.

Rippens, Paul H. 1998. *Historic Mount Lowe: A Hiker's Guide to the Mount Lowe Railway.* Self-published.

Salcedo, Nancy. 1999. *A Hiker's Guide to California Native Places: Interpretive Trails, Reconstructed Villages, Rock-Art Sites, and the Indigenous Cultures They Evoke.* Berkeley, CA: Wilderness Press.

Schad, Jerry. 1996. *101 Hikes in Southern California: Exploring Mountains, Seashore and Desert.* Berkeley, CA: Wilderness Press.

Schad, Jerry. 2000. *Afoot and Afield in Los Angeles County.* Berkeley, CA: Wilderness Press.

Schad, Jerry. 2004. *Top Trails Los Angeles.* Berkeley, CA: Wilderness Press.

Stienstra, Tom and Ann Marie Brown. 1999. *California Hiking – The Complete Guide to 1000 of the Best Hikes in California.* San Francisco, CA: Foghorn Press.

Troy, Mike and Kevin Woten. 1997. *Mountain Biking the San Gabriel Mountains' Best Trails*. Bishop, CA: Fine Edge Productions.

Wheelock, Walt. 1973. Out of Print. *Southern California Peaks.* Glendale, CA: La Siesta Press.

***Maps***

County of Los Angeles Department of Parks and Recreation. 2001. *Los Angeles County Riding and Hiking Trails.* Contact: 433 South Vermont Avenue, 4th Floor, Los Angeles, CA 90020.

Fine Edge Productions. 1992. *San Gabriel Mountains Recreation Topographic Map, Western Section, ANF and the Verdugo Mountains.* Bishop, CA.

National Park Service. *Santa Monica Mountains National Recreation Area Map.* Available at: http://www.nps.gov/samo/maps/mainmap.htm. Thousand Oaks, CA.

Tom Harrison Maps. San Rafael, CA.
Six map titles covering portions of Los Angeles County:

- Zuma-Trancas Canyons
- Malibu Creek State Park
- Topanga State Park
- Angeles Front Country
- Mount Wilson
- Angeles High Country

USDA Forest Service. 1995 (Minor Revisions 2002). *Angeles National Forest (The Official Forest Service Map).* Arcadia, CA.

### B.1.2 Web Sites

The following Web sites can be consulted regarding the benefits of trails and greenways. Several of the Web sites host fact sheets on trails, and provide data, research, and other information about trails.

- American Trails: http://www.americantrails.org/
- Trails and Greenways Clearinghouse: www.trailsandgreenways.org
- Greenways Incorporated: www.greeways.com
- National Park Service: www.nps.com
- The online trails search engine supported by the Santa Monica Mountains Conservancy: http://www.lamountains.com/parks_search.asp

## B.2 AGENCIES INVOLVED WITH TRAILS

### B.2.1 Regional Contact Information

***Federal***

**Angeles National Forest**
Supervisor's Office
701 N. Santa Anita Avenue
Arcadia, CA 91006
Tel: (626) 574-5200
Fax: (626) 574-5233
TDD: (626) 447-8992
Trail contact: Howard Okamoto

**Bureau of Land Management**
**Palm Springs South Coast**
**Field Office CA-660**
Palm Springs South Coast Field Office
690 W. Garnet Avenue, P.O. Box 581260
North Palm Springs, CA 92258-1260
Tel: (760) 251-4800
Fax: (760) 251-4899

**Santa Monica Mountains National Recreation Area**
401 West Hillcrest Drive
Thousand Oaks, CA 91360
Headquarters Recorded Message
Tel: (805) 370-2300
Visitor Information
Tel: (805) 370-2301
Trail contact: Melanie Beck

**U.S. Army Corps of Engineers**
915 Wilshire Boulevard
Los Angeles, CA 90017
Tel: (213) 452-3908/3333

**U.S. Fish and Wildlife Service**
2493 Portola Road, Suite B
Ventura, CA 93003
Tel: (805) 644-1766
Web site: www.fws.gov/ventura/

***State***

**California State Parks**
Angeles District
1925 Las Virgenes Road
Calabasas, CA 91302
Tel: (818) 880-0350
Trail contacts:
Portions of County of Los Angeles:
North: Charlie Harris
West: Victor Patino
South: Ted Novak
East: Juan Alban

**California Coastal Commission**
South Central Coast District Office
89 South California Street, Suite 200
Ventura, CA 93001-2801
Tel: (805) 585-1800
Web site: www.coastal.ca.gov/

**Mountains Restoration Trust**
3815 Old Topanga Canyon Road
Calabasas, CA 91302
Tel: (818) 591-1701
Web site: www.mountainstrust.org

**Santa Monica Mountains Conservancy**
Los Angeles River Center and Gardens
570 West Avenue Twenty-Six, Suite 100
Los Angeles, CA 90065
General Inquiries:
Tel: (310) 589-3200 and (323) 221-8900
E-mail: info@smmc.ca.gov

**Rivers and Mountains Conservancy**
900 South Fremont Avenue
Annex Building, 2nd Floor
P.O. Box 1460
Alhambra, CA 91802-1460
Tel: (626) 458-4315
Web site: www.rmc.ca.gov

**California Department of Fish and Game**
4949 Viewridge Avenue
San Diego, CA 92123
Public Information: (858) 467-4201
Fax: (858) 467-4299

*Regional and County*

**Los Angeles County Department of Public Works**
**Los Angeles County Flood Control**
Mapping and Property Division
Right-of-Way Section
900 South Fremont Avenue
Alhambra, CA 91803
Tel: (626) 458-7055

**Los Angeles County Metropolitan Transit Authority**
One Gateway Plaza
Los Angeles, CA 90012-2952
Tel: (213) 922-3068
Trail contact: Lynn Goldsmith

**Los Angeles Regional Water Quality Control Board**
320 West 4th Street, Suite 200
Los Angeles, CA 90013-2343
Tel: (213) 576-6640

## B.3 LOCAL TRAIL CONTRACTORS AND SUPPLIERS

This list of contractors and suppliers for trail construction is based on lists from the International Mountain Bicycling Association (IMBA),[1] the American Trails,[2] and the Professional Trailbuilders Association.[3] Additional resources may be available and should be investigated.

### B.3.1 Trail Builders

***Arrowhead Trails, Inc.***
11121 County Road 240
Salida, CO 81201-9226
Tel: (720) 244-7804
Web site: www.arrowheadtrails.com

***Bellfree Contractors, Inc.***
505 West Cypress Avenue
Redlands, CA 92373
Tel: (909) 793-4501
Web site: www.naturetec.com

***Donald Hays Trail Contractor, Inc.***
P.O. Box 7672
Tahoe City, CA 96145
Tel: (530) 583-9128

***Roe Construction***
P.O. Box 8277
Truckee, CA 96162
Tel: (530) 587-9176

***Richard May Construction, Inc.***
Route 1, Box 34
Mammoth Lakes, CA 93546
Tel: (760) 935-4955

***Trail Design and Construction***
P.O. Box 219
Forest Knolls, CA 94933
Tel: (415) 488-1665

***Trails Unlimited***
105A Grand Avenue
Monrovia, CA 91016
Tel: (626) 233-4309
Web site: www.trailsunlimited.com

### B.3.2 Trail Building Supplies

***A.M. Leonard***
241 Fox Drive
Piquoa, OH 45356-0816
Tel: (800) 543-8955
Web site: www.amleonard.com
Provides landscaping tools.

***Arrowhead Trails, Inc.***
11121 County Road 240
Salida, CO 81201-9226
Tel: (720) 244-7804
Web site: www.arrowheadtrails.com
Provides mechanized excavators.

***Ben Meadows Company***
P.O. Box 5277
Janeville, WI 53547-5277
Tel: (800) 241-6401
Web site: www.benmeadows.com
Provides complete line of tools and supplies for trail building.

1 International Mountain Bicycling Association. 2004. *Trail Solutions*. Boulder, CO: International Mountain Bicycling Association.

2 American Trails. 29 March 2006. Accessed 6 April 2006. *Products, Businesses and Consultants.* Available at: http://www.americantrails.org/resources/consultants/index.html

3 Professional Trailbuilders Association. 2006. Accessed on 6 April 2006. *Contractors by Location.* Available at: http://www.trailbuilders.org/location.html

***Country Home Products***
127 Meigs Road, P.O. Box 25
Vergennes, VT 05941
Tel: (800) 687-6575
Web site: www.countryhomeproducts.com
Good source of field and brush mowers.

***Forestry Suppliers, Inc.***
P.O. Box 8397
Jackson, MS 39284-8397
Tel: (800) 647-5368
Web site: www.forestry-suppliers.com
Provides complete line of tools and supplies for trail building.

***Forrest Tool Company***
P.O. Box 768
Mendocino, CA 95460
Tel: (707) 937-2141
Web site: www.maxax.com
Provides multiuse trail building tool.

***Outdoor Creations, Inc.***
P.O. Box 50
Round Mountain, CA 96084
Tel: (530) 337-6774
Manufactures pre-cast concrete signs, picnic tables, barbecues, benches, waste receptacles, etc.

***Sutter Equipment Co.***
80 Chamberlain Avenue
Novato, CA 94947
Tel: (415) 898-5955
Provides tools, excavators, and patented retaining wall structures.

***Trail Services***
15 Westwood Road
Bangor, ME 04401
Tel: (207) 947-2723
Web site: www.trailservices.com
Provides quality trail building tools that are often hard to find.

***Tree of Life Nursery***
33201 Ortega Highway
P.O. Box 635
San Juan Capistrano, CA 92693
Tel: (949) 728-0685
Provides a large selection of Southern California native plants.

### B.3.3 Bridge Sources

***Echo Bridge, Inc.***
P.O. Box 89
Elmira, NY 14902
Tel: (888) 327-4343
Web site: www.echobridgeinc.com
Custom design and prefabrication of wood, steel, and concrete bridges.

***E.T. Techtonics, Inc.***
P.O. Box 40060
Philadelphia, PA 19106
Tel: (215) 592-7620
Web site: www.ettechtonics.com
Designs lightweight fiberglass bridges.

***Naturetec***
505 West Cypress Avenue
Redlands, CA 92373
Tel: (909) 793-4501
Web site: www.naturetec.com
Custom design and manufacturing of fiberglass bridges.

***Permapost Products Company***
4066 SE Tualatin Valley Highway
P.O. Box 100
Hillsboro, OR 97123
Tel: (800) 828-0222
Web site: www.permapost.com
Custom design and prefabrication of wood bridges.

***Steadfast Bridges***
4021 Gault Avenue S.
Fort Payne, AL 35967
Tel: (256) 845-0154
Web site: www.steadfastbridge.com
Prefabricated bridge and overpasses.

***Western Wood Structures, Inc.***
20675 SW 105th Avenue
P.O. Box 130
Tualatin, OR 97062
Tel: (503) 692-6900
Web site: www.westernwoodstructures.com
Designs and supplies engineered wood bridges.

### B.3.4 Sign and Trail Marker Sources

***Carsonite International***
605 Bob Gifford Boulevard
Early Branch, SC 29916
Tel: (800) 648-7915
Web site: www.carsonite.com

***Cross Alert Systems, Inc.***
3970 Post Road, Second Floor
Warwick, RI 02886
Tel: (866) 276-7725
Web site: www.crossalert.com

***Interpretive Graphics***
3590 Summerhill Drive
Salt Lake City, UT 84121
Tel: (801) 942-5812
Web site: www.interpretivegraphics.com

***Pannier Graphics***
345 Oak Road
Gibsonia, PA 15044-8428
Tel: (800) 544-8428
Web site: www.panniergraphics.com

***RockArt***
531 North Los Alamos
Mesa, AZ 85213-7832
Tel: (877) 718-7446
Web site: www.rockartsigns.com

***Scenic Signs***
2803 Emery Drive
Wausau, WI 54401-9709
Tel: (800) 388-4811
Web site: www.scenicsigns.com

***Voss Signs, LLC***
P.O. Box 553
Manlius, NY 13104-0553
Tel: (800) 473-0698
Web site: www.vosssigns.com

## B.4 ADDITIONAL RESOURCES

### TABLE B.4-1
### ORGANIZATIONS ASSOCIATED WITH TRAILS IN LOS ANGELES COUNTY (BY DISTRICT)

| Group Name (Web site) | District | Activities | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Maps | Bicycling | Hiking | Education | Equestrian | Construction/ Maintenance | Advocacy |
| Equestrian Trails, Inc. (www.etinational.org) | All | | | | | X | | X |
| Puente Hills Landfill Native Habitat Preservation Authority (www.habitatauthority.org) | 1 | | | | X | | X | |
| La Cañada Flintridge Trails Council (lacanadaflintridgetrailscouncil.org) | 5 | | X | X | X | X | X | X |
| Mounted Assistance Unit | 1,4,5 | | | | | X | | |
| International Mountain Biking Association (www.imba.com) | All | | X | | | | X | X |
| Los Angeles County Bicycle Coalition (www.labikecoalition.org) | All | | X | | | | | X |
| Los Angeles Bike Paths (www.labikepaths.com) | All | X | X | | | | | |
| Cycle Santa Monica | 3 | X | | | | | | X |
| California Coastal Trail (www.californiacoastaltrail.org) | 3,4 | X | | X | X | | | X |

## TABLE B.4-1
## ORGANIZATIONS ASSOCIATED WITH TRAILS IN LOS ANGELES COUNTY (BY DISTRICT), Continued

| Group Name (Web site) | District | Activities | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Maps | Bicycling | Hiking | Education | Equestrian | Construction/ Maintenance | Advocacy |
| Concerned Off-Road Bicyclists Association (www.CORBAmtb.org) | 3 | | X | | | | X | X |
| Mountain Biking in the Santa Monica Mountains (www.mtb-bike.com) | 3 | X | X | | | | | |
| Pasadena Mountain Bike Club (www.pmbc.org) | 5 | | X | | | | | |
| SoCalMTB (www.socalmtb.com) | All | X | X | | | | | |
| Backcountry Horsemen of California (www.bchc.com) | 5 | | | | X | X | | X |
| California State Horsemen's Association (www.californiastatehorsemen.com) | All | | | | | X | | X |
| Santa Monica Mountains Trail Council | 3 | | X | X | X | X | X | X |
| Palos Verdes Peninsula Land Conservancy (www.pvplc.org) | 4 | | | X | X | | X | |
| San Gabriel and Lower Los Angeles Rivers and Mountains Conservancy (www.rmc.ca.gov) | 1,4,5 | | | | X | | X | |

## TABLE B.4-1
## ORGANIZATIONS ASSOCIATED WITH TRAILS
## IN LOS ANGELES COUNTY (BY DISTRICT), Continued

| Group Name (Web site) | District | Activities | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | Maps | Bicycling | Hiking | Education | Equestrian | Construction/ Maintenance | Advocacy |
| Hikes in the San Gabriel Mountains and the Angeles National Forest (tchester.org/sgm/hikes.html) | 5 | X | | X | | | | |
| Trail Runners Club (www.trailrunnersclub.com) | 3 | | | X | | | | |
| San Gabriel Mountains Trail Builders (www.sgmtrailbuilders.org) | 5 | | | | | | X | |
| Pacific Crest Trail Association (www/pcta.org) | 5 | X | | X | X | X | | |
| Sierra Club (angeles.sierraclub.org) | All | | | X | X | | | X |

# APPENDIX C
# STAKE HOLDER COORDINATION

## C.1 COORDINATION WITH STAKEHOLDERS

Coordination with stakeholders is essential both during and after the completion of a feasibility analysis. Trail stakeholders include members of the surrounding community, trail users, adjacent landowners, private developers, landowners being sought for trail right-of-ways, and the numerous agencies having jurisdiction over the land and resources that the proposed trail would traverse, such as the National Park Service, U.S. Department of Agriculture (USDA) Forest Service, California State Parks, California Department of Fish and Game, County of Los Angeles Flood Control District, and local cities. Successful implementation of public recreational assets and facilities is contingent on strong community involvement, and meeting the needs and understanding the concerns of the multiple stakeholders.

The relationship of trails to private lands is a complex one, and many benefits and concerns must be addressed. To ensure collaboration from stakeholders, it is helpful for the proposed trail project to communicate its goals and objectives early in the planning process. The initial outreach may take the form of a project mailer, brochure, or information pamphlet sent to all stakeholders and may include the following project information:

- Project description
- Recreational need for the project
- Project goals and objectives
- Project facts and statistics
- Complete and detailed map of the project and project's surrounding area
- Description of the planning process
- Invitation to a community meeting to discuss the project
- Contact information

### C.1.1 Working with Private Landowners

A trail project must have support from landowners to effectively move forward. Understanding the concerns of landowners and preparing responses to their concerns demonstrate goodwill on the project's behalf and will encourage landowner support.

The proximity of a trail to a homeowner can foster apprehension about the trail's impact on that individual's quality of life. Landowner involvement can be achieved by sending out mailings about the proposed project details, scheduling public meetings, conducting design and objectives workshops, offering open houses, and/or involving the media or local newspapers.

Common concerns of landowners include crime, property value, liability, aesthetics/visual quality, noise, and privacy.[1] The concerns perceived as the most serious are discussed in detail:

- **Crime.** Security concerns from landowners often stem from fear of the unknown, and protests of the project usually fade away once the trail is opened. According to national crime statistics, parks and trails are among the safest places to be. People are two to three times safer on a trail than in a parking lot, on the street, or even inside their own homes.[2] Another study surveyed 371 trail managers about trail safety, and only 3 percent reported that major criminal activity (crimes against a person) had occurred on their trail.[3]

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1 Flink, Charles A., Kristine Olka, and Robert M. Searns. 2001. *Trails for the Twenty-First Century: Planning, Design, and Management Manual for Multi-Use Trails*. Washington, DC: Island Press.

2 Tracy, Tammy, and Hugh Morris. January 1998. *Rail-Trails and Safe Communities: The Experience on 372 Trails*. Washington, DC: Rails-to-Trails Conservancy. Available at: http://safety.fhwa.dot.gov/ped_bike/docs/rt_safecomm.pdf

3 Tracy, Tammy, and Hugh Morris. January 1998. *Rail-Trails and Safe Communities: The Experience on 372 Trails*. Washington, DC: Rails-to-Trails Conservancy. Available at: http://safety.fhwa.dot.gov/ped_bike/docs/rt_safecomm.pdf

- **User Demographics.** Another common security-related concern is that trails will attract undesirable users to the area. However, senior citizens, who are generally not considered a security risk, are the most active and frequent users of greenways. Furthermore, the majority of greenway users live within 5 miles of the facility, with usership decreasing with increasing distance from the greenway.[4]

- **Property Value.** Trails are most often used by local residents, and once established, trails are considered a neighborhood or property asset. Property values have been shown to increase due to the proximity of a trail. In some cases, realtors have used trail proximity as a selling point.[5] Furthermore, the donation of trail easements reduces property tax.

- **Liability.** Landowners may be concerned that they may be liable for trail user injuries that occur on their property. However, Recreational Use Statutes (RUS), which are considered established precedents in all 50 states, protect landowners from liability in cases of injury due to carelessness on private property permitted for public recreational use. In order for a trail user to claim injuries from a property owner, RUS require the injured person to prove "willful and wanton misconduct" on the part of the landowner.[6] To determine the current status of RUS in California, it is strongly recommended that a knowledgeable attorney or County counsel be consulted for trail projects. In California, the RUS can be found in the California Government Code, Section 830-831.9[7] and California Civil Code, Section 846. [8]

### *C.1.1.1 Benefits of Trails to Private Landowners*

Generating public support for trail projects is the best way to avoid major project schedule disruptions caused by public concerns. A dependable way to garner public support is to prepare public meetings with full disclosure of proposed project details and facts, highlighting benefits about the proposed project that address issues of public concern. Trails have been shown and are known to have many benefits:

- **Community.** Trails provide a much needed "third place" that is neither home nor work. Trails offer a space where "community" can actually happen, where people can meet, interact, and be free to explore nature, exercise, and contemplate together or alone at their leisure. Trails are also hands-on environmental classrooms. People of all ages can participate in the natural world from which they often feel far removed.

- **Public Health and Recreation.** Most people realize exercise is important for maintaining good health in all stages of life, but many do not regularly exercise. The U.S. Surgeon General estimates that 60 percent of American adults are not regularly active and another 25 percent are not active at all.[9] In communities across the country, people do not have access to trails, parks, or other recreation areas close to their homes. Trails provide a safe, inexpensive avenue for regular exercise for people living in rural, urban, and suburban areas.

- **Economic.** Trails provide countless opportunities for economic renewal and growth. Trails can provide direct and permanent benefits to adjacent landowners through increased property values and tax incentives for land

[4] Furuseth, Owen J. and Robert E. Altman. 1990. "Greenway Use and Users: An Examination of Raleigh and Charlotte Greenways." *Carolina Planning Journal, 16*(2): 37–43. Chapel Hill, NC: University of North Carolina at Chapel Hill, Department of City and Regional Planning.

[5] Flink, Charles A., Kristine Olka, and Robert M. Searns. 2001. *Trails for the Twenty-First Century: Planning, Design, and Management Manual for Multi-Use Trails*. Washington, DC: Island Press.

[6] Flink, Charles A., Kristine Olka, and Robert M. Searns. 2001. *Trails for the Twenty-First Century: Planning, Design, and Management Manual for Multi-Use Trails*. Washington, DC: Island Press.

[7] California Government Code, Title 1, Division 3.6, Part 2, Chapter 2, Article 1, Section 830-831.9. Available at: http://www.leginfo.ca.gov/cgi-bin/calawquery?codesection=gov&codebody=&hits=20

[8] California Civil Code, Division 2, Part 2, Title 3, Chapter 2, Section 846. Available at: http://www.leginfo.ca.gov/cgi-bin/calawquery?codesection=civ&codebody=&hits=20

[9] Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion; President's Council on Physical Fitness and Sports. 1996. *Physical Activity and Health: A Report of the Surgeon General*. Washington, DC: Centers for Disease Control and Prevention, National Center for Chronic Disease Prevention and Health Promotion; President's Council on Physical Fitness and Sports.

donations and easements. The community can also benefit from providing a unique asset within an urban context. Popular trails can be tourist and local destinations and encourage recreation-related spending in the community.

- **Environmental.** Trails and their associated greenways protect important habitat, improve air and water quality, filter pollution, and provide corridors for people and wildlife. Trails offer a synergistic balance between the human and built environments, and natural communities and open spaces.

- **Transportation.** Communities with trails enjoy a safe transportation alternative to car travel, while reducing air pollution and promoting health.

- **Cultural and Historic Preservation.** Trails and greenways have the power to connect individuals and communities to the area's heritage by preserving and providing access to historic passages. Trails can give people a sense of place and an understanding of human kind's shared past, including often underappreciated areas such as Native American pathways.

### C.1.2 Working with Future Developments

Planned developments that are going through the entitlement process provide a valuable opportunity to increase the recreational resources to a local neighborhood and the County in general by providing land set aside for numerous uses, including gymnasiums, parks, and trails. Therefore, the initial meetings with those proposing development projects should include suggestions as to the placement of developed areas to conserve and preserve those natural resources that would be well suited for trail locations, such as scenic vistas, unique plant communities, other areas of interest, and areas with various terrains to provide recreational users with optimal resources.

### C.1.3 Working with Trail Advocacy Groups

Trail advocacy groups are an important outlet for individual trail users who are deeply invested in trail issues. They are also a valuable resource to trail planners. Advocacy groups can take many forms, including citizen advisory groups, nonprofit organizations, land trusts, and environmental commissions. These groups can provide useful insights about future trail needs, trail design, and management based on the conditions of existing trails, existing trail user patterns, and important local natural resources.

### C.1.4 Coordination between Stakeholders

The development of trails involves coordination between multiple private and public stakeholders, including multiple agencies and departments.

#### *C.1.4.1 Coordination with Landowners*

The involvement of those who own the land on which a proposed trail is routed should be involved in the planning phase as early as possible. This will ensure that they are able to become active in the project. It is essential that individual landowners feel that their opinions and concerns are heard by those who are proposing the trail route. In addition, encouraging landowners to become involved in the development of the trail helps them to see the potential benefits and understand the feelings of other landowners who have trails crossing their property. The Rails-to-Trails Conservancy has found that "Speaking directly with other landowners can do more to win people over than any statistics you can offer."[10]

#### *C.1.4.2 Coordination with Agencies*

Multiple agencies will be involved with the development of trails, including the numerous departments within and outside of the County. Working with these agencies may include telephone conversations, notification letters, applications for permits,

[10] Flink, Charles A., Kristine Olka, and Robert M. Searns. 2001. *Trails for the Twenty-First Century: Planning, Design, and Management Manual for Multi-Use Trails*. Washington, DC: Island Press.

and participation in private and public meetings. Stakeholder agencies should be identified early on in the process to encourage involvement and to avoid any last minute costly changes to accommodate an agencies perspective. The County of San Diego has adopted a Trails Master Plan that includes an in-depth discussion of agency coordination in the Trails Planning Considerations chapter.[11]

### *C.1.4.3 Public Meetings*

Either prior to or upon the determination of a feasible trail, public meetings should be held to provide all stakeholders with an opportunity to express their views of the proposed project. Public meetings must involve not just those landowners who are adjacent to a trail but also those who may be impacted by local trail traffic, the trail users themselves, public agencies involved in the project, or additional trail stakeholders in the area.

## C.1.5 Land Use Compatibility

Through proper trail planning and design, trail users and landowners adjacent to trails can receive all the benefits of having access to trails without any negative side effects. Parks, trails, and open spaces provide a number of design challenges for personal safety, as they are typically large and used by a variety of people. Direct monitoring is not always possible or desirable in natural settings. Designing for safety should be focused on pathways, parking areas, and other areas of concentrated activity. Crime Prevention Through Environmental Design (CPTED) is a crime prevention philosophy based on the theory that proper design and effective use of the built environment can enhance physical features, activities, and people in such a way as to maximize visibility, leading to a reduction in the fear and incidence of crime, as well as an improvement in the quality of life.

### *C.1.5.1 Natural Surveillance*

Natural surveillance is a key element in promoting safety and reducing crime along trails. The objective of natural surveillance is for trail visitors to be seen and heard, as well as seeing and hearing others if assistance is needed.

Design Strategies

- Locate parking lots, trails, and facilities used at night near streets and other activity centers so that they are easily observed by police patrols and other park users.
- Prune trees and trim shrubs regularly. Overgrown trees or shrubs can inhibit visibility along trails and offer a good hiding place for criminals.
- Locate structures and signs along trails to provide maximum surveillance opportunities.
- Provide good lighting for areas that will be used at night.
- Position some bike trails and walking paths near areas of park activity or at places where parks meet commercial or residential uses, or pair them with active streets, so that users will be more observable by others.
- Recognize that not all natural park areas can be observed or made safe during evening hours.

### *C.1.5.2 Natural Access Control*

Natural access control is the physical guidance of people coming and going from a space by the appropriate placement of entrances, fences, landscaping, and lighting. This principle helps deter access to a crime target or victim along trails and creates a perception of risk to a perpetrator.

[11] San Diego County, Department of Land Use and Planning. 12 January 2005. *County Trails Program, Community Trails Master Plan*. Available at: http://www.sdcounty.ca.gov/dplu/trails.html

Design Strategies

- Provide a clear distance of at least 10 feet between trails and wood-lines to offer decent sight lines and distance from potential attacks.
- Clearly mark the areas to be used only during the day with entrance signs or gates to control accessibility.
- Install trail signs with trail names, directional signs pointing toward areas of public activity, and mile markers to help orient users. Trails need to be marked for different users, such as bicyclists, hikers, or equestrians.

# APPENDIX D
# FEDERAL-AND STATE-LISTED SPECIES WITH POTENTIAL TO OCCUR WITHIN THE COUNTY OF LOS ANGELES

## TABLE D-1
## FEDERAL- AND STATE-LISTED SPECIES WITH POTENTIAL TO OCCUR WITHIN THE COUNTY OF LOS ANGELES

| Species | Status | Habitat |
|---|---|---|
| San Clemente sage sparrow *Amphispiza belli clementeae* | FT | Resident of dry brushlands of San Clemente Island. |
| Braunton's milk-vetch *Astragalus brauntonii* | FE | Occurs in closed-cone coniferous forest, chaparral, coastal scrub, and valley and foothill grassland. |
| Ventura Marsh milk-vetch *Astragalus pycnostachyus* var. *lanosissimus* | FE, SE | Occurs in coastal salt marsh within reach of high tide or protected by barrier beaches. |
| Coastal dunes milk-vetch *Astragalus tener* var. *titi* | FE, SE | Occurs in coastal bluff scrub and coastal dunes in moist, sandy depression along and near the Pacific Ocean. |
| Nevin's barberry *Berberis nevinii* | FE, SE | Occurs in chaparral, cismontane woodland, coastal scrub, and riparian scrub on steep, north-facing slopes or in low grade sandy washes. |
| Thread-leaved brodiaea *Brodiaea filifolia* | FT, SE | Occurs in cismontane woodland, coastal scrub, playas, valley and foothill grassland, and vernal pools usually associated with annual grassland and vernal pools. |
| Arroyo toad *Bufo californicus* | FE, CSC | Occurs in semi-arid regions near washes or intermittent streams, including valley-foothill and desert riparian and desert wash. |
| Swainson's hawk *Buteo swainsoni* | ST | Breeds in stands with few trees in juniper-sage flats, riparian areas and in oak savannah. Requires adjacent suitable foraging areas such as grasslands, or alfalfa or grain fields supporting rodent populations. |
| Mount Gleason Indian paintbrush *Castilleja gleasonii* | SR | Occurs in lower montane coniferous forest on open flats or slopes in granitic soil. |
| San Clemente Island Indian paintbrush *Castilleja grisea* | FE, SE | Occurs in coastal scrub and coastal bluff scrub on rocky slopes of canyons. |
| Santa Ana sucker *Catostomus santaanae* | FT, CSC | Endemic to Los Angeles Basin south coastal streams, preferring sand-rubble-boulder bottoms; cool, clear water; and algae. |
| Catalina Island mountain-mahogany *Cercocarpus traskiae* | FE, SE | Occurs in chaparral and coastal scrub. |
| Western snowy plover *Charadrius alexandrinus nivosus* | FT, CSC | Federal listing applies only to the Pacific coastal population. Occurs on sandy beaches, salt pond levees, and shores of large alkali lakes. |
| San Fernando Valley spineflower *Chorizanthe parryi* var. *fernandina* | FC, SE | Occurs in coastal scrub in sandy soils. |

## TABLE D-1
## FEDERAL- AND STATE-LISTED SPECIES WITH POTENTIAL TO OCCUR WITHIN THE COUNTY OF LOS ANGELES, Continued

| Species | Status | Habitat |
|---|---|---|
| Western yellow-billed cuckoo *Coccyzus americanus occidentalis* | FC, SE | Riparian forest nester along the broad lower flood-bottoms of larger river systems. |
| Salt marsh bird's-beak *Cordylanthus maritimus* ssp. *maritimus* | FE, SE | Occurs in coastal salt marsh and coastal dunes. |
| Santa Susana tarplant Deinandra minthornii | SR | Occurs in chaparral and coastal scrub on sandstone outcrops and crevices. |
| San Clemente Island larkspur *Delphinium variegatum* ssp. *kinkiense* | FE, SE | Occurs in valley and foothill grassland on east slopes on dark grayish-brown loam. |
| Beach spectaclepod *Dithyrea maritima* | ST | Occurs in coastal dunes and coastal scrub. |
| Slender-horned spineflower *Dodecahema leptoceras* | FE, SE | Occurs in chaparral and coastal scrub (alluvial fan sage scrub) in flood deposited terraces and washes. |
| Agoura Hills dudleya *Dudleya cymosa* ssp. *agourensis* | FT | Occurs in chaparral and cismontane woodland on rocky, volcanic breccia. |
| Marcescent dudleya *Dudleya cymosa* ssp. *marcescens* | FT, SR | Occurs in chaparral on sheer rock surfaces and rocky volcanic cliffs. |
| Santa Monica Mountains dudleya *Dudleya cymosa* ssp. *ovatifolia* | FT | Occurs in chaparral and coastal scrub in canyons on sedimentary conglomerates. |
| Southwestern willow flycatcher *Empidonax traillii extimus* | FE, SE | Occurs in riparian woodlands in Southern California. |
| Tidewater goby *Eucyclogobius newberryi* | FE, CSC | Occurs in brackish water habitats along the California coast from Agua Hedionda Lagoon, San Diego County to the mouth of the Smith River in shallow lagoons and lower stream reaches. |
| El Segundo blue butterfly *Euphilotes battoides allyni* | FE | Restricted to remnant coastal dune habitat in Southern California. Host plant is *Eriogonum parvifolium*. |
| American peregrine falcon *Falco peregrinus anatum* | SE | Winter resident of Los Angeles County, occurring in riparian areas, and coastal and inland wetlands. |
| San Clemente Island bedstraw *Galium catalinense* ssp. *acrispum* | SE | Occurs in valley and foothill grassland. Now restricted to steep cliffs and canyons due to goat and pig predation. |
| Unarmored threespine stickleback *Gasterosteus aculeatus williamsoni* | FE, SE | Occurs in weedy pools, backwaters, and among emergent vegetation at the stream edge in small Southern California streams. |
| Mohave tui chub *Gila bicolor mohavensis* | FE, SE | Endemic to the Mohave River Basin, adapted to alkaline, mineralized waters. Needs deep pools, ponds, or slough-like areas. |
| Palos Verdes blue butterfly *Glaucopsyche lygdamus palosverdesensis* | FE | Restricted to the cool, fog-shrouded, seaward side of Palos Verdes Hills, Los Angeles County. Host plant is *Astragalus trichopodus* var. *lonchus*. |
| Desert tortoise *Gopherus agassizii* | FT, ST | Most common in desert scrub, desert wash, and Joshua tree habitats. Occurs in almost every desert habitat. Prefers creosote bush habitat. |

## TABLE D-1
## FEDERAL- AND STATE-LISTED SPECIES WITH POTENTIAL TO OCCUR WITHIN THE COUNTY OF LOS ANGELES, Continued

| Species | Status | Habitat |
|---|---|---|
| California condor<br>*Gymnogyps californianus* | FE, SE | Requires vast expanses of open savannah, grasslands, and foothill chaparral in mountain ranges of moderate altitude. Nests in deep canyons containing clefts in the rocky walls. |
| Bald eagle<br>*Haliaeetus leucocephalus* | FT, SE | Occurs along ocean shores, lake margins, and rivers for both nesting and wintering. Most nests are within 1 mile of water in a large, old-growth, or a dominant live tree with open branches. |
| Island rush-rose<br>*Helianthemum greenei* | FT | Occurs in chaparral, coastal scrub, and closed-cone coniferous forest on rocky sites. |
| San Clemente loggerhead shrike<br>*Lanius ludovicianus mearnsi* | FE | Resident of San Clemente Island in washes, ravines, and mesas in vicinity of scattered tall bushes or low thorny scrub or cactus. |
| California black rail<br>*Laterallus jamaicensis coturniculus* | ST | Mainly inhabits salt marshes bordering larger bays in tidal salt marsh heavily grown to pickleweed; also in fresh water and brackish marshes. |
| San Clemente Island woodland star<br>*Lithophragma maximum* | FE, SE | Occurs in coastal bluff scrub and coastal scrub in rock crevices where it is moist all year. |
| San Clemente Island bird's-foot trefoil<br>*Lotus argophyllus* var. *adsurgens* | SE | Occurs in coastal scrub on volcanic, rocky substrate; coastal bluff scrub on exposed ridges and bluffs. |
| San Clemente Island lotus<br>*Lotus dendroideus* var. *traskiae* | FE, SE | Occurs in coastal scrub, coastal bluff scrub, and valley and foothill grassland. |
| San Clemente Island bush mallow<br>*Malacothamnus clementinus* | FE, SE | Occurs in valley and foothill grassland on sedimentary rock walls and ridges. |
| Spreading navarretia<br>*Navarretia fossalis* | FT | Occurs in vernal pools, chenopod scrub, marshes and swamps, and playas. |
| Southern steelhead - Southern California<br>*Oncorhynchus mykiss irideus* | FE, CSC | Federal listing refers to populations from Santa Maria River south to southern extent of range, San Mateo Creek in San Diego County. |
| California Orcutt grass<br>*Orcuttia californica* | FE, SE | Occurs in vernal pools. |
| Belding's savannah sparrow<br>*Passerculus sandwichensis beldingi* | SE | Inhabits coastal salt marshes, from Santa Barbara south through San Diego County. Nests in *Salicornia* on and about margins of tidal flats. |
| Lyon's pentachaeta<br>*Pentachaeta lyonii* | FE, SE | Occurs in chaparral and valley foothill grassland. Grows at the edges of clearings of chaparral, usually at the ecotone between grassland and chaparral or edges of firebreaks. |
| Pacific pocket mouse<br>*Perognathus longimembris pacificus* | FE, CSC | Inhabits the narrow coastal plains from the Mexican border north to El Segundo, Los Angeles County. |
| Brand's phacelia<br>*Phacelia stellaris* | FC | Occurs in coastal dunes and coastal scrub habitats. |

## TABLE D-1
## FEDERAL- AND STATE-LISTED SPECIES WITH POTENTIAL TO OCCUR WITHIN THE COUNTY OF LOS ANGELES, Continued

| Species | Status | Habitat |
|---|---|---|
| Coastal California gnatcatcher<br>*Polioptila californica californica* | FT, CSC | Obligate, permanent resident of coastal sage scrub below 2,500 feet in Southern California. |
| California red-legged frog<br>*Rana aurora draytonii* | FT, CSC | Occurs in lowlands and foothills in or near permanent sources of deep water with dense, shrubby, or emergent riparian vegetation. |
| Mountain yellow-legged frog<br>*Rana muscosa* | FE, CSC | Federal listing refers to the populations in the San Gabriel, San Jacinto, and San Bernardino Mountains only. Always within a few feet of water. |
| Santa Cruz Island rock cress<br>*Sibara filifolia* | FE | Occurs in coastal scrub on shady slopes in rocky, volcanic soils. |
| Mohave ground squirrel<br>*Spermophilus mohavensis* | ST | Occurs in open desert scrub, alkali scrub, and Joshua tree woodland. Restricted to the Mojave Desert. Prefers sandy to gravelly soils, avoiding rocky areas. |
| California least tern<br>*Sterna antillarum browni* | FE, SE | Nests along the coast from San Francisco Bay south to northern Baja California. A colonial breeder on bare or sparsely vegetated, flat substrates. |
| Island fox<br>*Urocyon littoralis* | FE, ST | Occurs in mixed chaparral, coastal scrub, and shrubby woodland. Prefers a high density of woody, perennial fruiting shrubs, and rocky places for cover. |
| Least Bell's vireo<br>*Vireo bellii pusillus* | FE, SE | Summer resident of Southern California in low riparian in vicinity of water or in dry river bottoms below 2,000 feet. |
| Island night lizard<br>*Xantusia riversiana* | FT | Found in a wide variety of habitats on three of the Channel Islands (Santa Barbara, San Clemente, and San Nicolas). |

**KEY:**
FE = federally endangered
FT = federally threatened
FC = federal candidate
SE = state endangered
ST = state threatened
SR = state rare
CSC = California species of concern

# APPENDIX E
# TRAIL CONSTRUCTION COSTS

Trail construction costs vary due to a variety of factors from site conditions to availability of resources and labor. The California State Parks trail labor and materials construction worksheet is included in the following appendix and will allow individuals to estimate trail construction costs based on 2006 estimated costs. The worksheets require knowledge of the type of construction efforts or repairs to take place. Repair information can be taken from the Trail Assessment and Repair Sheet and Work Logs in Section 5, *Trail Operation and Maintenance*, of the Trails Manual and Appendix L, *Trail Assessment and Maintenance Forms*. Additional associated costs of trail development are also included in this appendix.

The cost of constructing a trail depends on the type of trail, the terrain traversed by the trail, whether the trail crosses streams or roads, and the cost of mobilization to begin trail construction. After construction, a trail may require restoration of the vegetation disturbed during trail construction. Yearly maintenance is required to keep a trail safe and functional. Signs may include highway, regulatory, and informational signs. Some trailheads may require the construction of a parking lot to accommodate trail users. Additional costs include equestrian fencing, landscaping, temporary and permanent irrigation, trash receptacles, benches, drinking fountains, and solar-powered flashing beacons for traffic safety.

This appendix contains the following documents:

- California State Parks 2006 trail labor and materials construction worksheet
- California State Parks 2006 trail bridge construction worksheet
- Estimated 2006 trail construction costs

**CALIFORNIA STATE PARKS**

**2006 TRAIL LABOR AND MATERIALS CONSTRUCTION WORKSHEET**

TRAIL: _____

| CONSTRUCTION ACTIVITY | TOTALS | UNIT | | | PER UNIT COST | | LABOR COST | MATERIAL COST |
|---|---|---|---|---|---|---|---|---|
| **Trail Brushing and Clearing** | | | | | | | | |
| Trail Brushing maint. (light) | 0 | 260 | ft | @ | $16.00 | = | $0.00 | |
| Trail Brushing maint. (medium) | 0 | 160 | ft | @ | $16.00 | = | $0.00 | |
| Trail Brushing maint. (heavy) | 0 | 120 | ft | @ | $16.00 | = | $0.00 | |
| Trail Brushing const. (light) | 0 | 120 | ft | @ | $16.00 | = | $0.00 | |
| Trail Brushing const. (medium) | 0 | 60 | ft | @ | $16.00 | = | $0.00 | |
| Trail Brushing const. (heavy) | 0 | 30 | ft | @ | $16.00 | = | $0.00 | |
| Clearing,tree& stob removal,light | 0 | 80 | ft | @ | $16.00 | = | $0.00 | |
| Clearing,tree& stob removal,med. | 0 | 40 | ft | @ | $16.00 | = | $0.00 | |
| Clearing,tree& stob removal,heavy | 0 | 20 | ft | @ | $16.00 | = | $0.00 | |
| Down Tree Removal 1'- 3' chainsaw | 0 | 2 | hr | @ | $16.00 | = | $0.00 | |
| Down Tree Removal 4'- 6' chainsaw | 0 | 6 | hr | @ | $16.00 | = | $0.00 | |
| Down Tree Removal 7'- 9' chainsaw | 0 | 12 | hr | @ | $16.00 | = | $0.00 | |
| Down Tree Removal 1'- 3' crosscut | 0 | 6 | hr | @ | $16.00 | = | $0.00 | |
| Down Tree Removal 4'- 6' crosscut | 0 | 20 | hr | @ | $16.00 | = | $0.00 | |
| Down Tree Removal 7'- 9' crosscut | 0 | 40 | hr | @ | $16.00 | = | $0.00 | |
| **Trio Maintenance** | 0 | 75 | ft | @ | $16.00 | = | $0.00 | |
| **Trail Reroute and Reconstruction** | | | | | | | | |
| **Dozer Construction** | | | | | | | | |
| Trail Reroute & Reconstruct (hand crew support dozer) | 0 | 11.33 | ft | @ | $16.00 | = | $0.00 | |
| Trail Dozer Rental | 0 | | hrs | @ | $45.00 | = | | $0.00 |
| Dozer Operator | 0 | | hrs | @ | $25.00 | = | $0.00 | |
| **Hand Crew Construction** | | | | | | | | |
| Trail Reroute & Recon (light) 2' or < tread | 0 | 7 | ft | @ | $16.00 | = | $0.00 | |
| Trail Reroute & Recon (med) 4' or < tread | 0 | 5 | ft | @ | $16.00 | = | $0.00 | |
| Trail Reroute & Recon (heavy) 5' or < tread | 0 | 4 | ft | @ | $16.00 | = | $0.00 | |
| **Trail Hardening** | | | | | | | | |
| Trail Hardening Install ( Road Oyl) | 0 | 68 | sq ft | @ | $16.00 | = | $0.00 | |
| Trail Hardening Material ( Road Oyl) | 0 | 1 | sq ft | @ | $0.75 | = | | $0.00 |
| Trail Paving Contract (Asphalt) 4'x2.5" | 0 | 1 | sq ft | @ | $1.80 | = | | $0.00 |
| Trail Paving Hand, Wheelbarrows | | | | | | | | |
| Trail Paving Hand 4'x2.5" <300' | 0 | 32 | sq ft | @ | $16.00 | = | $0.00 | |
| Trail Paving Hand 4'x2.5" >300'<800' | 0 | 24 | sq ft | @ | $16.00 | = | $0.00 | |
| Trail Paving Hand 4'x2.5" >800' | 0 | 16 | sq ft | @ | $16.00 | = | $0.00 | |
| Asphalt Cost 2.5" depth | 0 | | sq ft | @ | 0.55 | = | | $0.00 |
| **Site Restoration** | | | | | | | | |
| Bridge Removal | 0 | 2 | ft | @ | $16.00 | = | $0.00 | |
| Trail Obliteration | 0 | 100 | sq ft | @ | $16.00 | = | $0.00 | |
| Trail Narrowing | 0 | 100 | sq ft | @ | $16.00 | = | $0.00 | |
| Wood Step Removal | 0 | 4 | ea | @ | $16.00 | = | $0.00 | |
| Hand Rail Removal | 0 | 30 | lin ft | @ | $16.00 | = | $0.00 | |
| Split Rail Fence Removal | 0 | 30 | lin ft | @ | $16.00 | = | $0.00 | |
| Wood Retaining Wall Removal | 0 | 30 | sq ft | @ | $16.00 | = | $0.00 | |
| **Switchback & Climbing Turns** | | | | | | | | |
| Switchback Construction 2' or < tread | 0 | 40 | hr | @ | $16.00 | = | $0.00 | |
| Switchback Construction 4' or < tread | 0 | 56 | hr | @ | $16.00 | = | $0.00 | |
| Switchback Construction 5' or < tread | 0 | 72 | hr | @ | $16.00 | = | $0.00 | |
| Climbing Turn Construction 2' or < tread | 0 | 24 | hr | @ | $16.00 | = | $0.00 | |
| Climbing Turn Construction 4' or < tread | 0 | 40 | hr | @ | $16.00 | = | $0.00 | |
| Climbing Turn Construction 5' or < tread | 0 | 56 | hr | @ | $16.00 | = | $0.00 | |
| Switchback Reconstruction 2' or < tread | 0 | 16 | ea | @ | $16.00 | = | $0.00 | |
| Switchback Reconstruction 4' or < tread | 0 | 24 | ea | @ | $16.00 | = | $0.00 | |
| Switchback Reconstruction 5' or < tread | 0 | 32 | ea | @ | $16.00 | = | $0.00 | |
| Climb. Turn Reconstruction 2' or < tread | 0 | 8 | ea | @ | $16.00 | = | $0.00 | |
| Climb. Turn Reconstruction 4' or < tread | 0 | 16 | ea | @ | $16.00 | = | $0.00 | |
| Climb. Turn Reconstruction 5' or < tread | 0 | 24 | ea | @ | $16.00 | = | $0.00 | |
| Log Barrier Installation | 0 | 2.5 | sq ft | @ | $16.00 | = | $0.00 | |
| **Turnpikes and Causeways** | | | | | | | | |
| **Turnpike/Causeway 3' tread** | | | | | | | | |
| Turnpike/Causeway 6" Lift <300' | 0 | 3 | lin ft | @ | $16.00 | = | $0.00 | |
| Turnpike/Causeway 6" Lift >300'<800' | 0 | 2.25 | lin ft | @ | $16.00 | = | $0.00 | |
| Turnpike/Causeway 6" Lift >800' | 0 | 1.5 | lin ft | @ | $16.00 | = | $0.00 | |
| Material cost | 0 | | cu yd | @ | $22.00 | = | | $0.00 |
| Fabric underlayment | 0 | | sq ft | @ | $0.08 | = | | $0.00 |
| **Turnpike/Causeway 4' tread** | | | | | | | | |
| Turnpike/Causeway 6" Lift <300' | 0 | 2.5 | lin ft | @ | $16.00 | = | $0.00 | |
| Turnpike/Causeway 6" Lift >300'<800' | 0 | 1.75 | lin ft | @ | $16.00 | = | $0.00 | |
| Turnpike/Causeway 6" Lift >800' | 0 | 1 | lin ft | @ | $16.00 | = | $0.00 | |

| MATERIAL COST INDEX | | UNIT |
|---|---|---|
| Shale Rock | $22.00 | yard |
| Quarry Rock 3" - 8" | $28.00 | yard |
| CMP Culvert 18" | $9.00 | ft. |
| Form Lumber | $1.50 | bd ft |
| Quarry Rock 1ft -2ft | $46.00 | cu ft |
| Pipe Bridge 8' section | $850.00 | ea. |
| Step Stringers 3"x12" | $2.20 | bd ft |
| Geotextile Fabric | $0.08 | sq ft |
| 3/8" cable galvanized | $0.90 | lin ft |
| 3/8" cable clamps | $0.60 | ea |
| Rebar 5/8" | $0.30 | lin ft |
| Retaining Wall Wood 4" x 8" | $2.20 | bd ft |
| Hardening agent (road oyl) | $0.75 | sq ft |
| Redwood 4" x 6" surfaced | $1.80 | bd ft |
| Labor Rate | $16.00 | hr |
| Cement | $24.00 | cu ft |
| Mortar | $8.00 | bag |
| Asphalt Materials | $0.55 | sq. ft. |
| Asphalt Contract | $1.80 | sq. ft. |
| Abutment Lumber | $2.40 | bd ft |
| Form Lumber | $1.50 | bd ft |
| Snap Ties | $0.50 | sq. ft. |
| She Bolt All Thread | $0.30 | sq. ft. |
| Misc. Form Hardware | $100.00 | per abutme |

TRAIL: _____

| CONSTRUCTION ACTIVITY | TOTALS | UNIT | | | PER UNIT COST | | LABOR COST | MATERIAL COST |
|---|---|---|---|---|---|---|---|---|
| Material cost | 0 | | cu yd | @ | $22.00 | = | | $0.00 |
| Fabric underlayment | 0 | | sq ft | @ | $0.08 | = | | $0.00 |
| **Turnpike/Causeway 5' tread** | | | | | | | | |
| Turnpike/Causeway 6" Lift <300' | 0 | 2 | lin ft | @ | $16.00 | = | $0.00 | |
| Turnpike/Causeway 6" Lift >300'<800' | 0 | 1.5 | lin ft | @ | $16.00 | = | $0.00 | |
| Turnpike/Causeway 6" Lift >800' | 0 | 0.75 | lin ft | @ | $16.00 | = | $0.00 | |
| Material cost | 0 | | cu yd | @ | $22.00 | = | | $0.00 |
| Fabric underlayment | 0 | | sq ft | @ | $0.08 | = | | $0.00 |
| Wall-less Turnpike, Native Soils 3'or< | 0 | 5 | lin ft | @ | $16.00 | = | $0.00 | |
| Wall-less Turnpike, Native Soils 4'or< | 0 | 4 | lin ft | @ | $16.00 | = | $0.00 | |
| Wall-less Turnpike, Native Soils 5'or< | 0 | 3 | lin ft | @ | $16.00 | = | $0.00 | |
| **Drainage Structures** | | | | | | | | |
| Drainage Lenses | 0 | 4 | cu ft | @ | $16.00 | = | $0.00 | |
| Quarry rock 4"-8" | 0.0 | | cu yd | @ | $28.00 | = | | $0.00 |
| Culvert Installation | 0 | | lin ft | @ | $16.00 | = | $0.00 | |
| Culvert cost 18" | 0 | | lin ft | @ | $9.00 | = | | $0.00 |
| Fabric for culvert and lenses | 0 | | sq ft | @ | $0.08 | = | | $0.00 |
| Drainage Ditch Construction | 0 | 5 | lin ft | @ | $16.00 | = | $0.00 | |
| **Retaining Wall Construction** | | | | | | | | |
| **Rock** | | | | | | | | |
| Structural Multi-tier | 0 | 1 | cu ft | @ | $16.00 | = | $0.00 | |
| Riprap (rock tread armoring) | 0 | 1 | cu ft | @ | $16.00 | = | $0.00 | |
| Causeway wall/Single-tier | 0 | 2 | cu ft | @ | $16.00 | = | $0.00 | |
| Non Structural (junk wall) | 0 | 4 | cu ft | @ | $16.00 | = | $0.00 | |
| Rock for dry rock structure | 0.0 | | cu yd | @ | $46.00 | = | | $0.00 |
| Rock Gathering/Transport Time- All Rock Retaining Walls | 0.0 | 4 | cu ft | @ | $16.00 | = | $0.00 | |
| Bridge Abutments-Mortar | 0 | 1.5 | cu ft | @ | $16.00 | = | $0.00 | |
| Rock for mortared abutment | 0.0 | | cu yd | @ | $46.00 | = | | $0.00 |
| Mortar | 0 | 94 lb | bags | @ | $8.00 | = | | $0.00 |
| Mortar Wall | 0 | 1.5 | cu ft | @ | $16.00 | = | $0.00 | |
| Rock for mortared wall | 0.0 | | cu yd | @ | $46.00 | = | | $0.00 |
| Mortar | 0 | 94 lb | bags | @ | $8.00 | = | | $0.00 |
| **Wood** | | | | | | | | |
| Standard, Structural 4" x 8" | 0 | 1 | sq ft | @ | $16.00 | = | $0.00 | |
| Wood materials for wall | 0 | | bd ft | @ | $2.20 | = | | $0.00 |
| Log Crib ( Movement < 50' ) | 0 | 2.5 | sq ft | @ | $16.00 | = | $0.00 | |
| Log Crib ( Movement > 50' < 100' ) | 0 | 2 | sq ft | @ | $16.00 | = | $0.00 | |
| Log Crib ( Movement > 100' < 150' ) | 0 | 1.5 | sq ft | @ | $16.00 | = | $0.00 | |
| Turnpike Wall | 0 | 5 | lin ft | @ | $16.00 | = | $0.00 | |
| Bridge Footings 4" x 8" | 0 | 1 | sq ft | @ | $16.00 | = | $0.00 | |
| Wood materials for footing | 0 | | bd ft | @ | $2.20 | = | | $0.00 |
| Rebar for Turnpike Wall | 0 | | lin ft | @ | $0.30 | = | | $0.00 |
| Geotextile Fabric Wall | 0 | 4 | sq ft | @ | $16.00 | = | $0.00 | |
| Geotextile Fabric | 0 | | sq ft | @ | $0.08 | = | | $0.00 |
| Cellular Confinement Wall | 0 | 4 | cu ft | @ | $16.00 | = | $0.00 | |
| Cellular Confinement | 0 | | cu ft | @ | $2.75 | = | | $0.00 |
| Edge Protection (wood/log) | 0 | 3 | lin ft | @ | $16.00 | = | $0.00 | |
| **Abutment Construction** | | | | | | | | |
| Wood Cribbed (Cubic Feet) | 0 | 1 | cu ft | @ | $16.00 | = | $0.00 | |
| Wood materials | 0 | | bd ft | @ | $2.40 | = | | $0.00 |
| Forming of Concrete Abut.(Sq. Feet) | 0 | 5.5 | sq ft | @ | $16.00 | = | $0.00 | |
| Form Lumber | 0 | | sq ft | @ | $1.50 | = | | $0.00 |
| Snap Ties | 0 | | sq ft | @ | $0.50 | = | | $0.00 |
| She Bolt All Thread | 0 | | sq ft | @ | $0.30 | = | | $0.00 |
| Concrete Pour (Cubic Feet) 2' thick | 0 | 9 | cu ft | @ | $16.00 | = | $0.00 | |
| Rebar | 0 | | lin. Ft | @ | $0.30 | = | | $0.00 |
| Concrete materials | 0 | | cu ft | @ | $24.00 | = | | $0.00 |
| Misc.Forming Hardware | 0 | | sets | @ | $100.00 | = | | $0.00 |
| **Step Construction** | | | | | | | | |
| Wood | | | | | | | | |
| Standard Step | 0 | 1 | ea | @ | $16.00 | = | $0.00 | |
| Waterbar, wood | 0 | 1 | ea | @ | $16.00 | = | $0.00 | |
| Interlocking Steps-Single | 0 | 0.5 | ea | @ | $16.00 | = | $0.00 | |
| Interlocking Steps-Double | 0 | 0.33 | ea | @ | $16.00 | = | $0.00 | |
| Full Crib Steps | 0 | 0.2 | ea | @ | $16.00 | = | $0.00 | |
| Wood for steps | 0 | 0 | bd ft | @ | $2.20 | = | | $0.00 |
| Rebar for steps | 0 | | lin ft | @ | $0.30 | = | | $0.00 |
| Cable Steps | 0 | 1 | ea | @ | $16.00 | = | $0.00 | |
| Cable,clamps & wood for each step | 0 | | ea | @ | $32.00 | = | | $0.00 |

| MATERIAL COST INDEX | | UNIT |
|---|---|---|
| Cellular Confinement | $2.75 | cu ft |
| Cable Step Unit | $32.00 | step |
| Puncheon Unit | $735.00 | ea 8' unit |
| Trail Bench | $750.00 | ea |
| Excavator Rental | $25.00 | hr |
| Dozer Rental | $35.00 | hr |
| Spike Camp Cost | $750.00 | wk |
| Cook Contract | $4,800.00 | mo |
| Move-in Move-out Cost | $750.00 | ea day |
| Helicopter Rental | $8,000.00 | hr portal to |
| Mule Packing Contract | $125.00 | day per mu |
| Van/CCV Rental | $600.00 | per month |
| Rigging Truck Cost | $35.00 | per hour |

TRAIL: _____

| CONSTRUCTION ACTIVITY | TOTALS | UNIT | | | PER UNIT COST | | LABOR COST | MATERIAL COST | MATERIAL COST INDEX | UNIT |
|---|---|---|---|---|---|---|---|---|---|---|
| Cut-out Stringer Steps | 0 | 0.75 | ea | @ | $16.00 | = | $0.00 | | | |
| 3" x 12" wood stringer & step | 0 | 0 | bd ft | @ | $2.20 | = | | $0.00 | | |
| Rock Steps Structural Framed | 0 | 0.5 | cu ft | @ | $16.00 | = | $0.00 | | | |
| Rock Steps Non Structural | 0 | 1.5 | cu ft | @ | $16.00 | = | $0.00 | | | |
| Mortar Rock Steps | 0 | 0.5 | cu ft | @ | $16.00 | = | $0.00 | | | |
| Rock for Steps | 0.0 | | cu yd | @ | $46.00 | = | | $0.00 | | |
| Mortar for mortared steps | 0 | 94 lb | bags | @ | $8.00 | = | | $0.00 | | |
| **Bridge Construction** | | | | | | | | | | |
| Standard Design | 0 | 0.2 | lin ft | @ | $16.00 | = | $0.00 | | | |
| Bridge #1 Material cost | 0 | ft | Based on bridge #1 cost sheet | | | = | | $0.00 | | |
| Bridge #2 Material cost | 0 | ft | Based on bridge #2 cost sheet | | | = | | $0.00 | | |
| Bridge #3 Material cost | 0 | ft | Based on bridge #3 cost sheet | | | = | | $0.00 | | |
| Bridge #4 Material cost | 0 | ft | Based on bridge #4 cost sheet | | | = | | $0.00 | | |
| Hand Transport Bridge Materials | 0 | Estimated Person Hours | | @ | $16.00 | = | $0.00 | | | |
| Bridge Stinger Transport <300' | 0 | 32 | hrs/set | @ | $16.00 | = | $0.00 | | | |
| Rigging Truck Operation | 0 | 4 | hrs/set | @ | $35.00 | = | | $0.00 | | |
| Bridge Stinger Transport >300' < 600' | 0 | 40 | hrs/set | @ | $16.00 | = | $0.00 | | | |
| Rigging Truck Operation | 0 | 6 | hrs/set | @ | $35.00 | = | | $0.00 | | |
| Bridge Stinger Transport >600' < 900' | 0 | 48 | hrs/set | @ | $16.00 | = | $0.00 | | | |
| Rigging Truck Operation | 0 | 8 | hrs/set | @ | $35.00 | = | | $0.00 | | |
| Bridge Stinger Transport >900' < 1,200' | 0 | 64 | hrs/set | @ | $16.00 | = | $0.00 | | | |
| Rigging Truck Operation | 0 | 10 | hrs | @ | $35.00 | = | | $0.00 | | |
| Pipe Bridge Construction | 0 | 1 | lin ft | @ | $16.00 | = | $0.00 | | | |
| Pipe Bridge Materials | 0 | 8' | units | @ | $850.00 | = | | $0.00 | | |
| **Puncheon Construction** | 0 | 0.75 | lin ft | @ | $16.00 | = | $0.00 | | | |
| Puncheon Materials 5' wide | 0 | 12' | units | @ | $735.00 | = | | $0.00 | | |
| **Safety Railings** | 0 | 10 | lin ft | @ | $16.00 | = | $0.00 | | | |
| 4" x 6" Handrails Materials | 0 | | bd ft | @ | $1.80 | = | | $0.00 | | |
| **Bench Construction** | 0 | 1 | ea | @ | $750.00 | = | | $0.00 | | |
| **Excavations** | | | | | | | | | | |
| Excavation (Rock) soft | 0 | 4 | cu ft | @ | $16.00 | = | $0.00 | | | |
| Excavation (Rock) hard | 0 | 1 | cu ft | @ | $16.00 | = | $0.00 | | | |
| Excavation (Soil) soft | 0 | 0.75 | cu yd | @ | $16.00 | = | $0.00 | | | |
| Excavation (Soil) hard | 0 | 0.25 | cu yd | @ | $16.00 | = | $0.00 | | | |
| **Export (soil) from drainage** | 0 | 20 | cu ft | @ | $16.00 | = | $0.00 | | | |
| **Trail Excavator Rental** | 0 | | hrs | @ | $25.00 | = | | $0.00 | | |
| **Excavator Operator** | 0 | | hrs | @ | $25.00 | = | $0.00 | | | |
| **Helicopter Rental** | 0 | | hrs | @ | $8,000.00 | = | | $0.00 | | |
| **Mule Packing Contract** | 0 | | day | @ | $125.00 | = | | $0.00 | | |
| **Spike Camps** | | | | | | | | | | |
| If Spike Camp Put "1" in Box<br>If No Spike Camp Put "2" in Box | 2 | | | | | | | | | |
| Spike Camp Move-in Move-out Cost | 0.00 | | ea | @ | $750.00 | = | | $0.00 | 0 | |
| Spike Camp Overhead Costs | 0.00 | | weeks | @ | $750.00 | = | | $0.00 | | |
| Cook Contract | 0.00 | | month | @ | $4,800.00 | = | | $0.00 | | |
| | | | | | | | | | | |
| **Vehicle Cost (Crew Van/CCV)** | 0 | | month | @ | $600.00 | = | | $0.00 | | |

| | | | | |
|---|---|---|---|---|
| **Trail Crew Management Information** | | | tax on materials | $0.00 |
| Crew Size (number of workers) | 10 | | | |
| | | | **Labor** | **Materials** |
| Work Day Hours ( 8 or 10 hour days) | 8 | | $0.00 | $0.00 |
| | | **Hiking Time** | $0.00 | |
| Average Daily Hiking Time on Project | | **Total Labor** | $0.00 | |
| Display in increments of 15 minutes at .25 | 0.50 | **Supervision Cost** | | $0.00 |
| hours (ex .25, .50, .75, 1.00, 1.25, 1.50) | | **Tool & Equipment Replacement** | | $0.00 |
| | **Administrative Overhead Percentage** | 12% | | $0.00 |
| | **TOTAL PROJECT COST** | | | **$0.00** |

**CALIFORNIA STATE PARKS**

**2006 TRAIL BRIDGE CONSTRUCTION WORKSHEET**

**BRIDGE # 1 MATERIALS WORK SHEET**

**TRAIL: 0**

**LOCATION:**

**BRIDGE SPAN:** 0 Feet

| # | Item | EA Board Ft | Total Board ft | Total Lin ft | Unit | Unit Cost | Total Cost |
|---|---|---|---|---|---|---|---|
| 0 | gluelam pt stringers w/hardware | - | - | 0 | Lin Ft | $55.00 | $0.00 |
| 0 | 3" x 12" x 64" rwd decking | 16 | 0 | 0 | Bd Ft | $2.20 | $0.00 |
| 0 | 12" x 15" x 12' rwd mud sill | 180 | 0 | 0 | Bd Ft | $2.40 | $0.00 |
| 0 | 6" x 8" x 12' rwd post sills | 72 | 0 | 0 | Bd Ft | $2.20 | $0.00 |
| 0 | 4"x 6" x 6' rwd surfaced posts | 12 | 0 | 0 | Bd Ft | $1.80 | $0.00 |
| 0 | 4" x 6" x 10' rwd surfaced rails | 20 | 0 | 0 | Bd Ft | $1.80 | $0.00 |
| 0 | 4" x 6" x 12' rwd surfaced rails | 24 | 0 | 0 | Bd Ft | $1.80 | $0.00 |
| | misc hardware / fasteners | - | - | - | Package | | $0.00 |

| | |
|---|---|
| SUB TOTAL | $0.00 |
| TAX | $0.00 |
| TOTAL | $0.00 |

**ESTIMATED 2006 TRAIL CONSTRUCTION COSTS**

## ESTIMATED 2006 TRAIL CONSTRUCTION COSTS

| Category | Cost |
|---|---|
| **Restoration** | |
| Vegetation restoration | $1.00 per square foot |
| **Signage** | |
| Highway informational sign | $1,500.00 per sign |
| Highway warning sign | $2,000.00 per sign |
| Permitted use sign | $1,500.00 per sign |
| Etiquette sign | $1,500.00 per sign |
| "Crossing private lands" sign | $2,000.00 per sign |
| Boundary sign | $750.00 per sign |
| Temporary connector sign | $750.00 per sign |
| Entrance sign | $2,000.00 per sign |
| Trailhead information sign and kiosk | $3,500.00 per sign |
| Reassurance marker | $1,000.00 per sign |
| Direction change/juncture indicator | $750.00 per sign |
| Interpretive sign | $2,000.00 per sign |
| Wayside exhibit | $2,500.00 per sign |
| Destination sign | $750.00 per sign |
| Adopter sign | $1,500.00 per sign |
| **Landscaping** | |
| Landscaping | $80.00 per linear foot |
| Temporary irrigation | $45.00 per linear foot |
| Permanent irrigation | $80.00 per linear foot |
| **Parking Lot** | |
| Parking lot construction (pervious concrete) | $9.50 per square feet |
| Guardrail | $50.00 per linear foot |
| **Support Structure** | |
| Kiosk | $3,500.00 per kiosk |
| Plumbed restroom | $75,000.00 |
| **Additional Trail Amenity** | |
| Drinking fountain | $2,000.00 each |
| Equestrian fencing | $15.00 per linear foot |
| Horse tie-up | $120.00 each |
| Horse trough | $500.00 each |
| Trash receptacle | $500.00 each |
| Bench | $300.00 each |
| Street crossing solar-powered flashing beacon | $4,000.00 each |

# APPENDIX F
# RECREATIONAL FUNDING

Many funding opportunities for development of trails exist. Each funding mechanism has its own set of requirements and specific uses. Seven potential sources of recreational funding are identified in Table F-1, *Recreational Funding Sou*rces.[1]

## TABLE F-1
## RECREATIONAL FUNDING SOURCES

| Funds | Purpose | Department Contact |
|---|---|---|
| Habitat Conservation Fund (HCF) | Acquire, enhance, or restore specified types of lands for wildlife or open space. | Charlie Williard<br>OGALS<br>(916) 651-8597<br>cwill@parks.ca.gov<br><br>Warren Westrup<br>Acquisition & Real Property Services<br>(916) 653-9946<br>wwest@parks.ca.gov<br><br>Luan Aubin<br>(916) 651-8573<br>laubi@parks.ca.gov<br><br>Sandy Berry<br>(916) 651-7738<br>sberr@parks.ca.gov |
| National Historic Preservation Fund | Preserve properties that are significant in American history, architecture, archaeology, and culture. | Gene Itogawa<br>Office of Historic Preservation<br>(916) 653-8936<br>gitog@parks.ca.gov |
| Off-Highway Vehicle Fund | Plan, acquire, develop, construct, maintain, administrate, operate, and conserve and enforce lands in the system. | Don Fuller<br>OHMVR<br>(916) 324-1569<br>dfull@parks.ca.gov |
| Recreational Trails Program (RTP) | Provide funds for recreational trails and trail-related projects. | Doug Wilber<br>Trails Section<br>(916) 651-6916<br>dwilb@parks.ca.gov<br><br>Don Fuller<br>OHMVR<br>(916)324-1569<br>dfull@parks.ca.gov |

[1] California State Parks, Planning Division. May 2002. "Chasing State and Federal Funding." (Technical Assistance series.) Sacramento, CA. Available at: http://www.parks.ca.gov/pages/795/files/chasing%20state%20and%20federal%20funding.pdf

## TABLE F-1
## RECREATIONAL FUNDING SOURCES, Continued

| Funds | Purpose | Department Contact |
|---|---|---|
| Environmental Enhancement and Mitigation Program (EEMP) | Mitigate the environmental impacts of modified or new public transportation facilities. | Doug Wilber<br>Trails Section<br>(916) 651-6916<br>dwilb@parks.ca.gov |
| Transportation Enhancement Activities for the 21st Century (TEA-21) | Enhance transportation (e.g., facilities for pedestrians and bicycles, acquisition of scenic easements, and archaeological planning and research). | Doug Wilber<br>Trails Section<br>(916) 651-6916<br>dwilb@parks.ca.gov |
| National Recreation Trail Fund Act | The California Department of Parks and Recreation administers the federally funded National Recreation Trail Fund Act (NRTFA) grant program. NRTFA funds recreational trails acquisition and development projects. Roughly $2.2 million is available annually with some matching required. | Luan Aubin<br>(916) 651-8573<br>laubin@parks.ca.gov<br><br>Sandy Berry<br>(916) 651-7738<br>sberr@parks.ca.gov |
| Land and Water Conservation Fund | States, cities, counties, and districts authorized to acquire, develop, operate, and maintain park and recreation areas.<br>$7.7 million for California, 60 percent allotted to Southern California (50 percent - reimbursement) | State Department of Parks and Recreation<br>Don Shapiro<br>(916) 651-8575<br>dshap@parks.ca.gov<br><br>Barbara Baker<br>(916) 651-7743<br>bbaker@parks.ca.gov<br><br>Charlie Williard<br>OGALS<br>(916) 651-8597<br>cwill@parks.ca.gov |
| Rivers, Trails and Conservation Assistance (RTCA) Program | Corridor conservation plans: statewide rivers or trails assistance | National Park Service<br>Southern California Field Office<br>570 West Avenue 26, Suite 175<br>Los Angeles, CA 90065<br>Phone (323) 441-2117/9307<br>Fax (323) 226-9235 |

# APPENDIX G
# SAMP EASEMENT

## Chapter 21
## 21.11: Sample Trail Easement to Land Trust

**KARIN MARCHETTI PONTE, LAND CONSERVATION LEGAL SERVICES**

**We,** and , of Town of , State of , (hereinafter referred to as the "Grantors," which word is intended to include jointly and severally, unless the context clearly indicates otherwise, the above-named Grantors, their personal representatives, heirs and assigns, and any successors in interest to the subject premises, and their respective personal representatives, successors, heirs and assigns, ),

**GRANT** as a gift, to LAND TRUST, a non-profit conservation organization existing under the laws of the State of , with a mailing address of (hereinafter referred to as the "HOLDER," which word shall, unless the context clearly indicates otherwise, include the Holder's successors and assigns),

**with QUITCLAIM COVENANT**, in perpetuity, a **Trail Easement** pursuant to the Maine Uniform Conservation Easement Act at 33 M.R.S.A. Section 476 et seq., and Sections 170(h), 2031(c), 2522, and 2055 of the Internal Revenue Code, over our land on Island, Town of , County, Maine, described in a deed to from , dated , and recorded at the County Registry of Deeds at Book , Page , over the trail or trails, being feet in width, [[and over the beach that is accessed by said trails]] depicted in Exhibit B, which trails are contiguous with [[other trails on abutting parcels]] [[public roads]] [[other trail easements]] [[other traditional public access areas]] [[land owned by or dedicated to public use]] [[a public beach]]. This grant is made exclusively for conservation purposes, to wit: to provide outdoor recreational opportunities and education for the residents and visitors to Island, in particular along a traditional contiguous trail network [[and in particular to provide access to ,]] all in accordance with the following provisions:

**TRAIL EASEMENT**: Grantors, their heirs and assigns, agree to refrain from taking any action to prohibit or discourage or to exact a fee for pedestrian or cross country ski access over the trail easement established hereby. This easement should not be construed to permit mechanized or motorized equipment or vehicles of any nature on the Trail Easement without the express permission of Grantors, except for trail work by Holder and its agents or in emergency circumstances. Grantors and Holder have the right to require that public use is conducted in a manner that does not unreasonably disturb plant or wildlife habitat or the quiet use and enjoyment of nearby private property not subject to this Trail Easement. Grantors have the right to use the Trail Easement and to permit more intensive uses of the Trail Easement, such as motorized or bicycle access, provided that such use does not unreasonably interfere with the pedestrian uses granted hereby, and provided that more than a *de minimis* use of the Trail Easement for commercial outdoor recreation is prohibited, in accordance with Internal Revenue Code § 2031(c). Grantors and Holder may agree in writing to relocate trails as necessary and convenient over time to preserve the accessibility or contiguity of trail networks on Island and other publicly accessible areas.

**[[Optional:** Grantors and Holder have the right to jointly agree to limit, restrict or prohibit public use of the all or any part of the Trail Easement or designated alternative locations, temporarily to assure safety or for maintenance purposes, and indefinitely as necessary or appropriate to achieve the purposes of this grant and to preserve other important conservation values of the Protected Property.**]]**

Grantors and Holder, and their respective heirs, successors, and assigns, claim all of the rights and immunities against liability for injury to the public to the fullest extent of the law under Title 14 M.R.S.A. Section 159-A, et seq. as amended and successor provision thereof (The Maine Recreational Use Statute),

and under any other applicable provision of law and equity. [[Nevertheless, Holder will secure, maintain and provide Grantors with evidence of general liability insurance covering the trail on the Protected Property, and will name Grantors, as owners of the Protected Property, as co-insured.]]

**HOLDER'S RIGHTS**: Holder, its authorized representatives, successors, or assigns, are granted the right to enter the land of Grantors described above and the trails [[and beach]] thereon, at any reasonable time and in any reasonable manner that is consistent with the conservation purposes hereof, including the right to enter over any rights-of-way pertaining to Grantors land, after making reasonable efforts to notify residents of said premises, for the following purposes:

1. to monument, lay out, establish, maintain or (as limited above) to relocate a pedestrian trail no greater than [[ ( )]] feet in width, contiguous with trails on abutting properties now or hereafter established, including the right to make improvements to trails such as timber steps, boardwalks, railings, and bridges, barriers to discourage use by motorized vehicles, cairns, small signs, alterations necessary to prevent erosion, and to selective cut, prune and remove leaners and blowdowns to preserve safety and to provide scenic views. Holder has no obligation to exercise this right, and Grantors have a coextensive right to undertake these activities. This right may be delegated or assigned to another entity upon prior written notice to Grantors, their heirs and assigns.

2. to inspect the Protected Property for violations of the terms of this Trail Easement, and to enforce the same by actions at law or in equity.

Holder is also granted the right to assign this Trail Easement, but only to an entity that as a condition of transfer agrees to uphold the conservation purposes of this grant, and satisfies the requirements of Section 170(h)(3) of the Internal Revenue Code, (or successor provisions thereof) and the requirements of Section 476(2) of Title 33 of the Maine Revised Statutes Annotated, as amended (or successor provisions thereof), and the right to its proportional share, as calculated in accordance with Federal Treasury Regulation 1.170-A-14(g)(6)(2), of the proceeds of any sale or taking of the premises underlying this Trail Easement, should this Trail Easement be extinguished, which may be accomplished only by court order.

**IN WITNESS WHEREOF**, [[and , their spouses respectively, joining in this conveyance as Grantors and releasing all rights by descent or otherwise,]] have hereunto set their hands and seals this day of , in the year .

Signed, sealed and delivered
in the presence of:

_____ _____

_____ _____

ACKNOWLEDGEMENT

HOLDER ACCEPTANCE & ACKNOWLEDGEMENT

ATTACHED EXHIBITS

**NOTE:** *This model document is provided for the purpose of illustration and education and does not represent the variety of protection options that can be accomplished with Conservation Easements or Trail Easements.*

# APPENDIX H
# CONSERVATION EASEMENT TAX INFORMATION

The information below is general information regarding donations and tax deductions associated with trail and conservation easements. However, a tax professional should always be contacted by the individual or entity seeking a tax deduction on a case-by-case basis. The information below in no way states a trail or conservation easement will be tax deductible.

California Revenue and Taxation Code Sections 421–430.5 address types of conservation easement tax benefits available in California.[1] The different easement types recognized by California are defined in California Government Code, Section 27255,[2] which describes the purpose of conservation easements as to "retain land predominantly in its natural, scenic, historical, agricultural, forested, or open-space condition." Conservation easements are further defined in Section 815.1 of the Civil Code, and open space easements are also defined in Section 51075 of the Civil Code.[3] An agricultural conservation easement is defined in Section 10211 of the Public Resources Code,[4] and grant of an open space easement is discussed in Government Code 51051.[5,6]

Land donations by private owners offer the possibility for a state or federal tax incentive or write-off. The Internal Revenue Service (IRS) treats gifts of conservation easements in the same manner it treats other gifts of land to qualified recipients; the present value of the charitable (easement) gift is deducted from income.[7] The terms of federal taxes are covered under the IRS Internal Revenue Code (IRC) §170(h),[8] which sets forth the requirements that a conservation easement must meet to be eligible (i.e., charitable) for federal income and estate tax deductions. In general, the IRC outlines three basic requirements that must be met for an easement to qualify for tax benefits:

1. A qualified real property interest (a conservation easement must be perpetual). For the purposes of the tax code, the term, "qualified real property interest," means any of the following interests in real property:
    a. The entire interest of the donor other than the qualified mineral interest,
    b. A remainder interest, or
    c. A restriction (granted perpetuity) on the use that may be made of the real property.
2. Granted to a qualified organization (a government organization or public charity with conservation goals)
3. Granted exclusively for conservation purposes. It must meet at least one of the following four purposes:
    a. Provides outdoor recreational or educational use for the general public
    b. Protects a relatively natural habitat of fish, wildlife, or plants, or a similar ecosystem
    c. Preserves open space (including farmland and forest land) where such preservation:
        i. Provides scenic enjoyment for the general public, or is pursuant to a clearly delineated federal, state, or local governmental conservation policy, and
        ii. Yields a significant public benefit
    d. Preserves a historically important land area or a certified historic structure

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1 *West's Annotated California Codes*. December 2005. California Revenue and Taxation Code, Sections 421–430.5. Eagan, MN: Thomson West. Available at: http://law.justia.us/california/codes/rtc/421-430.5.html

2 *West's Annotated California Codes*. December 2005. California Revenue and Taxation Code, Sections 421–430.5. Eagan, MN: Thomson West. Available at: http://law.justia.com/california/codes/index.html

3 California Department of Conservation. 1 January 1998. Division of Land Resources Program, *Williams Act Program*. Available at: http://www.conservation.ca.gov/DLRP/lca/easement_exchanges/index.htm

4 California Department of Conservation. 1 January 1998. Division of Land Resources Program, *Williams Act Program*. Available at: http://www.conservation.ca.gov/DLRP/lca/easement_exchanges/index.htm

5 *West's Annotated California Codes*. December 2005. California Revenue and Taxation Code, Sections 421–430.5. Eagan, MN: Thomson West. Available at: http://law.justia.com/california/codes/index.html

6 California Resources Agency. June 2003. "California Agency Conservation Easements." In *California Environmental Information Catalog*. Sacramento, CA. Available at: http://gis.ca.gov/catalog/BrowseRecord.epl?id=21063

7 Byers, Elizabeth, and Karin Marchetti Ponte. 2005. *The Conservation Easement Handbook*. (Second Edition.) Page 83. Washington, DC: Land Trust Alliance and Trust for Public Land.

8 Department of Treasury, Internal Revenue Service. *Internal Revenue Code § 170. Charitable, etc., contributions and gifts*. 2005. Available at: http://www.law.cornell.edu/uscode/html/uscode26/usc_sec_26_00000170----000-.html

A sample trail easement form is included in Appendix E, *Sample Trail Easement Agreement*. This form is only an example. Each form should be revised to incorporate site-specific information and then reviewed by County Counsel prior to authorization. Several categories of conservation easements are eligible for IRS tax deductions:[9]

1. Public recreation or education easements
   a. Public access is required.
   b. Property must have value to the public.
2. Significant natural habitat easements
   a. Property must be in a relatively natural state.
   b. Property must exhibit one of the following characteristics:
      i. Rare, endangered, or threatened species must be present, or
      ii. The property must contribute to the ecological viability of a park or other conservation area, or
      iii. The property must represent a high-quality native terrestrial or aquatic ecosystem.
3. Open space for scenic enjoyment easements
   a. The property must indeed be scenic (i.e., development would impair the scenic character of the local rural or urban landscape or would interfere with a scenic panorama from a public viewpoint), and must be easily seen by the public
   b. Protection of the property must yield a "significant public benefit," as evidenced by such characteristics as:
      i. The uniqueness of the property;
      ii. The consistency of the proposed open space with federal, state, local, or private conservation programs in the region, including a legislatively mandated program identifying specific parcels for future protection;
      iii. The intensity of existing and foreseeable development in the vicinity, and the likelihood that development of the property would lead to degradation of the area;
      iv. The opportunity for public use or appreciation of the restricted land;
      v. The likelihood that the donee will acquire valuable substitute property or property rights;
      vi. The cost to the donee in enforcing the terms of the easement; and
      vii. The population density in the area.
4. Open space pursuant to governmental policy easements (this includes farmland and timberland)
   a. Protection of the property is "pursuant to a clearly delineated federal, state, or local governmental conservation policy" (e.g., agricultural land preservation).
   b. Protection of the property must yield a significant public benefit.
5. Historic value easements
   a. A "historically important land area" must be either independently significant or deemed to contribute to a registered historic district or adjacent to and contributing to the historic or cultural integrity of a property on the National Register of Historic Places (NRHP).
   b. A "certified historic structure" must be listed on the NRHP or certified by the Secretary of the Interior as contributing to the historic character of the registered historic district in which it is located.

[9] Northern California Regional Land Trust. 2002. Web site. Contact: Northern California Regional Land Trust, 167 East Third Avenue, Chico, CA 95926. Available at: http://www.landconservation.org

# APPENDIX I
# ACCESSIBILITY GUIDELINES

These accessibility guidelines are based on the *Forest Service Trail Accessibility Guidelines*.[1] As stated in the Trail Accessibility Guidelines "the guidelines were developed to maximize accessibility, while recognizing and protecting the unique characteristics of the natural setting of each trail."[2]

Trails are not required to be accessible. These guidelines do not limit the Department of Parks and Recreation to deviate from these guidelines based on specific situations. The following four conditions are instances that allow for exceptions to the implementation of the guidelines for portions of a trail in recognition of the unique and natural settings:

- Where compliance would cause substantial harm to cultural, historic, religious, or significant natural features or characteristics.

- Where compliance would substantially change the physical or recreational setting or the trail class, designed use, or managed use of the trail or trail segment or would not be consistent with the applicable forest land and resource management plan.

- Where compliance would require construction methods or materials that are prohibited by federal, state, or local law, other than state or local law whose sole purpose is to prohibit use by persons with disabilities.

- Where compliance would not be feasible due to terrain or prevailing construction practices.

The following specifications should be followed for all new trails. Exceptions to these standards should occur for portions of a trail that fall under one of the four exceptions listed above.

- **Surface.** The trail surface shall be firm and stable. Firmness refers to the penetration of the surface that occurs when force is applied; for example, when stepped on. On the other hand, stability refers to the displacement of the surface when a turning motion is applied to the surface, such as the twisting of a foot.

- **Clear Tread Width.** Tread width refers to the path or visible trail surface perpendicular to the direction of travel. The clear tread width of the trail is the width of the useable trail tread, measured perpendicular to the direction of travel and on or parallel to the surface of the useable trail tread. The clear tread width of the trail should be a minimum of 36 inches.

- **Openings.** This specification addresses openings in trail spaces. Openings in trail surfaces shall be of a size that does not permit passage of a 0.5-inch-diameter sphere. Elongated openings shall be placed so that the long dimension is perpendicular or diagonal to the dominant direction of travel.

- **Protruding Objects.** This specification addresses those with visual impairments. Protruding objects on trails shall comply with ADAAG (Americans with Disabilities Act Accessibility Guidelines) 4.4.1 and shall have 80 inches minimum clear head room.

- **Tread Obstacles.** Examples of tread obstacles include tree roots, rocks, brush, downed trees, or branches projecting from the trail. Where tread obstacles exist, they shall not exceed 2 inches high maximum.

- **Passing Space.** This specification allows people who use wheelchairs to pass other hikers easily. Where the clear tread width of the trail is less than 60 inches, passing spaces shall be provided at intervals of 1,000 feet

[1] U.S. Forest Service. 5 May 2005. *Draft USDA Forest Service Trail Accessibility Guidelines*. Available at: http://www.fs.fed.us/recreation/programs/accessibility/

[2] U.S. Forest Service. 5 May 2005. *Draft USDA Forest Service Trail Accessibility Guidelines*. Available at: http://www.fs.fed.us/recreation/programs/accessibility

maximum. Passing spaces shall be either a 60-inch minimum by 60-inch minimum space, or an intersection of two walking surfaces that provide a T-shaped space complying with ADAAG 4.2.3, provided that the arms and stem of the T-shaped space extend at least 48 inches beyond the intersection.

- **Slopes.** This specification addresses two slopes that are crucial elements to people with mobility impairments.
  - **Outslope.** The outslope should not exceed 5 percent.
  - **Trail Grade.** The grade of the trail segments should comply with one or more of the provisions of this section. No more than 30 percent of the total trail length shall exceed a grade of 8 percent.
    - Trail grade should be 5 percent or less for any distance.
    - Trail grade should be 8 percent maximum for 200 feet maximum. Resting intervals complying with ADAAG 16.2.8 shall be provided at distances no greater than 200 feet apart.
    - Trail grade should be 10 percent maximum for 30 feet maximum. Resting intervals complying with ADAAG 16.2.8 shall be provided at distances no greater than 30 feet apart.
    - Trail grade should be 12.5 percent maximum for 10 feet maximum. Resting intervals complying with ADAAG 16.2.8 shall be provided at distances no greater than 10 feet apart.

- **Resting Intervals.** Resting intervals shall be 60 inches minimum in length, shall have a width at least as wide as the widest portion of the trail segment leading to the resting interval, and have a slope not exceeding 5 percent in any direction.

- **Edge Protection.** Where edge protection is provided along a trail, the edge protection shall have a height of 3 inches minimum.

- **Signs.** Newly constructed and altered trails and trail segments complying with ADAAG 16.2 shall be designated with a wheelchair symbol at the trailhead and at all designated access points. Signs identifying accessible trail segments shall include the total distance of the accessible segment and the location of the first point of departure from the technical provisions.

# APPENDIX J
# DESIGN SPECIFICATIONS

***FIGURES***

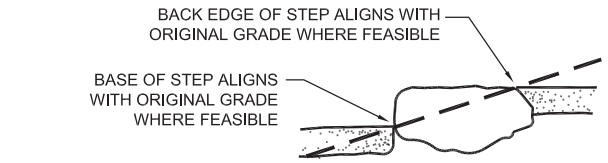
**INSTALLATION OF STONE STEPS**

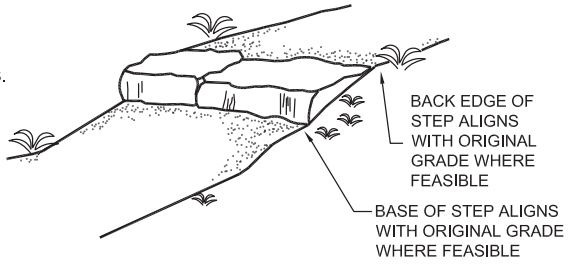
THE STONES IN STONE STEPS ARE HELD IN PLACE BY GRAVITY. TO HAVE ENOUGH WEIGHT TO BE EFFECTIVE, EACH STONE SHOULD HAVE MORE THAN ENOUGH HEIGHT TO CREATE A STEP OF THE NEEDED HEIGHT, SHOULD BE AT LEAST TWICE AS DEEP AS THE HEIGHT OF THE STEP, AND SHOULD BE FIRMLY ANCHORED IN UNDISTURBED SOIL (OR HIGHLY COMPACTED FILL). THE BEST STONES FOR STEPS HAVE A FAIRLY FLAT TOP AND A REASONABLY FLAT FACE, AND ARE HEAVY ENOUGH THAT TWO OR MORE PEOPLE ARE NEEDED TO LIFT OR MOVE THEM.

WHEN MORE THAN ONE STONE IS NEEDED TO MAKE ONE STEP, THE STONES SHOULD ABUT EACH OTHER FIRMLY SO THAT CRUSHER FINES CANNOT WASH OUT THROUGH CRACKS BETWEEN THE STONES.

**OPTIMUM PLACEMENT**

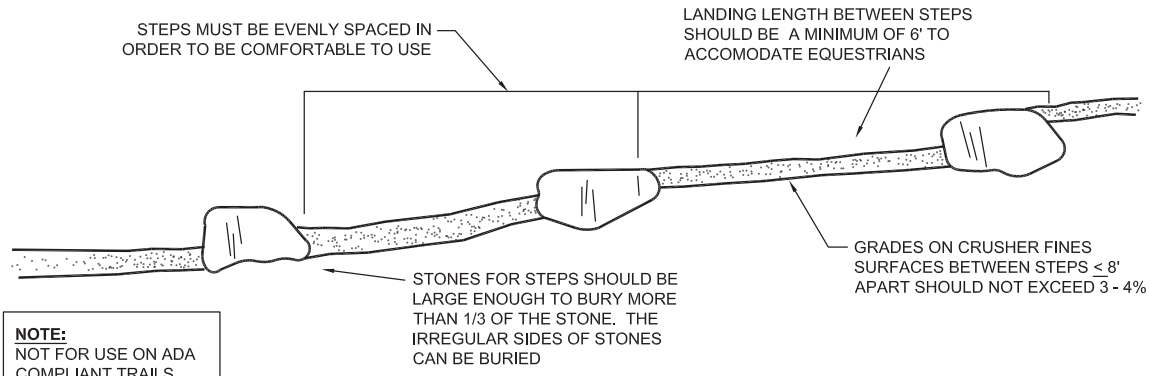
STONES ARE SET WELL INTO UNDISTURBED OR WELL COMPACTED SOIL, NO FILLS ARE NEEDED, MINIMAL EARTH MOVEMENT, GOOD DRAINAGE OFF THE SIDES OF THE STEP, LEAST AMOUNT OF WORK. THIS IS THE MOST NATURAL PLACEMENT FOR STONE STEPS.




**SPACING OF STEPS**

**N.T.S**




**NOTE:**
NOT FOR USE ON ADA COMPLIANT TRAILS.

**SOURCE:** Adapted by the Dangermond Group from Troy Scott Parker's *Natural Surface Trails by Design*.

**Figure J-1**
**Stone Steps**

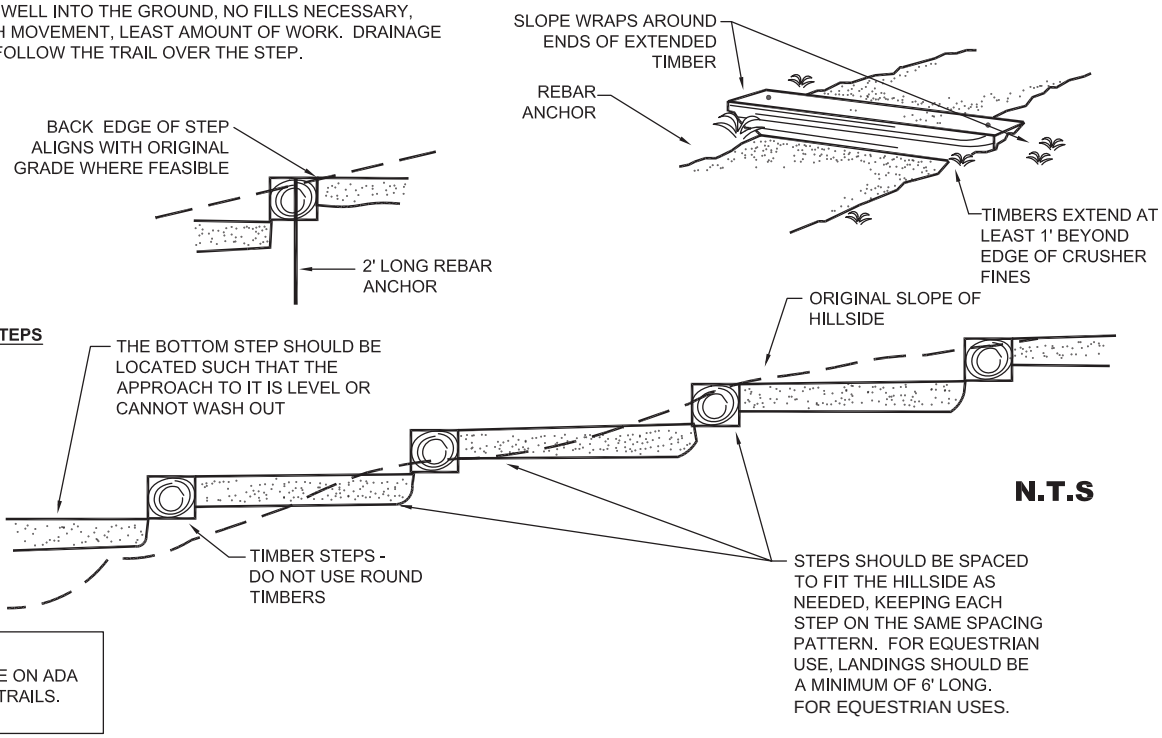
**INSTALLATION OF TIMBER STEPS**

USE PRESSURE-TREATED LANDSCAPE TIMBERS WHICH HAVE A ROUGH-SAWN FINISH. FOR AESTHETICS, AVOID PRESSURE TREATMENTS THAT PERFORATE THE WOOD WITH HUNDREDS OF SMALL SLITS. TYPICALLY, THE TIMBER USED FOR EACH STEP SHOULD BE AT LEAST 2' WIDER THAN THE TRAIL SO THAT THE TIMBER CAN FULLY RETAIN THE CRUSHER FINES ABOVE THE STEP.

SINCE TIMBER IS NOT HEAVY ENOUGH TO HOLD ITSELF IN PLACE, THEY ARE HELD IN PLACE BY 2' LONG SECTIONS OF REBAR DRIVEN STRAIGHT INTO THE GROUND, ONE AT EACH END. DRIVING THE REBAR CAN BE DIFFICULT OR IMPOSSIBLE IN ROCKY SOIL. IF THE REBAR BENDS AFTER IT IS SIGNIFICANTLY IN THE GROUND, SAW OFF THE UNDRIVEN PART RATHER THAN BEND IT OVER.

**OPTIMUM PLACEMENT**

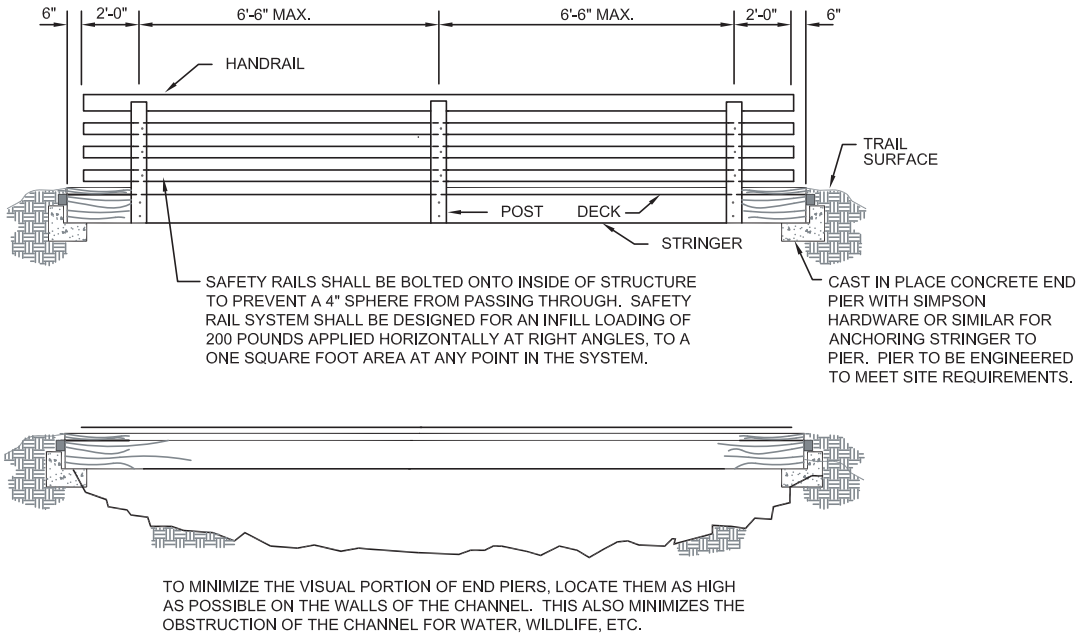
TIMBER IS SET WELL INTO THE GROUND, NO FILLS NECESSARY, MINIMAL EARTH MOVEMENT, LEAST AMOUNT OF WORK. DRAINAGE WILL MOSTLY FOLLOW THE TRAIL OVER THE STEP.




**NOTE:**
NOT FOR USE ON ADA COMPLIANT TRAILS.

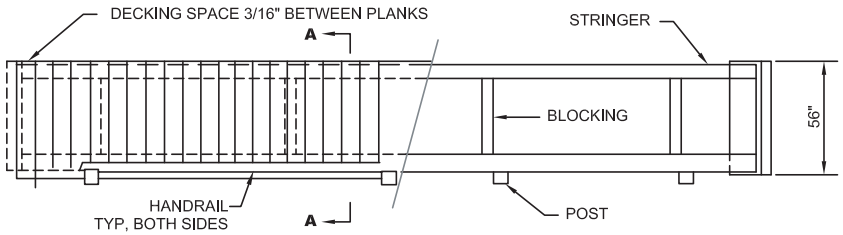
**SOURCE:** Adapted by the Dangermond Group from Troy Scott Parker's *Natural Surface Trails by Design*.

**Figure J-2**
**Timber Steps**

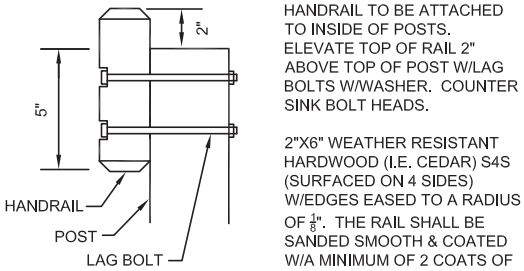



TO MINIMIZE THE VISUAL PORTION OF END PIERS, LOCATE THEM AS HIGH AS POSSIBLE ON THE WALLS OF THE CHANNEL. THIS ALSO MINIMIZES THE OBSTRUCTION OF THE CHANNEL FOR WATER, WILDLIFE, ETC.

**ELEVATIONS**



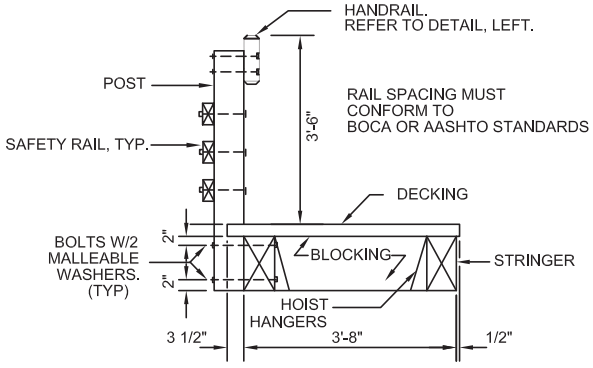

**PLAN**




HANDRAIL TO BE ATTACHED TO INSIDE OF POSTS. ELEVATE TOP OF RAIL 2" ABOVE TOP OF POST W/LAG BOLTS W/WASHER. COUNTER SINK BOLT HEADS.

2"X6" WEATHER RESISTANT HARDWOOD (I.E. CEDAR) S4S (SURFACED ON 4 SIDES) W/EDGES EASED TO A RADIUS OF $\frac{1}{8}$". THE RAIL SHALL BE SANDED SMOOTH & COATED W/A MINIMUM OF 2 COATS OF LINSEED OIL.

**HANDRAIL DETAIL**




**SECTION A-A**

NOTE: RAILS SHOULD BE SPACED TO PREVENT A 4" SPHERE FROM PASSING BETWEEN THE RAILS.

****IMPORTANT NOTE****

THIS DRAWING IS CONCEPTUAL ONLY CONSULT WITH ENGINEERS FOR SPECIFICATIONS.

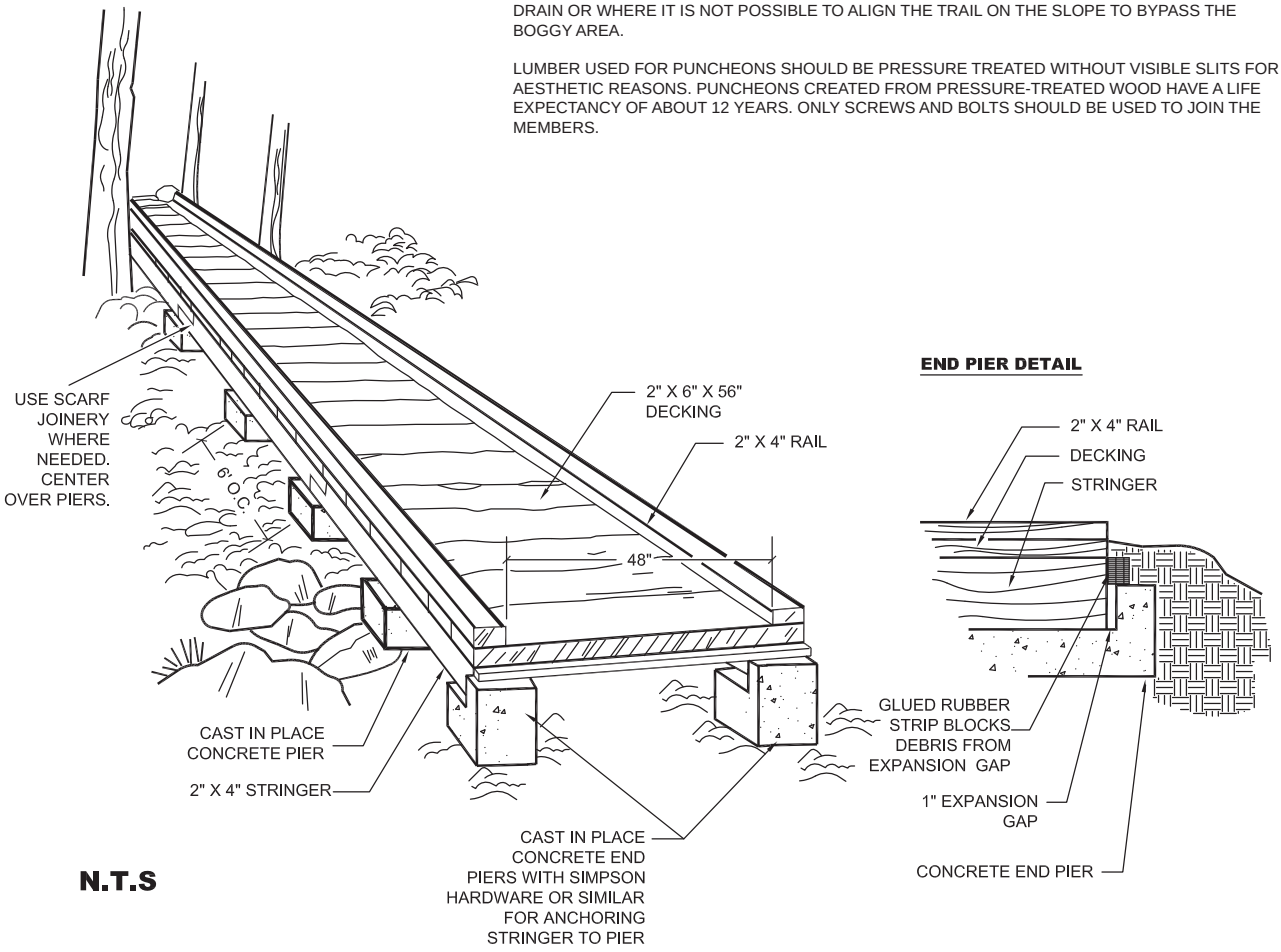
PLANS OF SUCH A DISTANCE MUST BE APPROVED BY LOS ANGELES COUNTY BUILDING AND SAFETY

**SOURCE:** Adapted by the Dangermond Group from Troy Scott Parker's *Natural Surface Trails by Design*.

**Figure J-3**
**Bridge**

A PUNCHEON IS USED TO LIFT A TRAILTREAD ABOVE WET AREAS THAT ARE NOT POSSIBLE TO DRAIN OR WHERE IT IS NOT POSSIBLE TO ALIGN THE TRAIL ON THE SLOPE TO BYPASS THE BOGGY AREA.

LUMBER USED FOR PUNCHEONS SHOULD BE PRESSURE TREATED WITHOUT VISIBLE SLITS FOR AESTHETIC REASONS. PUNCHEONS CREATED FROM PRESSURE-TREATED WOOD HAVE A LIFE EXPECTANCY OF ABOUT 12 YEARS. ONLY SCREWS AND BOLTS SHOULD BE USED TO JOIN THE MEMBERS.



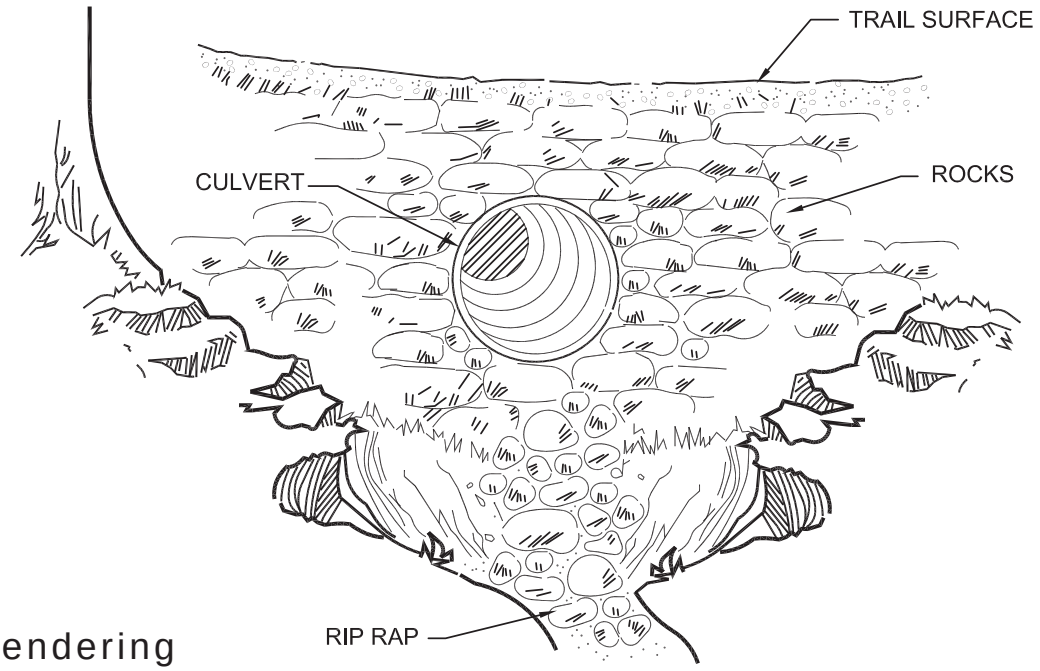

**N.T.S**

**NOTE:**
ALTERNATIVE ALIGNMENTS TO AVOID BOGGY AREAS SHOULD BE SOUGHT WHERE EVER POSSIBLE. USE OF PUNCHEON MAY REQUIRE FEDERAL OR STATE WETLAND PERMITS AND SHOULD BE USED ONLY WHERE ALTERNATIVES ARE NOT FEASIBLE.

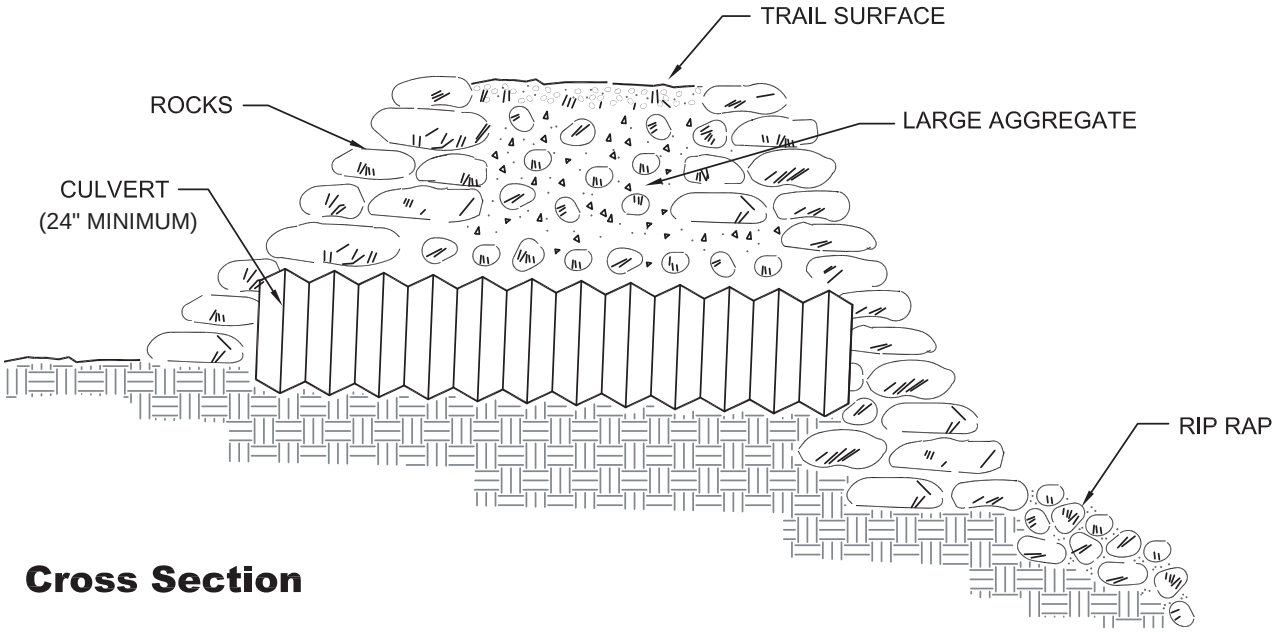
PUNCHEONS SHOULD NOT BE USED WHERE THERE IS FLOWING WATER DEEPER THAN 4" DURING WET SEASONS. PUNCHEONS SHOULD NOT EXCEED 50 FEET IN LENGTH.

HEIGHT OF DECKING SURFACE ABOVE ADJACENT SOIL/WATER SURFACE MAY REQUIRE RAILING (PER ADA)

**Figure J-4**
**Puncheon**



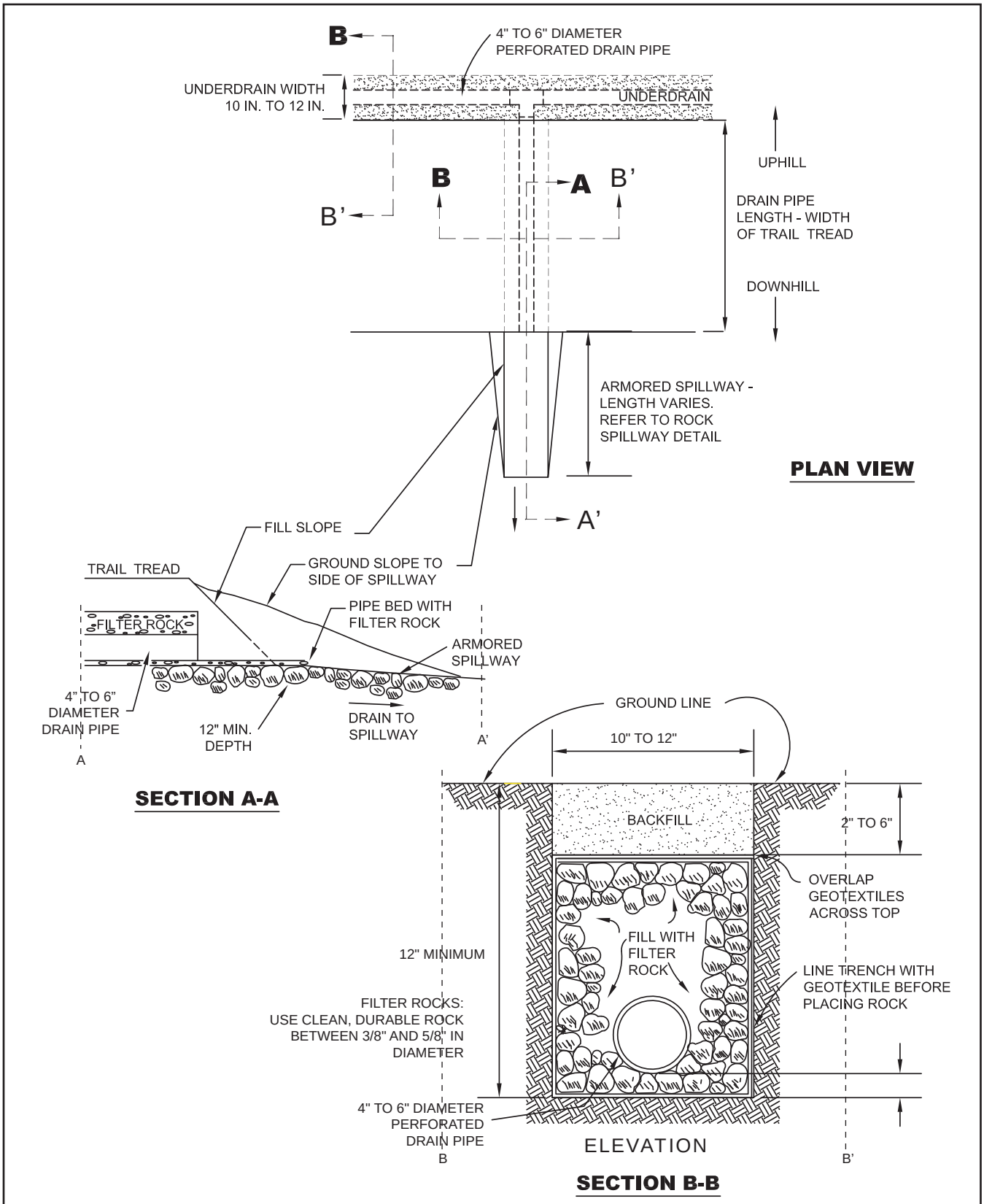

Rendering




**Cross Section**

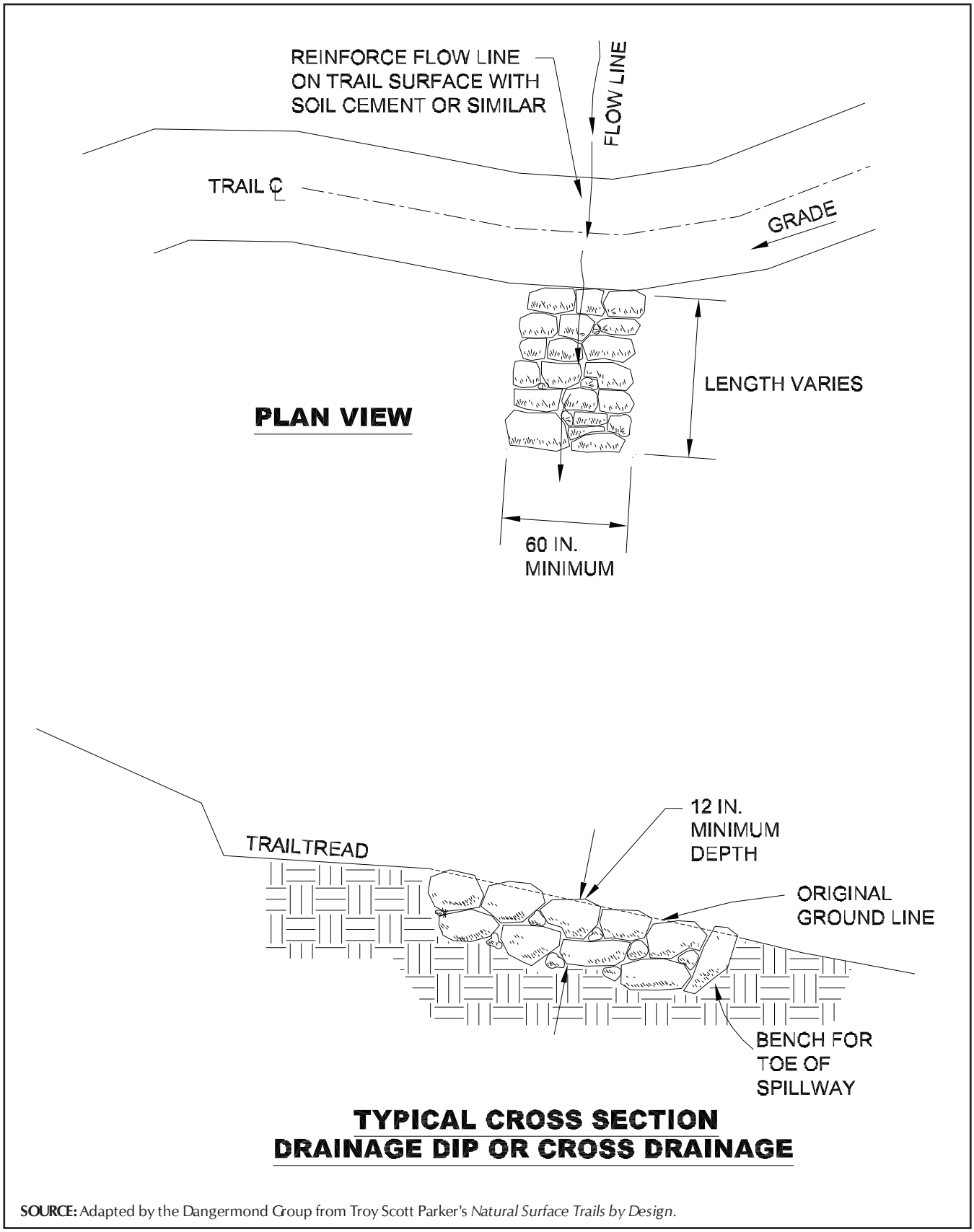
**SOURCE:** Adapted by the Dangermond Group from Troy Scott Parker's *Natural Surface Trails by Design*.

**Figure J-5**
**Metal Culvert**



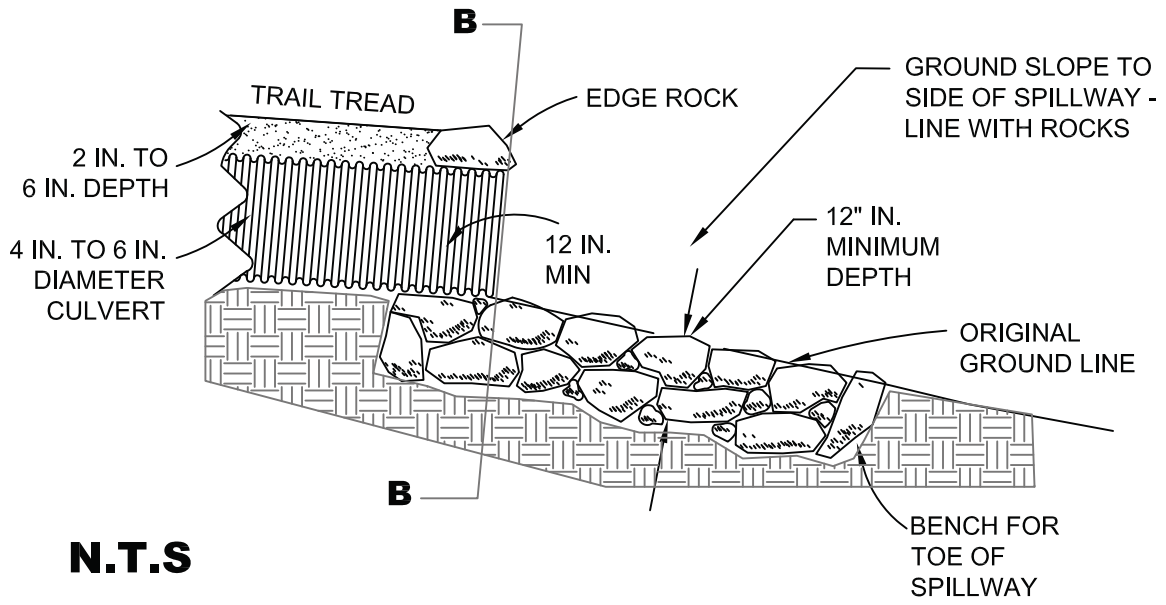

**SOURCE:** Adapted by the Dangermond Group from Troy Scott Parker's *Natural Surface Trails by Design*.

**Figure J-6**
**Underdrain**

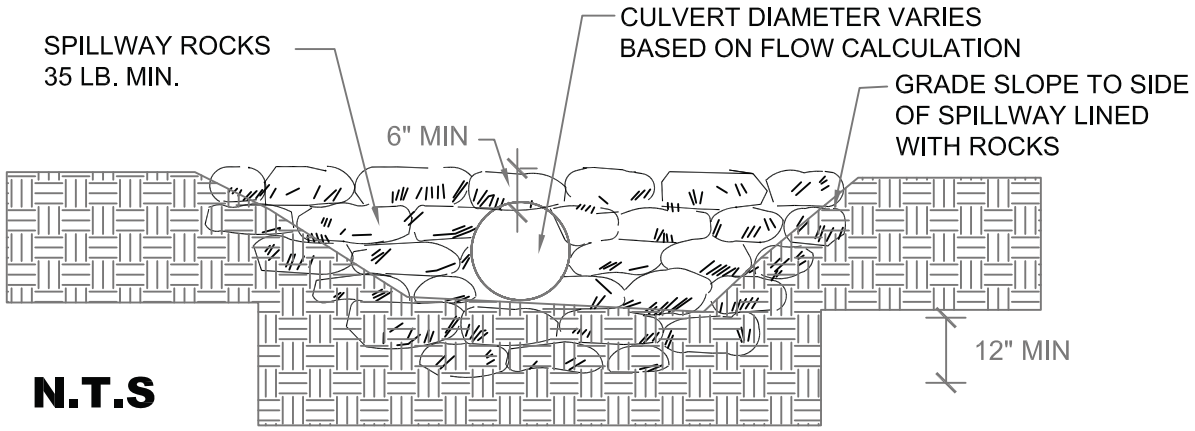



**SOURCE:** Adapted by the Dangermond Group from Troy Scott Parker's *Natural Surface Trails by Design*.

**Figure J-7**
**Rock Spillway**



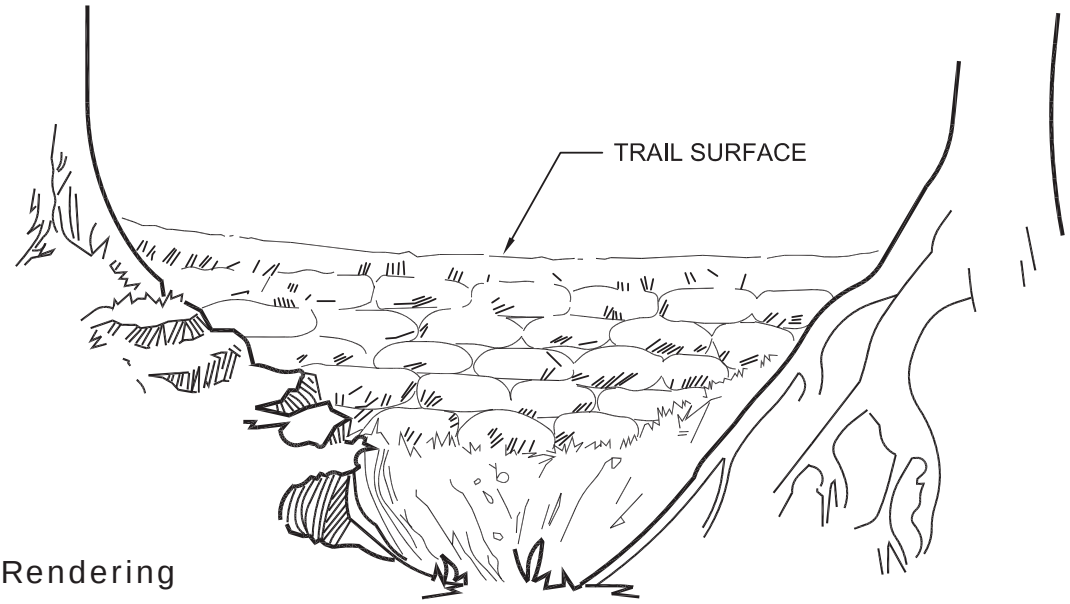

**TYPICAL CULVERT CROSS SECTION**



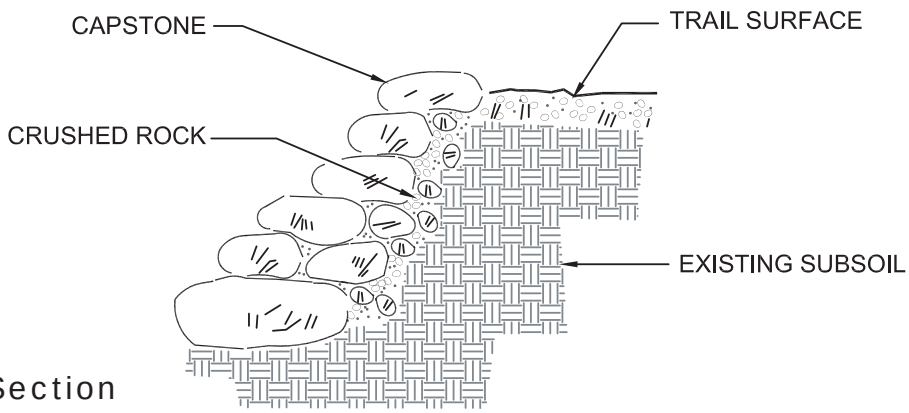

ELEVATION B-B

**SOURCE:** Adapted by the Dangermond Group from Troy Scott Parker's *Natural Surface Trails by Design*.

**Figure J-8**
**Rock Spillway with Culvert**




Rendering

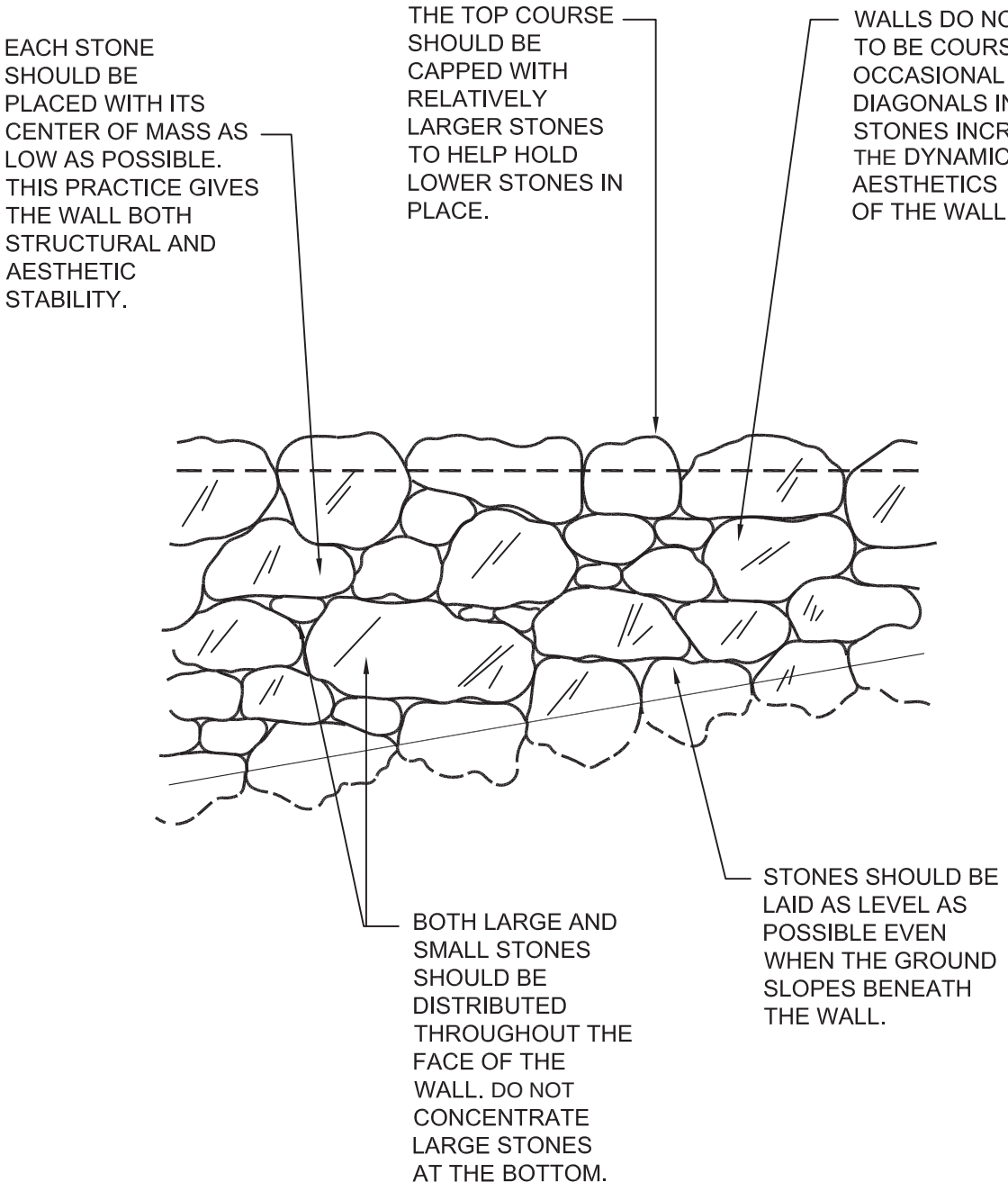



Cross Section

## KEYS TO ROCK WALL CONSTRUCTION

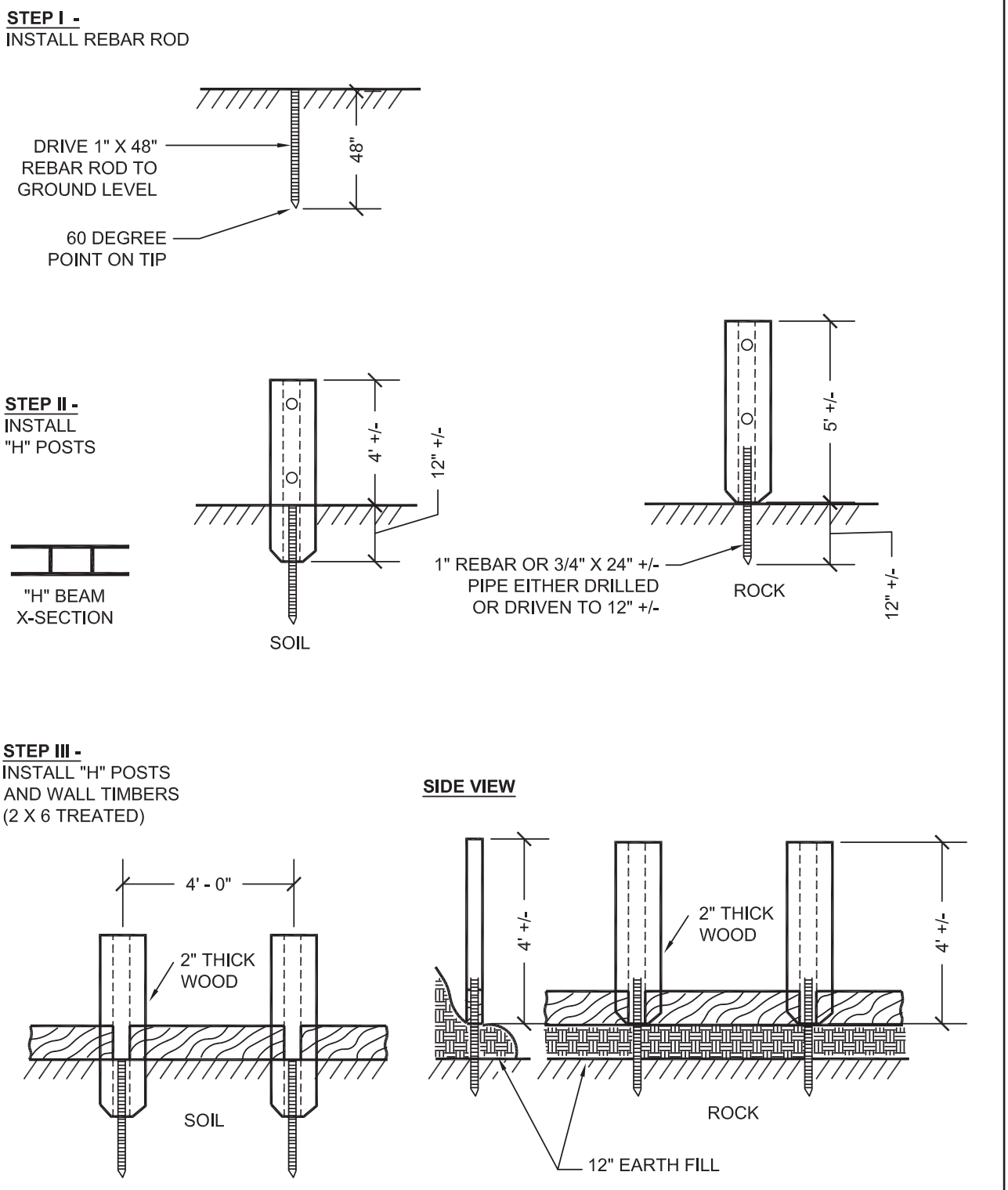
- INSLOPE THE FOUNDATION
- PLACE THE LARGEST OF ROCKS ON THE BOTTOM
- BUILD IN TIERS WHENEVER POSSIBLE
- WORK FROM THE LOW END OF THE FOUNDATION TOWARD THE HIGH END
- BUTT THE BEGINNING OF THE WALL AGAINST A BOULDER, A ROCK OUTCROPPING, OR OTHER ANCHOR
- MATCH THE FACES OF THE ROCKS
- ESTABLISH CONTACT POINTS BETWEEN EACH PAIR OF ROCKS
- PLACE WEDGES ONLY IN THE INSIDE FACE OF A WALL, NOT THE OUTSIDE FACE
- ROCKS IN EACH TIER SHOULD "BREAK THE JOINTS" BETWEEN THE ROCKS IN THE TEIR IMMEDIATELY BELOW
- USE SMALL STONES OR CRUSHED ROCK TO FILL BEHIND THE RISING WALL, AND PACK ROCK INTO ALL THE VOIDS IN THE BACK OF THE WALL
- LAY A FINAL TIER OF CAPSTONES OF A SIZE THAT WILL NOT BE EASILY DISLODGED

**Figure J-9**
**Stone Retaining Wall**




**SOURCE:** Adapted by the Dangermond Group from Troy Scott Parker's *Natural Surface Trails by Design*.

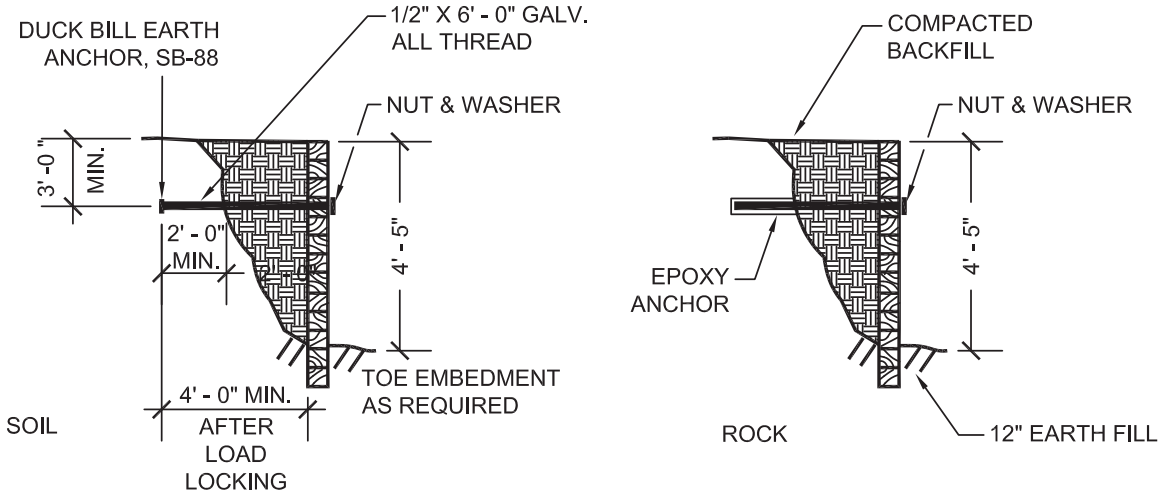
**Figure J-10**
**Stone Retaining Wall Detail**



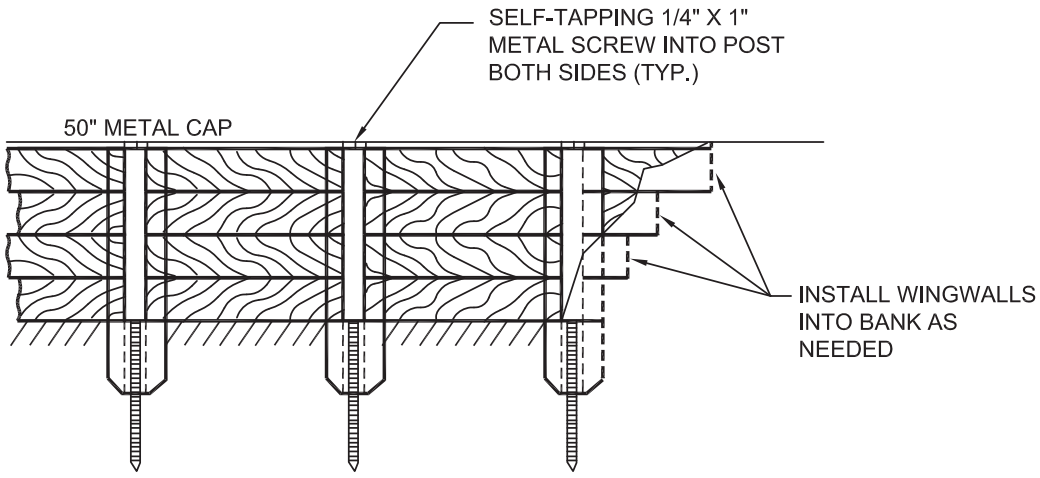

**SOURCE:** Adapted by the Dangermond Group from Troy Scott Parker's *Natural Surface Trails by Design*.

**Figure J-11**
**H-Beam Wall 1**

**STEP IV -**
INSTALL ANCHORS
AND BACKFILL




**STEP V -**
INSTALL CAPS




*HEIGHT OF RETAINING WALL SHOULD NOT EXCEED 3'-0"
WITHOUT ENGINEERING, PER BUILDING & SAFETY.

**SOURCE:** Adapted by the Dangermond Group from Troy Scott Parker's *Natural Surface Trails by Design.*

**Figure J-12**
**H-Beam Wall 2**

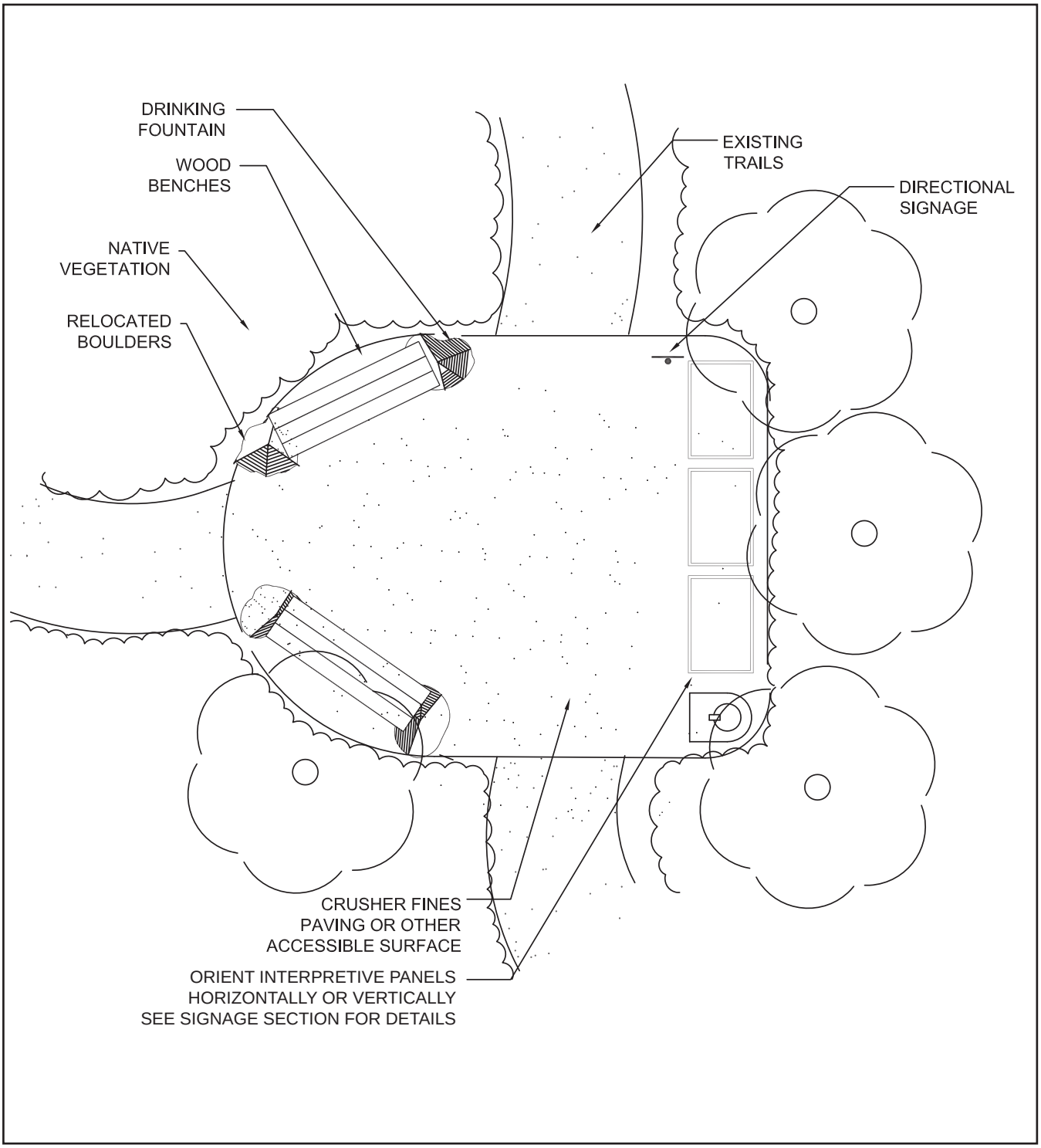
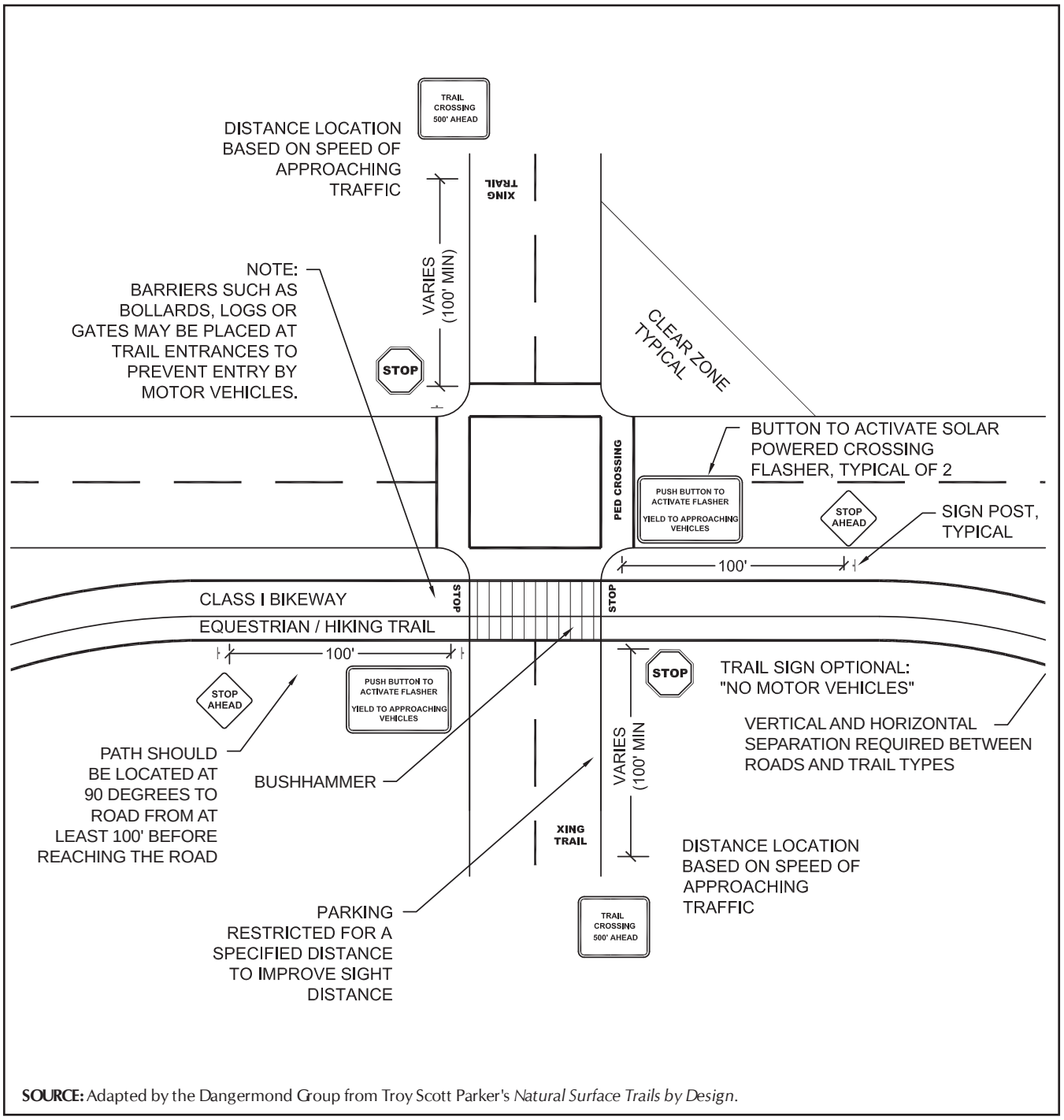
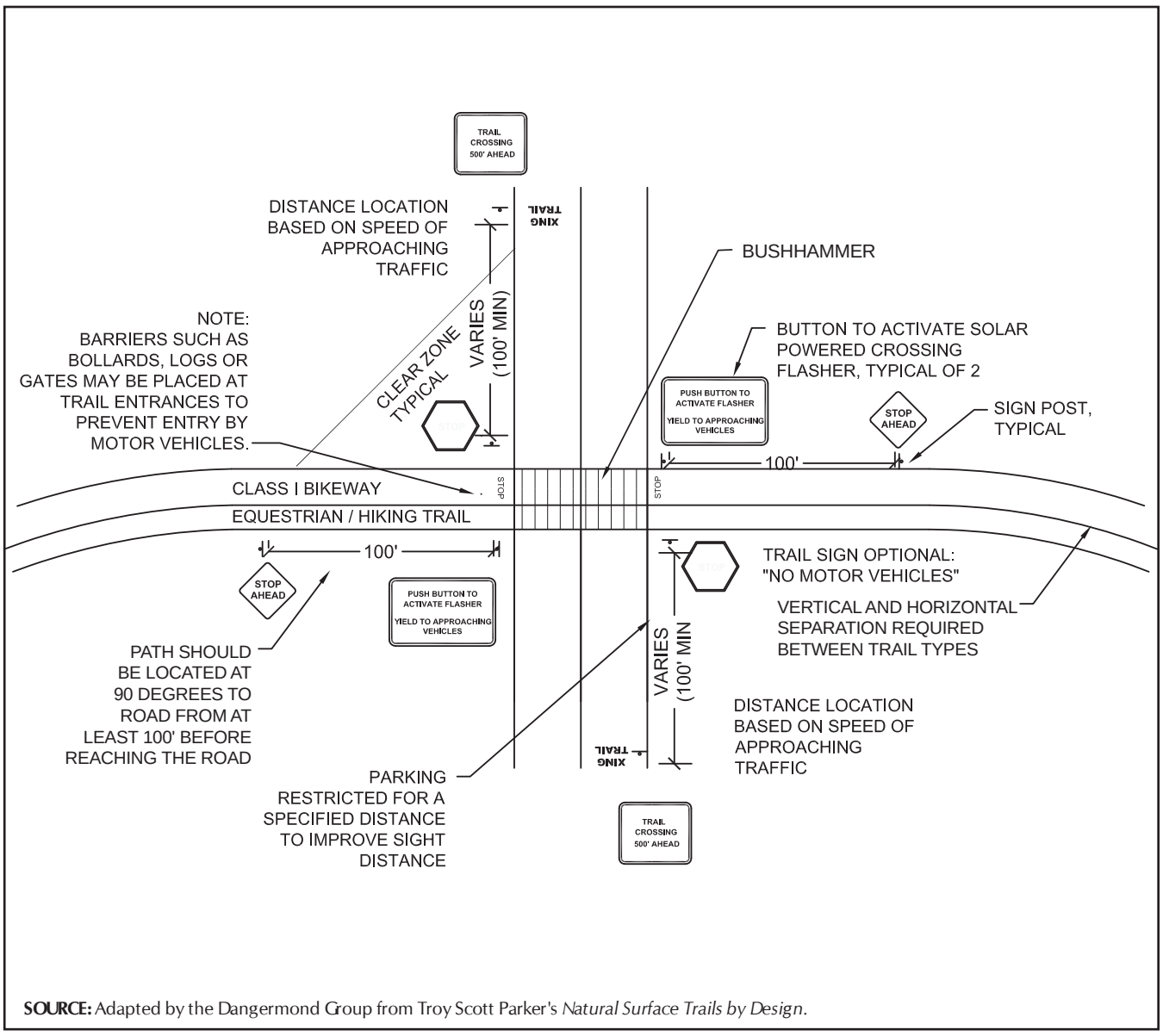



**Figure J-13**
**Trailhead Design**




**SOURCE:** Adapted by the Dangermond Group from Troy Scott Parker's *Natural Surface Trails by Design*.

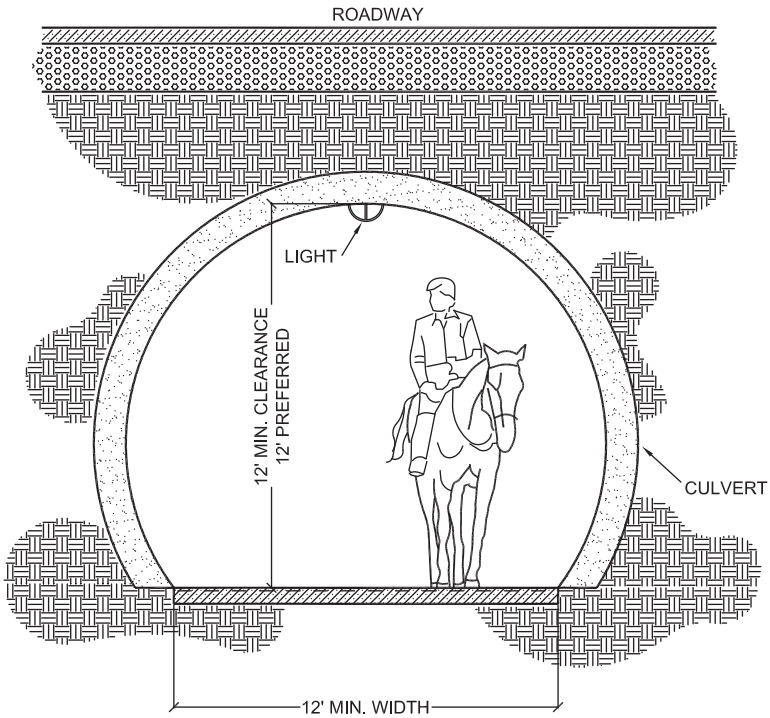
**Figure J-14**
**Trail Crossing at Intersection**



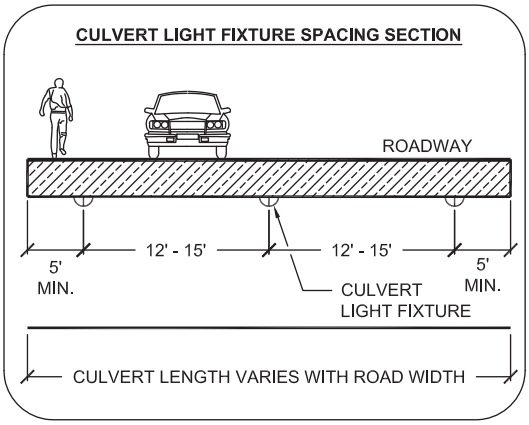

**SOURCE:** Adapted by the Dangermond Group from Troy Scott Parker's *Natural Surface Trails by Design*.

**Figure J-15**
**Trail Crossing at Midblock**

CULVERT UNDERCROSSINGS CAN BE USED WHERE AT-GRADE CROSSINGS ARE NOT SAFE AND WHERE OVERPASSES ARE NOT PRACTICAL.



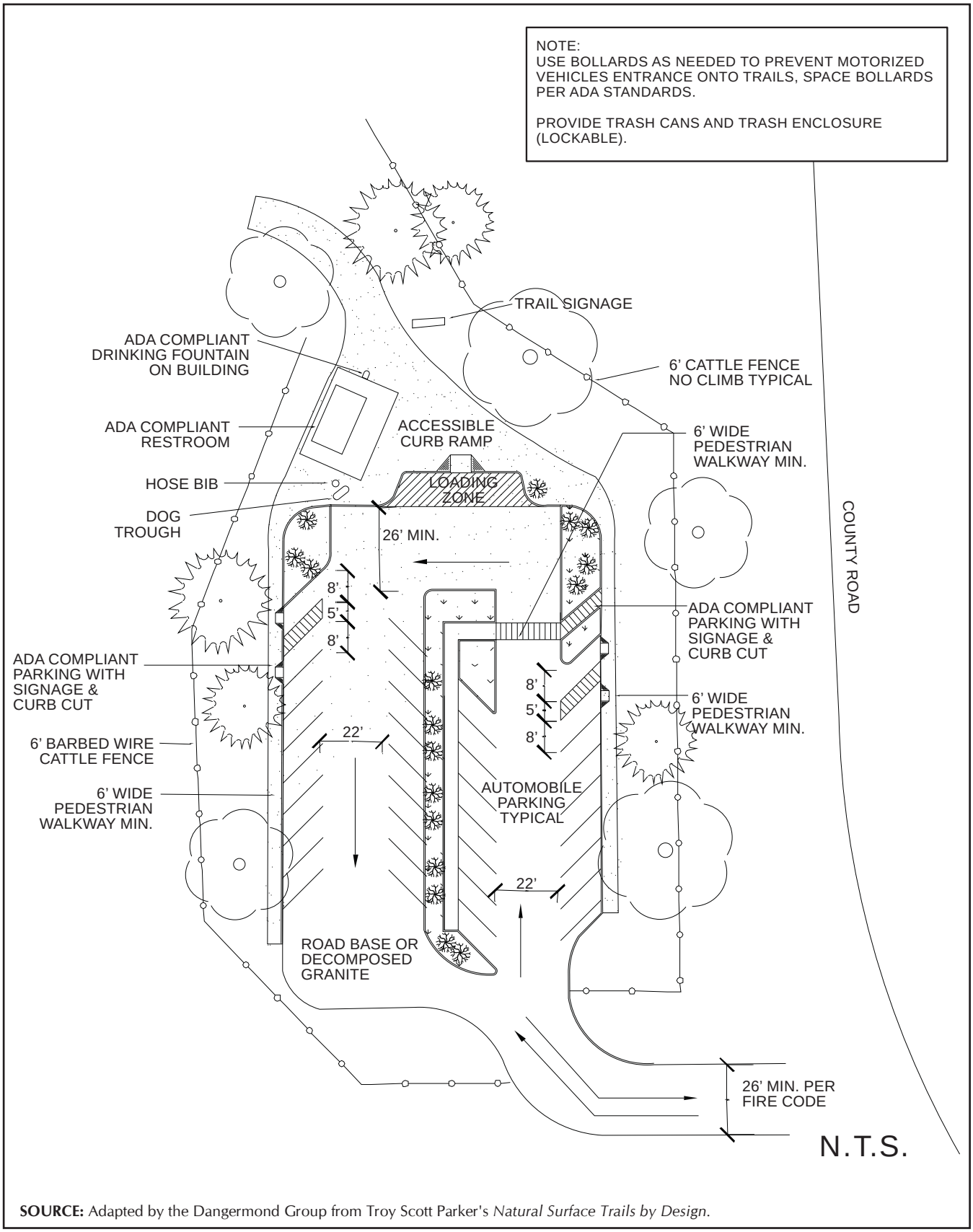

CULVERT UNDERCROSSINGS SHOULD BE LIT AT 12 TO 15 FOOT EVENLY SPACED INTERVALS WITH VANDAL-RESISTANT CAGED LIGHTS, WITH THE FIRST LIGHT SET BACK A MININUM OF 5 FEET FROM CULVERT ENTRANCES. LIGHTS SHOULD BE INSTALLED IN TOP CENTER OF CULVERT. SOLAR POWERED LIGHTS SHOULD BE USED WHERE ELECTRICITY IS NOT PRACTICAL.




**N.T.S**

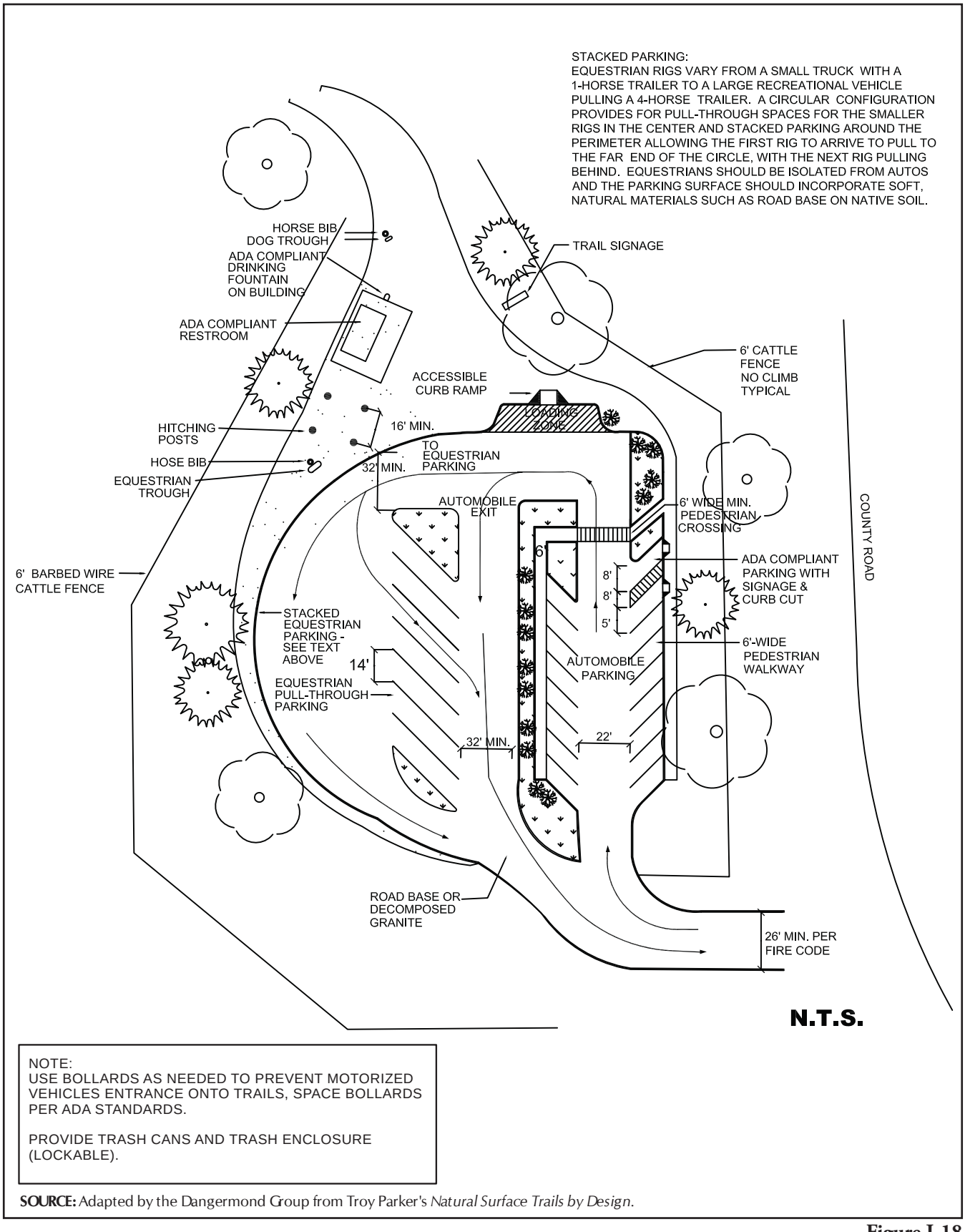
**SOURCE:** Adapted by the Dangermond Group from Troy Scott Parker's *Natural Surface Trails by Design*.

**Figure J-16**
**Culvert Undercrossing**




**SOURCE:** Adapted by the Dangermond Group from Troy Scott Parker's *Natural Surface Trails by Design*.

**Figure J-17**
**Automobile Parking**




**SOURCE:** Adapted by the Dangermond Group from Troy Parker's *Natural Surface Trails by Design*.

**Figure J-18**
**Automobile and Equestrian Parking**

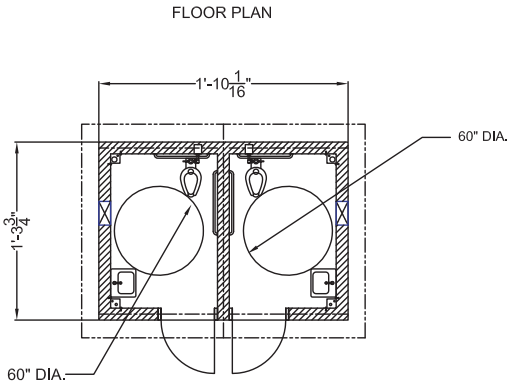
A PLUMBED RESTROOM MAY ONLY BE CONSTRUCTED WHERE WATER AND SEWER CONNECTIONS ARE AVAILABLE AND WHERE WEEKLY MAINTENANCE IS AVAILABLE.

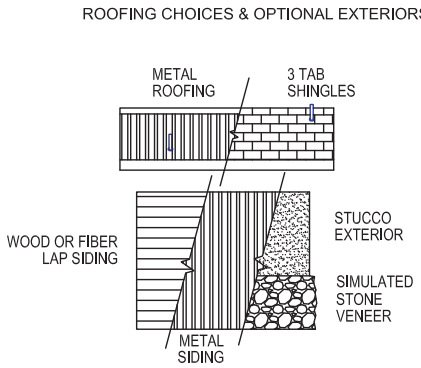
RESTROOMS SHOULD BE SITED WITH ACCESS FROM TRAIL AND PARKING AREAS AT 5% MAXIMUM GRADE.

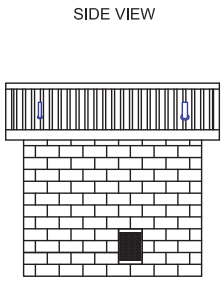
THE DIMENSIONS AND LAYOUT ARE TYPICAL AND ADA COMPLIANT.

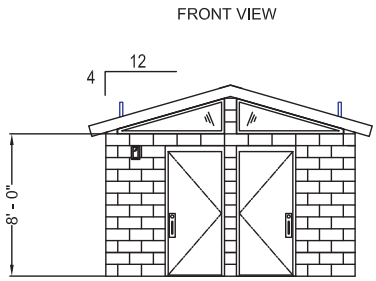
COURTESY OF ROMTEC. WWW.ROMTEC.COM

NOTE: CONSULT WITH LICENSED DESIGN PROFESSIONAL AND OBTAIN PLAN APPROVAL FROM LOS ANGELES COUNTY BUILDING AND SAFETY DEPARTMENT



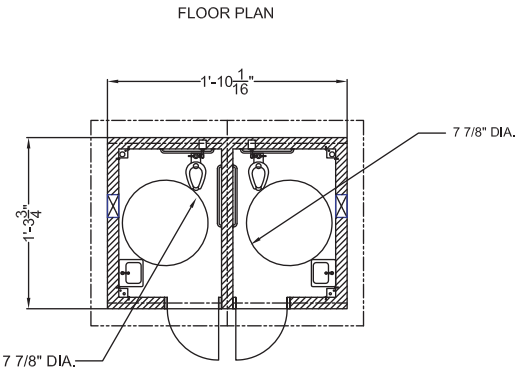

**SOURCE:** Courtesy of Romtec. www.romtec.com

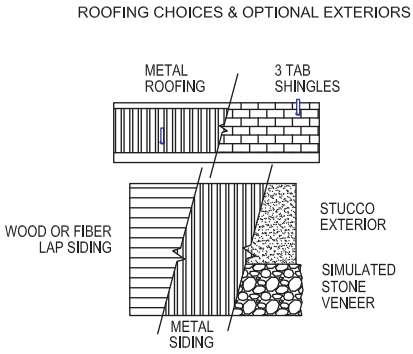
**Figure J-19**
**Restroom with Hook-ups**

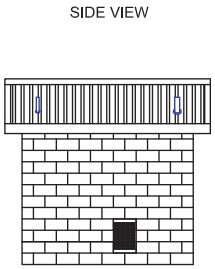
A PLUMBED RESTROOM IS RECOMMENDED WHERE WATER AND SEWER CONNECTIONS ARE AVAILABLE AND WHERE WEEKLY MAINTENANCE IS AVAILABLE.

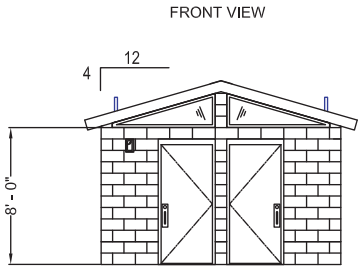
RESTROOMS SHOULD BE CONSTRUCTED WITH ACCESS FROM TRAIL AND PARKING AREAS AT 5% MAXIMUM GRADE.

THE DIMENSIONS AND LAYOUT ARE TYPICAL AND AMERICANS WITH DISABILITIES ACT (ADA) COMPLIANT.




**SOURCE:** Courtesy of Romtec. www.romtec.com

**Figure J-20**
**Composting Restroom**

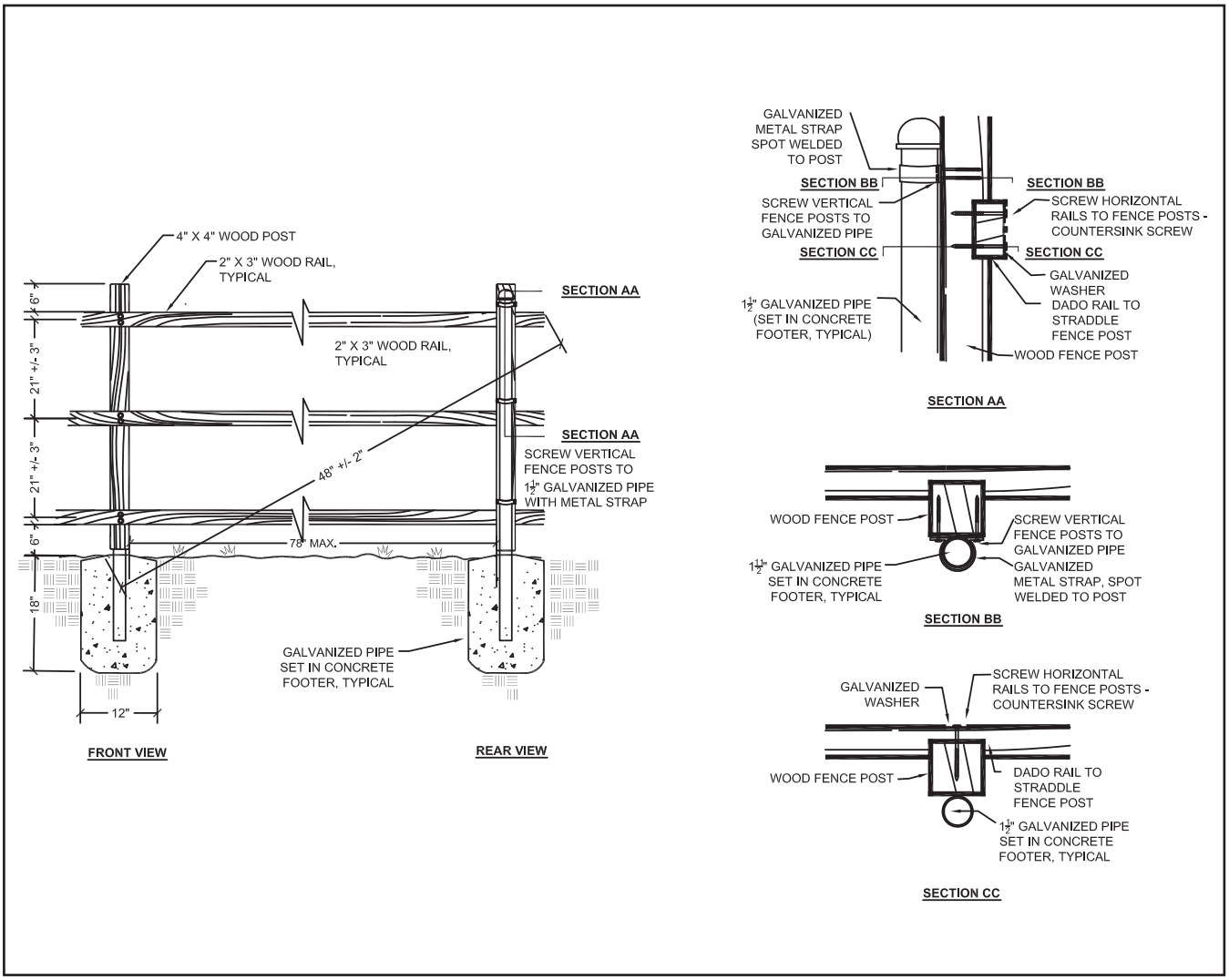
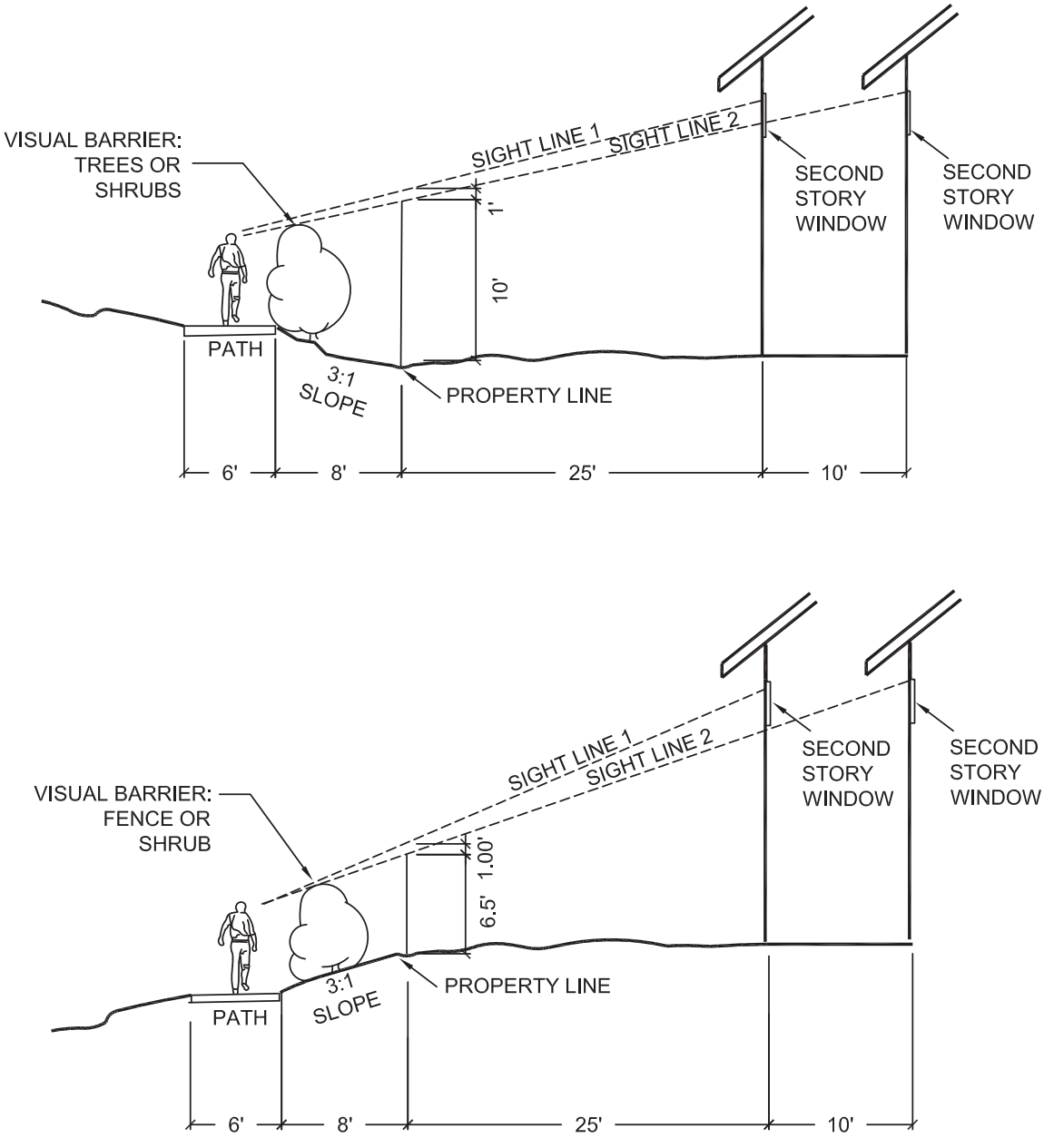



**Figure J-21**
**Typical Trail Fencing**

A FENCE OR SHRUB BARRIER ADJACENT TO THE TRAIL SHOULD BE USED TO SCREEN HOMES AND YARDS FROM TRAIL-USER VIEW. BARRIERS LOCATED FURTHER FROM THE TRAIL NEED TO BE CORRESPONDINGLY HIGHER TO EFFECTIVELY SCREEN UNDESIRABLE VIEWS.

THE HEIGHT OF THE BARRIER SHOULD BE CALCULATED BASED ON THE SITE CONDITIONS, INCLUDING VARIABLES SUCH AS THE HEIGHT OF WINDOWS, THE DEPTH OF THE BACKYARD, AND THE SIDESLOPE.




**N.T.S**

THESE EXAMPLES ARE TYPICAL CONDITIONS AND ARE TO BE USED AS EXAMPLES ONLY.

**SOURCE:** The Dangermond Group from Troy Scott Parker's *Natural Surface Trails by Design*.

**Figure J-22**
**Trail Residential Sightlines**

**BI-LEVEL TWIN RECEPTOR STEEL DRINKING FOUNTAIN**

FOUNTAIN WILL COMPLY WITH AMERICAN WITH DISABILITIES ACT REQUIREMENTS.

THE TYPICAL FOUNTAIN WILL HAVE A POWDER-COAT FINISH WITH IMMERSION COATING INSIDE AND OUTSIDE THE FOUNTAIN. THE FOUNTAIN WILL ALSO HAVE VANDAL-RESISTANT PUSH BUTTON, CORROSION REISTANT SELF-CLOSING AUTOMATIC STREAM HEIGHT REGULATOR, ONE-PIECE VANDAL-RESISTANT BUBBLER WITH HOOD GUARD AND INLET STRAINER.

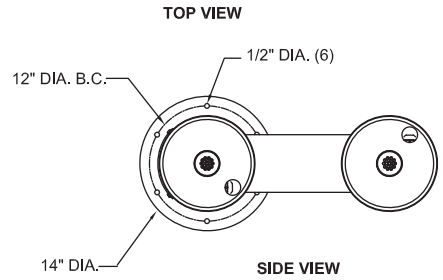
**NOTES;**

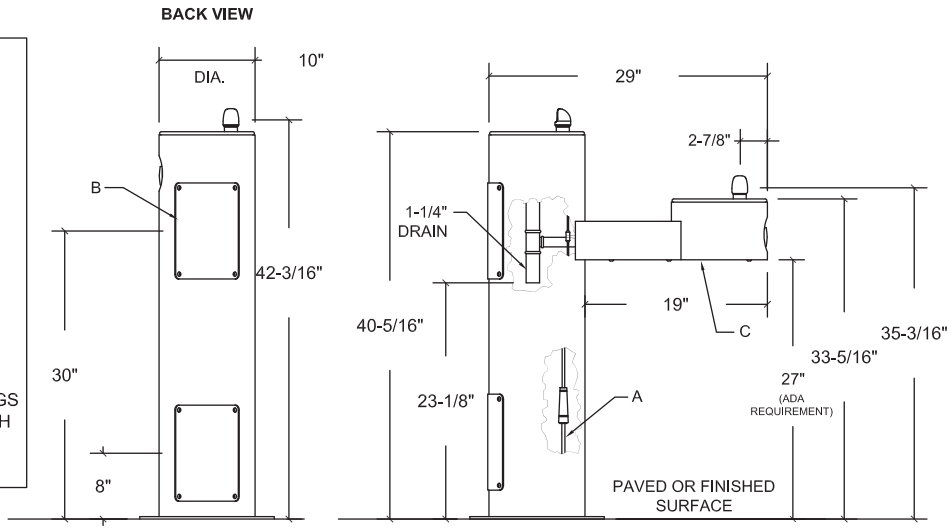
PEDESTAL DRINKING FOUNTAIN SHALL ONLY BE USED WHEN NO RESTROOM BUILDING IS CONSTRUCTED.

APPROPRIATE SYSTEM SHOUD BE DESIGNED TO HANDLE EXCESS WATER (SEWER, SEPTIC SYSTEM, SUMP, ETC.)

IF POTABLE WATER IS NOT AVAILABLE, CONSIDER DESIGNING CISTERN OR TANK, AND CONNECTING TO DRINKING FOUNTAIN.

PLEASE USE MANUFACTURER'S SPECIFICATIONS TO DEVELOP FOOTINGS AND CONNECTIONS THAT COMPLY WITH THE LOS ANGELES COUNTY BUILDING CODE.



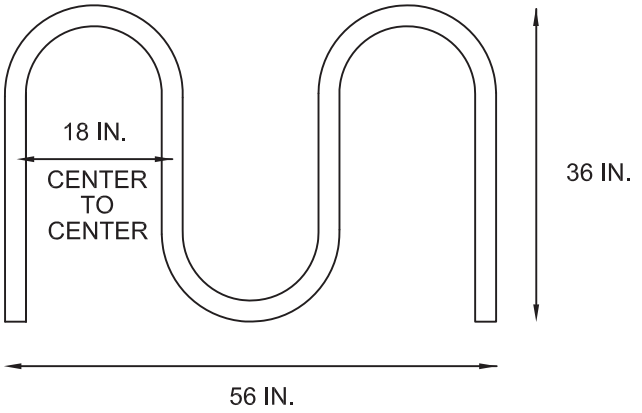



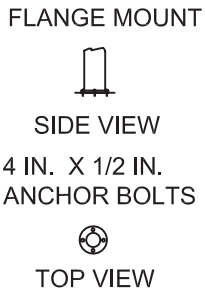

LEGEND

A = 3/8" O.D. UNPLATED COPPER TUBE CONNECT - SHUT OFF VALVE BY OTHERS
B = ACCESS PANEL (8" X 10")
C = REMOVABLE BOTTOM COVER

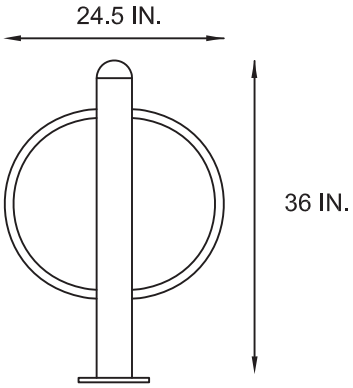
**Figure J-23**
**Drinking Fountain**

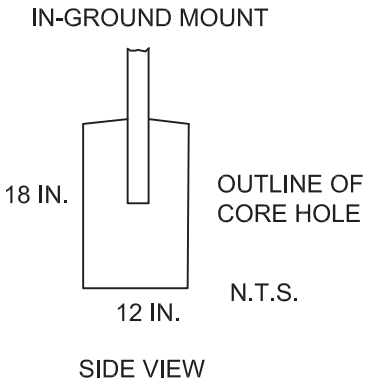
**WAVE STYLE BICYCLE RACK**




**FULL CIRCLE BICYCLE RACK**




**N.T.S**

BICYCLE RACKS TO BE CONSTRUCTED OF CARBON OR STAINLESS STEEL PIPE. HOT-DIPPED GALVANIZED FINISH OR STAINLESS STEEL FINISH TYPICAL. POWDER COAT COLORS PER PROJECT STANDARDS.

WAVE RACK TO BE CONSTRUCTED OF 2-3/8 IN. OD, SCHEDULE 40 PIPE MINIMUM.

CIRCULAR RACK TO BE CONSTRUCTED OF 4 1/2 IN. OD SCHEDULE 40 PIPE FOR THE MAIN POST WITH 1 IN. OD STEEL BAR WELDED TO THE MAIN POST MINIMUM.

RACKS CAN BE MOUNTED EITHER BY EMBEDDING INTO CONCRETE OR SURFACE MOUNTED USING SURFACE FLANGED PIPE.

**SOURCE:** The Dangermond Group from Troy Scott Parker's *Natural Surface Trails by Design*.

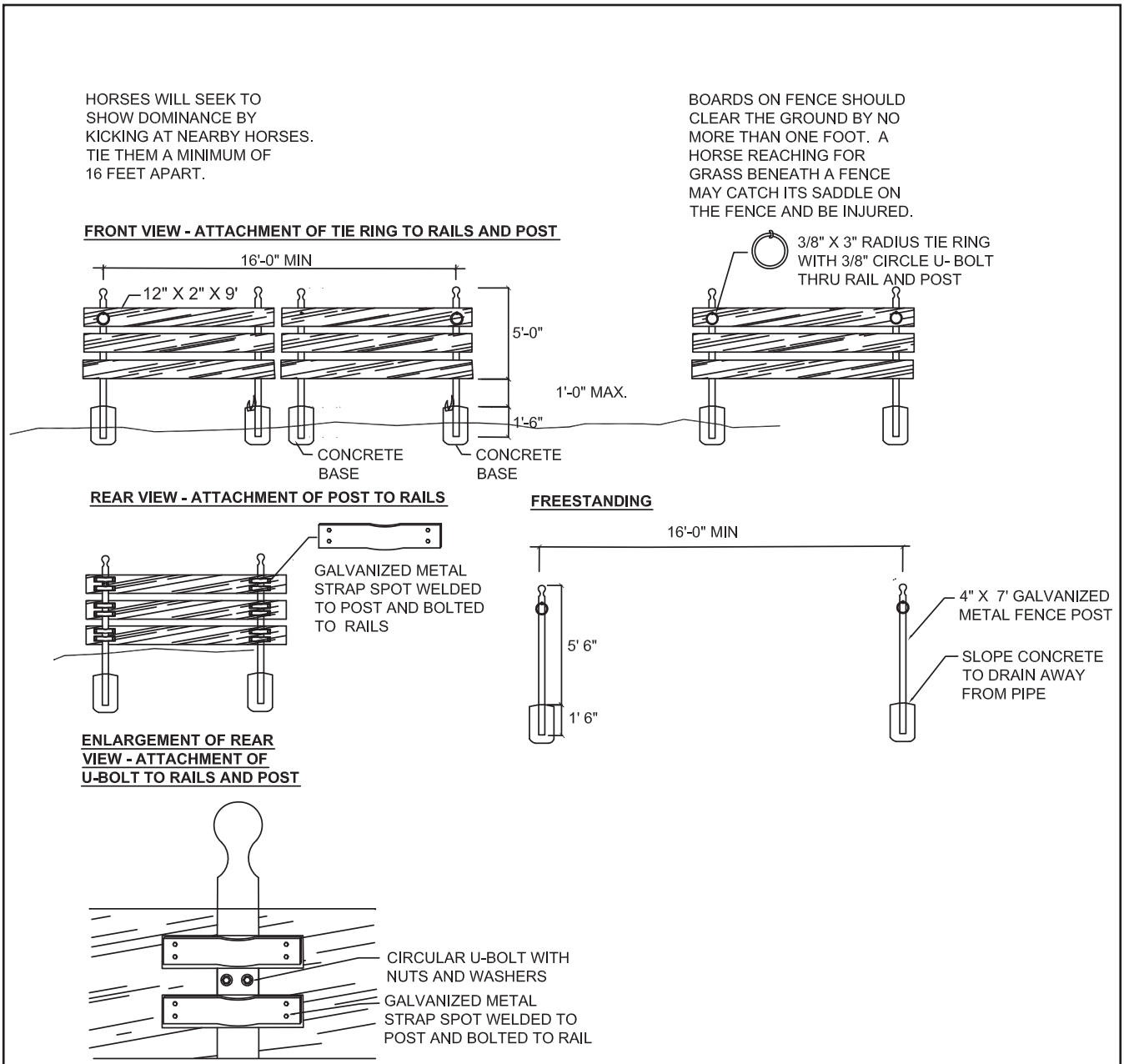
**Figure J-24**
**Bicycle Rack**

RECOMMENDED PUSH
PADDLE WATERER

PROVIDE PROPER DRAINAGE
CONNECTION TO NEARBY
LANDSCAPE OR USE GRAVEL
CHIMNEY

MOUNT APPROXIMATELY 18 IN. ABOVE GROUND

**Figure J-25**
**Horse Trough**




**SOURCE:** The Dangermond Group from Troy Scott Parker's *Natural Surface Trails by Design*.

**Figure J-26**
**Horse Tie Ups**

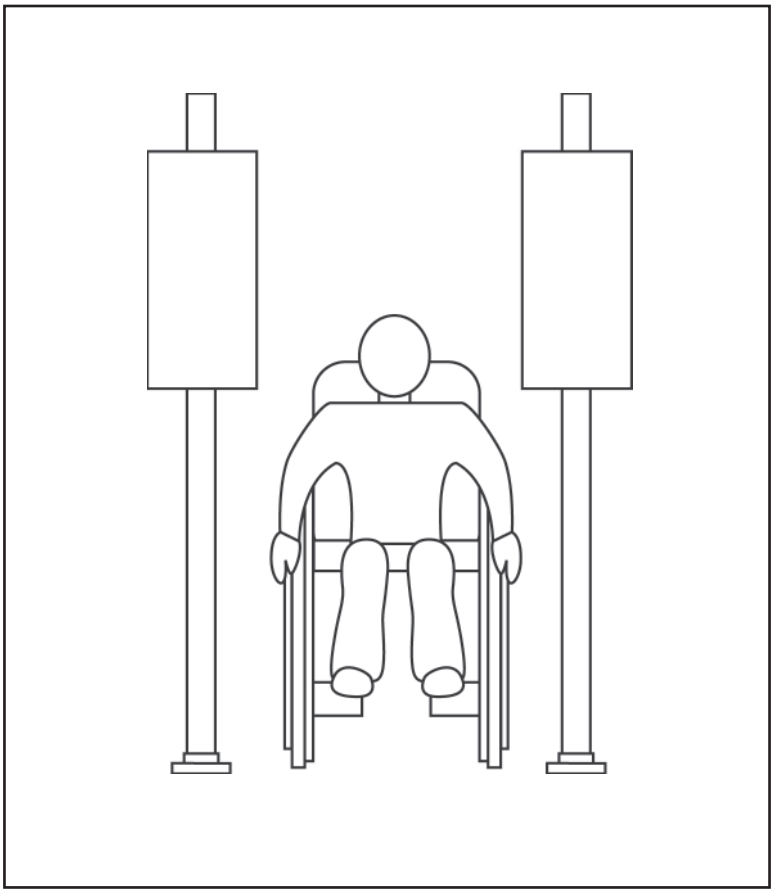


**Figure J-27**
**Inverted Bollard Wheelchair Accessability Drawing**

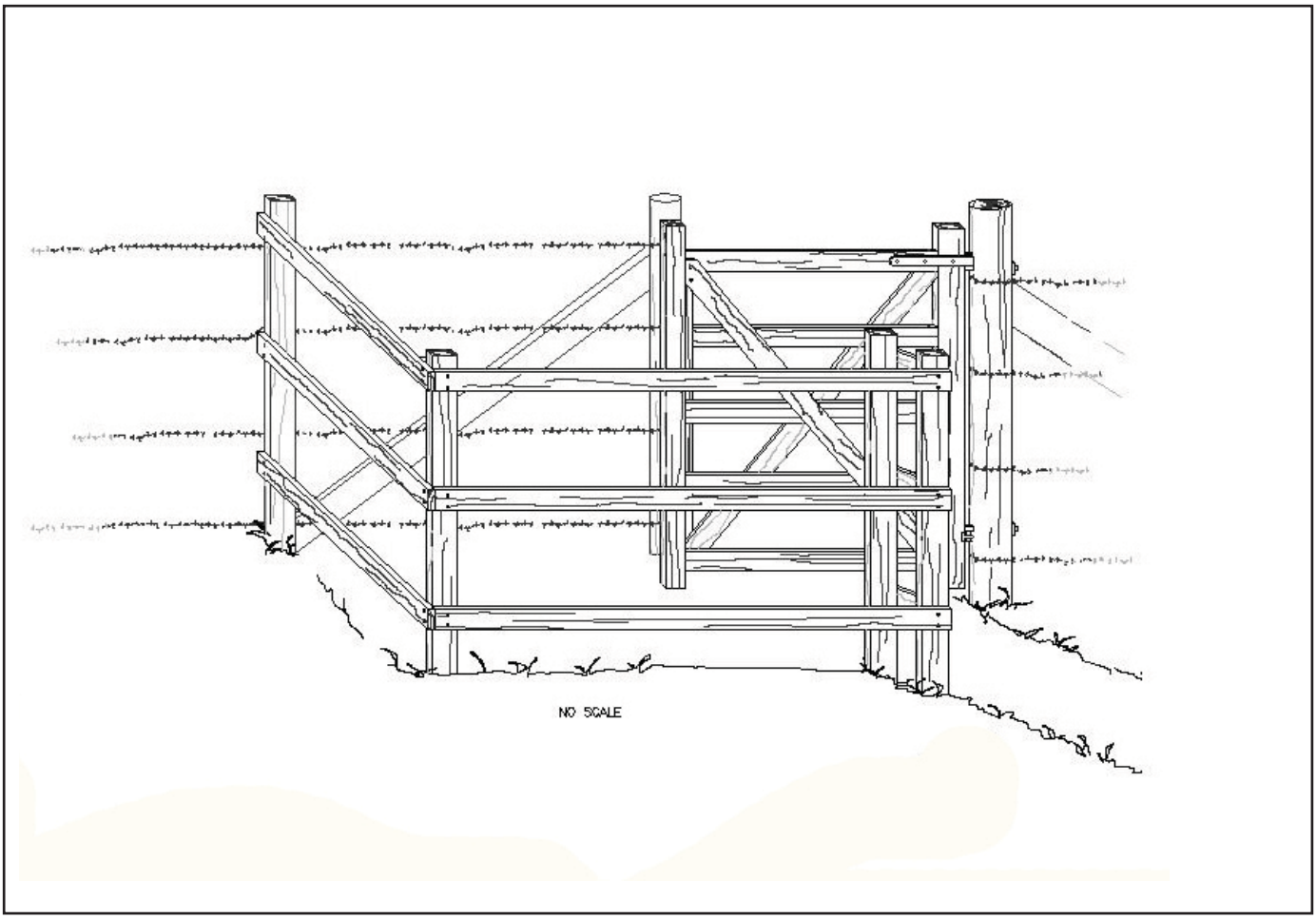



**Figure J-28**
**Timber Kissing Gate with Wheelchair Accessibility**

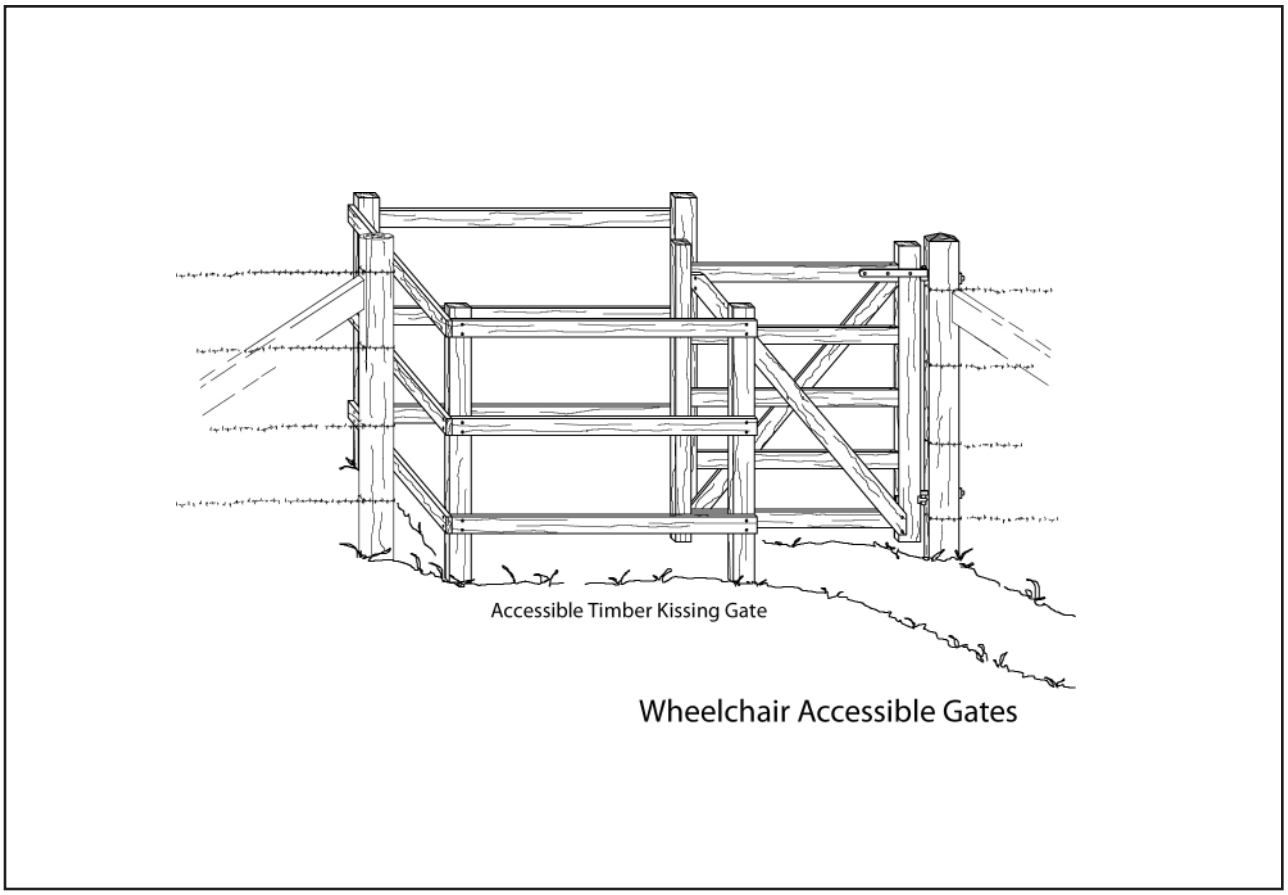



**Figure J-29**
**Chicane for Wheelchair Accessibility**

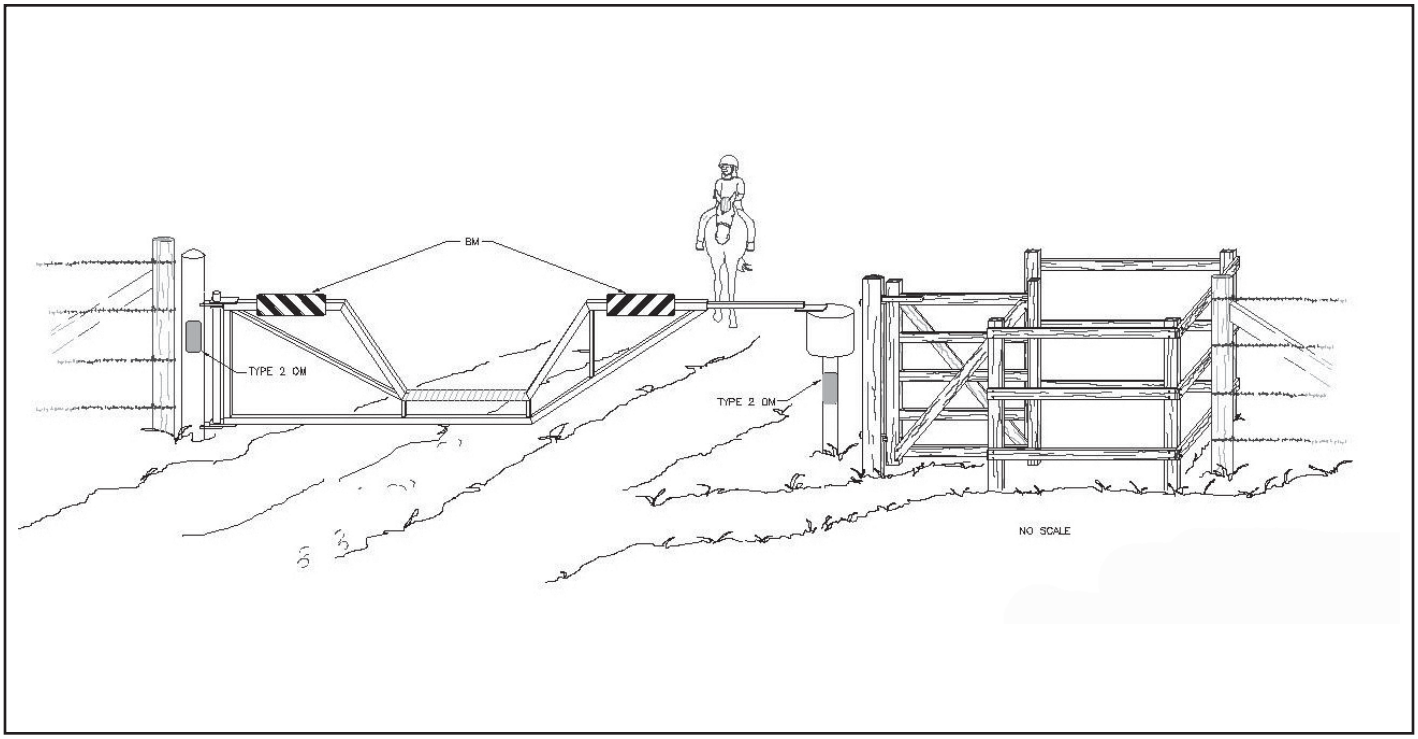



**Figure J-30**
**Horse Friendly Forest Road Closure Gate with Horse and Wheelchair Accessibility**

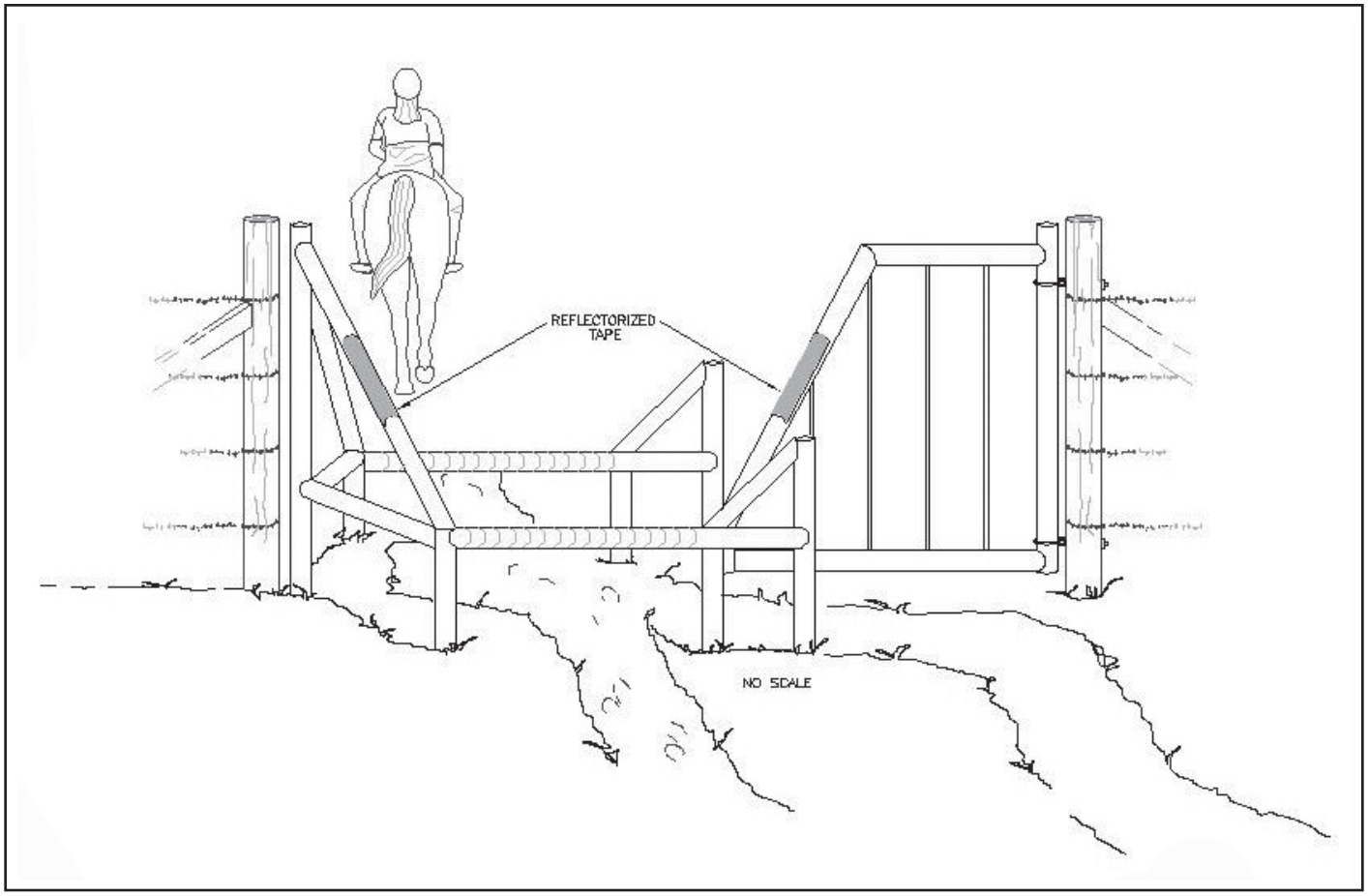



**Figure J-31**
**Horse Gate with Wheelchair Accessibility**

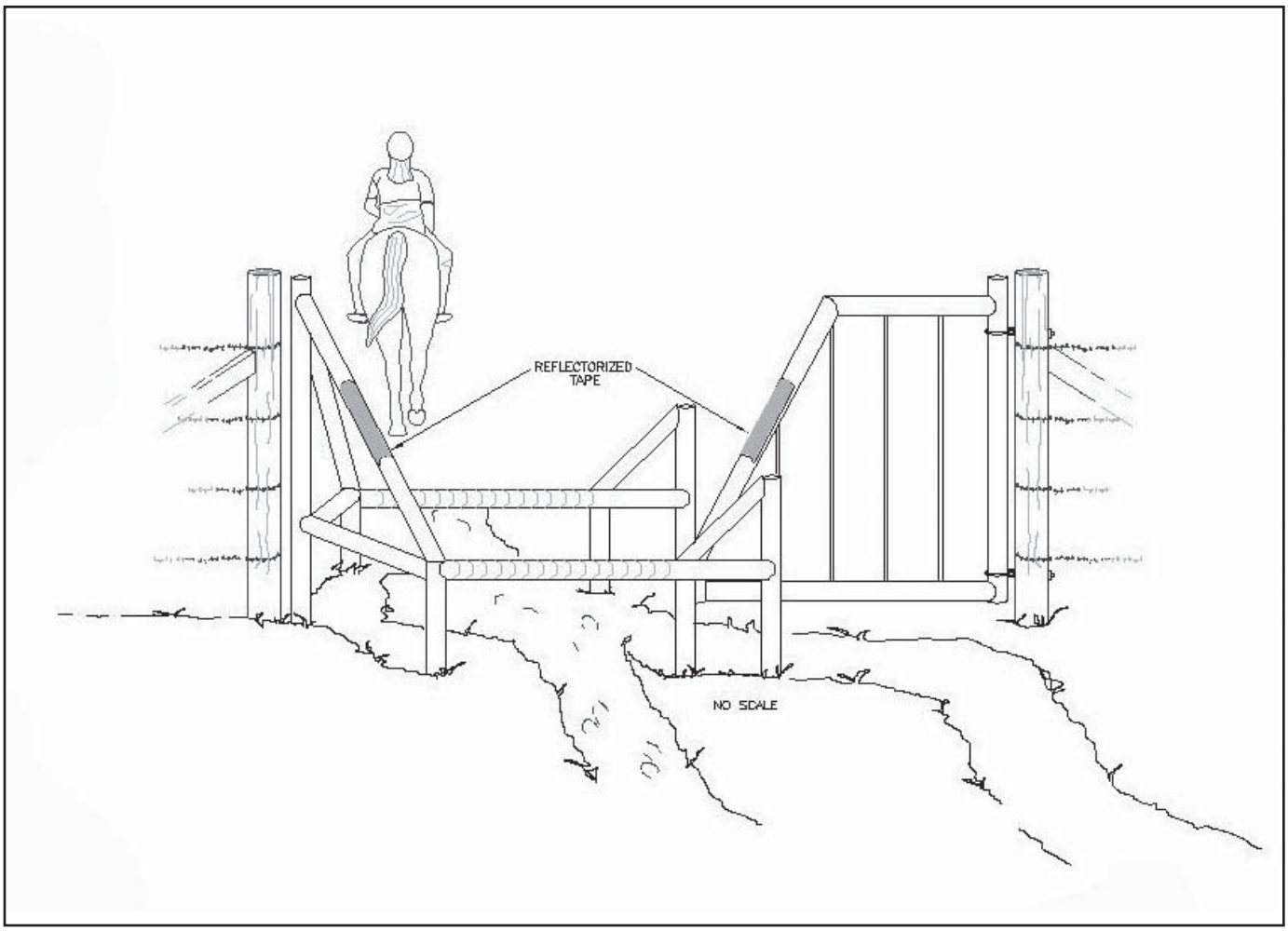



**Figure J-32**
**Horse Gate with Wheelchair Accessibility**

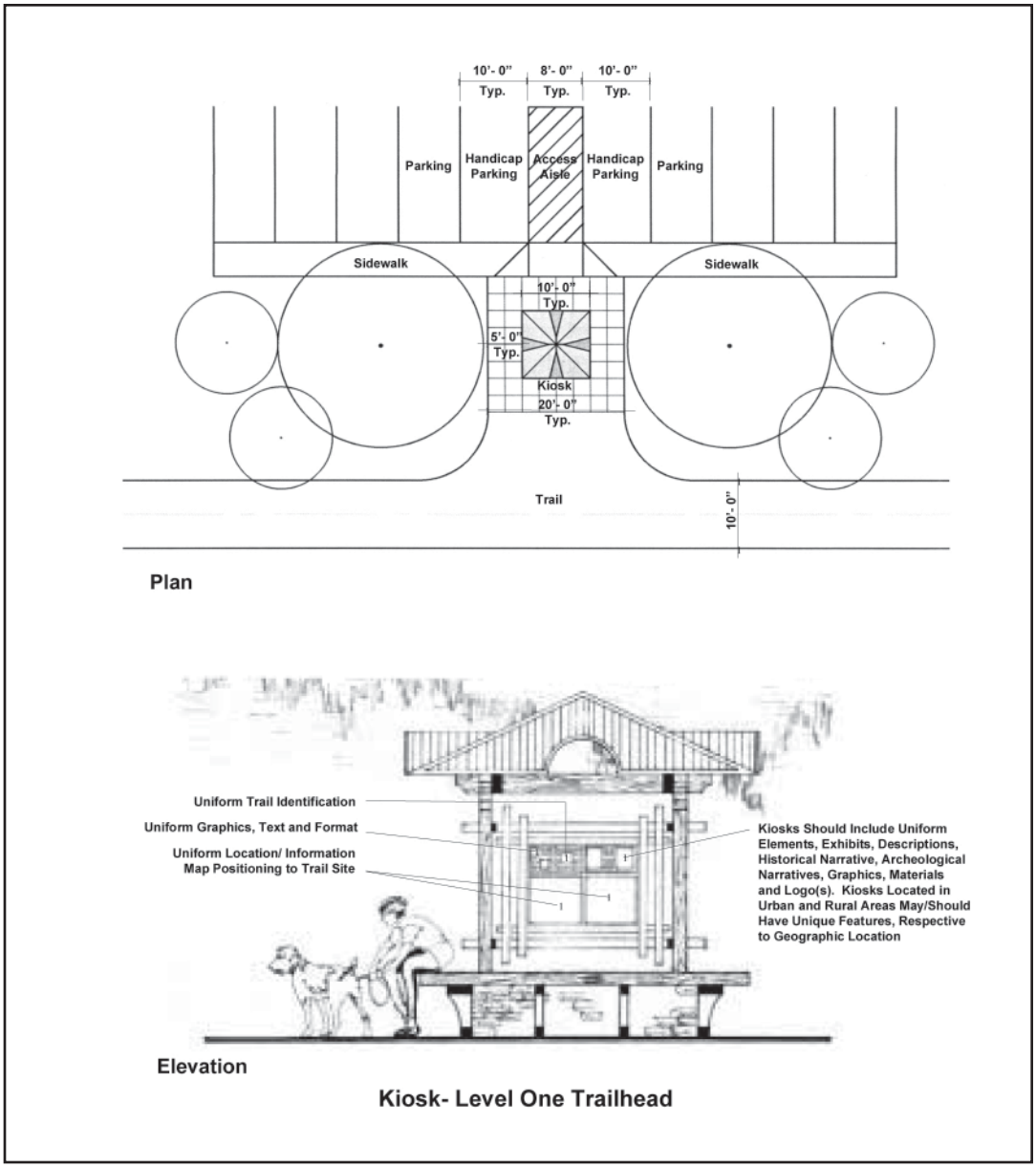



**Figure J-33**
**Kiosk Level One Trailhead**

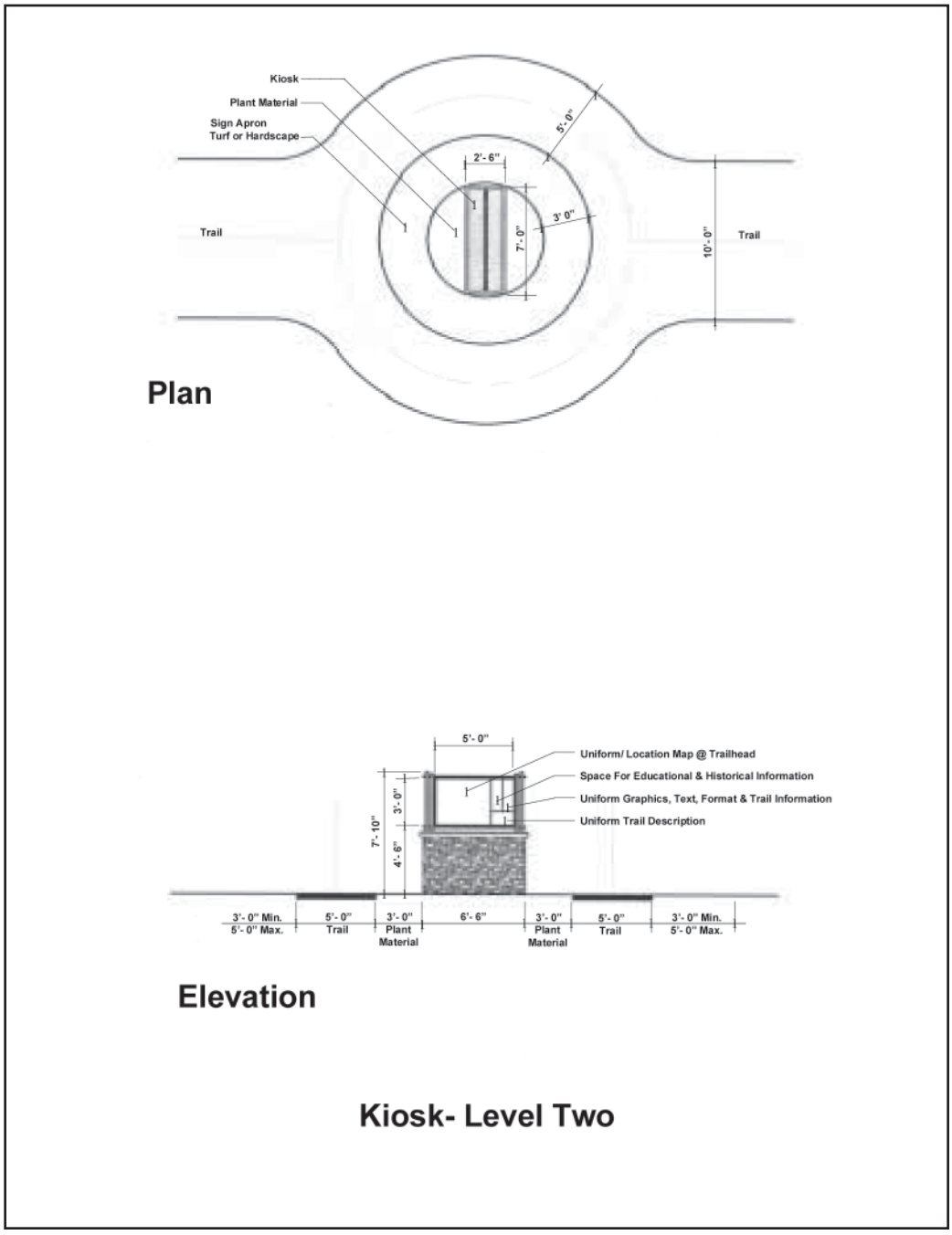



**Figure J-34**
**Kiosk Level Two**

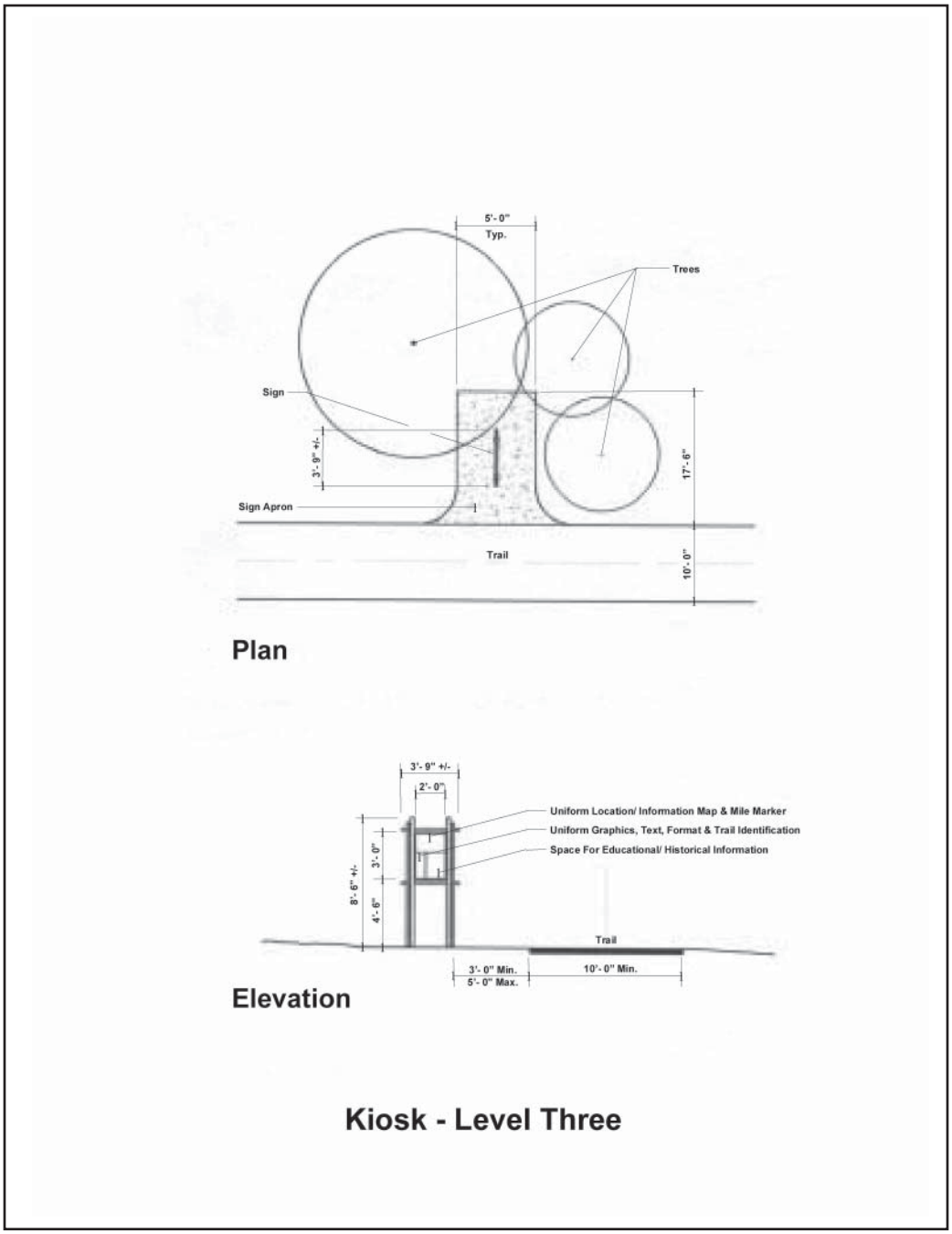



**Figure J-35**
**Kiosk Level Three**

# APPENDIX K
# WAY-FINDING SIGNS

## HIGHWAY SIGNS

Highway signs are regulated by various agencies (e.g., state, county, municipalities) and should conform to relevant agency standards.

Information Signs

**Description and Purpose:** Information signs provide basic trail information to motorists and trail users at the initial highway approach to the trailhead, public recreation area, and places of cultural interest. Approaching motorists should be able to read the sign from the roadway and well in advance of the highway exit ramp.
**Sample Way-finding Sign Text:** "County of Los Angeles Wonderland Trail—1,000 feet" (in some applications, signs may include a County trails logo)
**Location and Frequency:** Posting of signs falls under the jurisdiction of the relevant highway regulatory agency, such as the California Department of Transportation (Caltrans) or U.S. Department of Transportation. All highway signs should be coordinated with the appropriate highway agency.
**Size and Color:** The size and color of signs fall under the jurisdiction of the relevant highway regulatory agency such as Caltrans or U.S. Department of Transportation, and all highway signs should be coordinated with the appropriate highway agency. Highway information signs, such as brown recreation signs, direct motorists and trail users to areas of public recreation and cultural interest. Signs should follow the U.S. Department of Transportation, Federal Highway Administration *Manual on Uniform Traffic Control Devices (MUTCD): Standard Highway Signs*.[1]
**Other Considerations:** Signs may be subtle if calling attention to the trail is not desirable (e.g., parking problems).
**Graphic Example:** Figure K-1, *Sample Highway Sign*; Figure K-2, *Standard MUTCD Sign;* Figure K-3, *Sample Trail Marker;* and Figure K-4, *Sample Trail Marker*

Warning Signs

**Description and Purpose:** Warning signs provide motorists and trail users with a warming of approaching trail and street intersections. Way-finding sign should be clearly placed in advance of the intersection.
**Sample Way-finding Sign Text:** "Ped Xing" (in some applications, signs may include a County trails logo, directional arrows, usage signs, or the name of the road being crossed)
**Location and Frequency:** Signs should occur at every street and trail intersection. Posting of signs falls under the jurisdiction of the relevant highway regulatory agency such as Caltrans or U.S. Department of Transportation. All highway signs should be coordinated with the appropriate highway agency.
**Size and Color:** The size of signs falls under the jurisdictions of the relevant highway regulatory agency such as Caltrans or U.S. Department of Transportation. All highway signs should be coordinated with the appropriate highway agency. Typically, the *Manual on Uniform Traffic Control Devices* calls for black lettering on a yellow background.
**Other Considerations:** Warning signs are especially important where visibility is limited.
**Graphic Example:** Figure K-5, *Equestrian Crossing*, and Figure K-6, *Pedestrian Crossing*

[1] U.S. Department of Transportation, Federal Highway Administration. 2004. *Manual on Uniform Traffic Control Devices: Standard Highway Signs, English Version*. Washington, DC.

## REGULATORY SIGNS

Permitted Use (Usage Control) Signs

**Description and Purpose:** Permitted use signs provide trail users with information on permitted and non-permitted uses of the trail.
**Sample Way-finding Sign Text:** "Foot travel only—closed to all other uses" (emphasize permitted use; use a slash for non-permitted uses)
**Location and Frequency:** Post signs at all access points.
**Size and Color:** The color is typically black lettering or image on a white background. Images may include a red circle with a red slash placed diagonally through the image.
**Graphic Example:** Figures K-7, K-8, and K-9, *Sample Non-Permitted Use Sign*; and Figures K-10 and K-11, *Sample Permitted Use Sign*

Etiquette Signs

**Description and Purpose:** Etiquette signs provide reminders of polite trail behavior for all trail users.
**Sample Way-finding Sign Text:** "Yield to pedestrians," "Ride and walk on the right," "Warn others when passing from behind," "Control speed!," "Stay alert," "Use caution around horses," "Keep dogs on leash," "No bicycles or horses"
**Location and Frequency:** Post signs before narrow, blind, or contentious sections of trail where trail user conflicts are likely, such as between cyclists and equestrians.
**Size and Color:** The size and color may vary depending on application. Sign should be 2 feet by 1 foot, 2 inches with brown lettering on a white background, bordered in brown.
**Graphic Example:** Figure K-12, *Sample Yield Sign*

"Crossing Private Lands" Signs

**Description and Purpose:** There may be a need for "Crossing Private Lands" signs near the interface between a trail network and adjacent communities.
**Sample Way-finding Sign Text:** "Private land," "Use of this land is a privilege and not your right," "STAY ON TRAIL," "The County depends on the cooperation of many private landowners, please respect the land you travel through," "Camping, fires, hunting, straying from the trail is prohibited," "Enforced by County Sheriff," "Do not block driveways," "Keep dogs on leash"
**Location and Frequency:** Post signs in and at edges of neighborhoods or private land that the trail crosses.
**Size and Color:** Mount signs on variable-height posts. Signs should be 2 feet by 1 foot, 2 inches with brown lettering on a white background, bordered in brown.
**Other Considerations:** Signs should be bold and clear, but not unwelcoming or intimidating to trail users.
**Graphic Example:** Figures K-13 and K-14, *Sample Crossing/Boundary Sign*

Boundary Signs

**Description and Purpose:** Boundary signs alert trail users and landowners to the presence of a trail easement.
**Sample Way-finding Sign Text:** "Private land behind this sign," and on reverse, "Property boundary, Altadena Crest Trail, County of Los Angeles"
**Location and Frequency:** Post signs at all beginnings and endings of easements along trails.
**Size and Color:** Letters should be blue on a white background.
**Other Considerations:** Signs should be two-sided.
**Graphic Example:** Figures K-13 and K-14, *Sample Crossing/Boundary Sign*

Temporary Connector Signs

**Description and Purpose:** Connector signs identify temporary trail segments and encourage their use.
**Sample Way-finding Sign Text:** "Temporary trail, use permitted"
**Location and Frequency:** Post signs at the junctures of existing trails and temporary trails.
**Size and Color:** Letters should be white on a brown background.
**Other Considerations:** Connector signs should be used in connection with Direction Change/Juncture Indicator signs to show change in direction.
**Graphic Example:** Figures K-13 and K-14, *Sample Crossing/Boundary Sign*

## INFORMATIONAL SIGNS

Entrance Signs

**Description and Purpose:** Entrance signs mark the official entrance to a trail or recreational area.
**Sample Way-finding Sign Text:** "Brown Mountain Trail Network—County of Los Angeles Department of Parks and Recreation," "Lion's Den Trailhead" (include trail logo)
**Location and Frequency:** Post signs perpendicular to the road and at all primary trailhead locations.
**Size and Color:** The color is typically white lettering on brown background. Signs may be two-sided so that both entering and exiting trail users can read it.
**Other Considerations:** Coordination with relevant highway department authority such as Caltrans may be required.
**Graphic Example:** Figure K-15, *Sample Entrance Sign*; and Figure K-16, *Entrance Sign Elevation;* and Figure K-17, *Trailhead Information*

Trailhead Information Kiosk Signs

**Description and Purpose:** Trailhead information kiosk signs should provide general information about the trail, navigational aids, and safety bulletins.
**Sample Way-finding Sign Text:** Trailhead kiosk signs should include trail-specific information.

| Panel 1 Information: | Panel 2 Information: |
|---|---|
| General trail information | Description of local flora and fauna |
| Map of trail network | Topographical map and trail profile |
| | Trail length and elevation gain/loss |
| | Technical difficulty and expected conditions |
| | Safety information |
| | Cautionary notes, such as a buried cable |
| | Maintenance and emergency contact information |

**Location and Frequency:** Post signs at all primary trailhead locations within 50 feet of where the trail leaves the parking lot.
**Size and Color:** The kiosk should include a roof and two to three information panels, or a roof with one two-sided panel.
**Graphic Example:** Figure K-18, *Sample Kiosk*, and Figure K-19, S*ample Kiosk Elevation*

Reassurance Markers

**Description and Purpose:** Reassurance markers provide en route reassurance of trail identity and visually mark the trail line in areas where the trail blends seamlessly with the surrounding area.
**Sample Way-finding Sign Text:** "Silver Cloud Trail—4.5 miles, moderate difficulty" (include trail logo and trail directional arrow)
**Location and Frequency:** Post signs at points of confusion or at every 0.25 mile. Signs should alternate from one side of the trail to the other. Signs are usually posted at eye level.
**Size and Color:** The color should be consistent and blend with the natural palette.
**Graphic Example:** Figure K-20, *Sample Reassurance/Directional Sign*, and Figure K-21, *Reassurance/Directional Elevation*

Direction Change/Juncture Indicators

**Description and Purpose:** Direction change/juncture indicators alert trail users to a change in direction or juncture with another trail, and may include destinations and distances, features, regulations, warnings, and closures.
**Sample Way-finding Sign Text:** "Cascade Trail closed," "7.9 miles to First Water Trail Junction"
**Location and Frequency:** Post signs at ambiguous trail turns and at all junctures with other trails. Orient signs to face users approaching from all likely directions. Signs should be used sparingly and posted within sight of a reassurance marker.
**Size and Color:** Signs are typically 4-foot-high wooden posts with trail information in relief along the sides. Sign information should be painted on the post in color. Alternatively, aluminum blazes can be nailed into the post.
**Other Considerations:** Signposts should be placed in areas without erosion issues.
**Graphic Example:** Figure K-20, *Sample Reassurance/Directional Sign*, and Figure K-21, *Reassurance/Directional Elevation*

Interpretive Signs

**Description and Purpose:** Interpretive signs may display the entire trail network and identify major trail names and important interpretive features such as mountain peaks, streams, plant communities, or historic points of interest.
**Sample Way-finding Sign Text:** "Birds of the San Gabriel Mountains"
**Location and Frequency:** Post signs at major trailheads and destination features.
**Size and Color:** Letters should be 1.25 inches high and blue, on natural 4-inch-thick wood boards.
**Other Considerations:** An interpretive sign is expensive and can be included as part of the trailhead kiosk to save money on installation and maintenance.
**Graphic Example:** Figure K-22, *Sample Interpretive Sign*, and Figure K-23, *Sample Interpretive Sign Elevation*

Wayside Exhibits

**Description and Purpose:** Wayside exhibits explain interesting land features, plant and animal communities, historic events, and points of interest.
**Sample Way-finding Sign Text:** "Geological history of Vasquez Rocks" (Text can be several paragraphs in length and should be written in layman's terminology. Graphics should be integrated with textual explanations.)
**Location and Frequency:** Reserve wayside exhibits for major features located in high-traffic areas.
**Size and Color:** Wayside exhibits should feature native materials. For example, river stones should be used as a base building material if the wayside exhibit is located adjacent to a river.
**Other Considerations:** Wayside exhibits are the most complex and expensive type of way-finding sign.
**Graphic Example:** Figure K-24, *Sample Wayside Sign*, and Figure K-25, *Sample Wayside Elevation*

Destination Signs

**Description and Purpose:** These signs show directions and distances to various destinations accessed by the trail network.

**Sample Way-finding Sign Text:** "Horsetail Falls—0.2 miles ahead" (include a directional arrow to the destination)
**Location and Frequency:** Post destination signs at trailheads, major junctions, and spur trails (to water).
**Size and Color:** Letters should be blue and on natural wood boards.
**Other Considerations:** Destination signs direct users to underutilized trail segments by tempting them with the possibility of seeing something special.
**Graphic Example:** Figure K-20, *Sample Reassurance/Directional Sign*, and Figure K-21, *Reassurance/Directional Elevation*

Adopter Signs

**Description and Purpose:** Adopter signs acknowledge the volunteers who are responsible for trail maintenance along a designated section of the trail.
**Sample Way-finding Sign Text:** "This section of the trail has been adopted by the International Mountain Bicycling Association"
**Location and Frequency:** Post adopter signs on road crossing signs or at beginning of designated clean-up areas.
**Size and Color:** Letters should be blue on a white background.
**Other Considerations:** This is not intended to be an advertisement for the volunteer; adopter signs should be discreet, not a glaring promotion.
**Graphic Example:** Figures K-13 and K-14, *Sample Crossing/Boundary Sign*

## TRAIL NETWORK GRAPHICS

Confirmation/Identification Signs (Trail Logos)

**Description and Purpose:** Trail logos are graphic symbols that are used throughout the trail network to create consistency, identify the trail network, and orient trail users. Logos can also be standalone badges or blazes that are affixed to a post or a tree.
**Sample Way-finding Sign Text:** "Altadena Crest Trail—County of Los Angeles"
**Location and Frequency:** Include trail logos on all major signs throughout the trail network. Blazes are usually posted at eye level.
**Size and Color:** Trail logos should be small (3 to 6 inches) and colorful.
**Graphic Example:** Figure K-26, *Sample Trail Logo*

You-Are-Here Indicators

**Description and Purpose:** You-are-here indicators are optional markers that are included on interpretive signs or information kiosks to correlate the present physical location of a particular kiosk on a general trail map.
**Sample Way-finding Sign Text:** "You are here" (include an arrow indicating the location of the sign)
**Location and Frequency:** Symbolize you-are-here indicators, and include the symbol on the map legend.
**Size and Color:** The text should be larger than other map text, but should not dominate or distract from the map graphic.

## SIGN CONSTRUCTION DETAILS AND MATERIALS

Specifications for each sign type in terms of materials, background color, font color, and font size is included in Table K-1, *Sign Construction Details and Materials*. The choice of materials for signs and structures, as well as their structural engineering, should reflect materials indigenous to the immediate area. For example, use river rocks in lowland areas where there are water corridors and use horizontal ledge stones in higher, dryer elevations where that stone is more common (Figure K-27, *Sample Natural Materials*).

## TABLE K-1
## SIGN CONSTRUCTION DETAILS AND MATERIALS

| Type | Material | Background Color | Font Color |
|---|---|---|---|
| Highway informational sign | Aluminum or HDP | Brown | White |
| Highway warning sign | Aluminum or metal | Yellow | Black |
| Permitted uses sign | Paint on aluminum or plastic, or decal | White | Black |
| Etiquette sign | Aluminum or plastic | White | Brown |
| "Crossing private lands" sign | Aluminum or plastic 2′ × 1′2″ (variable height) | White with font color border | Brown or black |
| Boundary sign | White carbonate post or 6″ × 6″ wood post | White | Medium blue (Pantone 308) |
| Temporary connector sign | Decal | Brown | White |
| Entrance sign | Aluminum or HDP | Brown | White |
| Trailhead information kiosk sign | Wood | Brown | White |
| Reassurance marker | Paint on aluminum or plastic, or decal blaze | White or natural wood | Medium blue (Pantone 308) |
| Direction change / juncture indicator | Paint on aluminum or plastic, or 6″ × 6″ wood post | White or natural wood | Medium blue (Pantone 308) |
| Interpretive sign | Wood, metal, or plastic with a plastic covering, approximately 3′ × 25″ × 3″ | Buff | Multi-color |
| Wayside exhibit | Wood, metal, or plastic with a plastic covering | Buff | Multi-color |
| Destination sign | Wood | Natural wood | Medium blue (Pantone 308) |
| Adopter sign | Aluminum or plastic, no larger than 2′ × 1′ 2″ | White | Medium blue (Pantone 308) |
| Confirmation/identification sign | Paint on aluminum or plastic, 3″ to 6″ | Colorful graphic | Colorful lettering |

**KEY:** HDP = High-density plywood

# APPENDIX L
# TRAIL ASSESSMENT AND MAINTENANCE FORMS

## TRAIL ASSESSMENT AND REPAIR SHEET

| Trail Name/Number: | Location (include Marker#): |
|---|---|
| Priority: | Crew Leader: |

**Problem:**

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_____
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_____

**Repair Methods Description (See Trail Work Log):**

_____
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| Sketch Existing Trail: | Sketch Repair: |
|---|---|
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| Crew Members: | Tools Required: |
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## TRAIL WORK LOG

| Feet (from Marker) | Action (see Trail Log Key) | Feature (see Trail Log Key) | Size | | | Units | Comment | Total |
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## TRAIL LOG KEY

| Feature Distance | Feature | Action | Size/Quantity | Unit | Comment |
|---|---|---|---|---|---|
| | Asphalt placed | Install/maintain | | Square foot | |
| | Bench | Maintain/replace | | Each | As specified |
| | Bridge | Construct/reconstruct | | Linear foot | Varies by design |
| | Bridge | Maintain | | Linear foot | As specified |
| | Bridge | Remove | | Linear foot | Varies by design |
| | Bridge—mid-span supports | Construct/reconstruct | | Linear foot | As specified |
| | Causeway | Construct/reconstruct | | Cubic foot | |
| | Climbing turn | Construct/reconstruct | | Each | |
| | Concrete | Install | | Cubic foot | |
| | Culvert | Install/remove | | Linear foot | Varies by type and design |
| | Culvert; rock | Construct/reconstruct | | Cubic foot | |
| | Down trees | Remove | | Diameter (inches) | |
| | Drainage dip | Construct/reconstruct | | Each | As specified—could be cubic foot excavation |
| | Drainage lense | Construct/reconstruct | | Cubic foot | |
| | Ford | Construct/reconstruct | | Cubic foot | |
| | Hand rail removal | Remove | | Linear foot | |
| | Hand rails | Construct/reconstruct | | Linear foot | |
| | Puncheon | Construct/reconstruct | | Linear foot | |
| | Puncheon | Maintain | | Linear foot | As specified |
| | Retaining wall—causeway rock walls | Construct/reconstruct | | Cubic foot | |
| | Retaining wall—cellular confinement | Construct | | Cubic foot | |
| | Retaining wall—cribbed abutments | Construct/reconstruct | | bd. foot | |
| | Retaining wall—geotextile fabric | Construct | | Square foot | |
| | Retaining wall—mortared rock | Construct/reconstruct | | Cubic foot | |

## TRAIL LOG KEY

| Feature Distance | Feature | Action | Size/Quantity | Unit | Comment |
|---|---|---|---|---|---|
| | Asphalt placed | Install/maintain | | Square foot | |
| | Bench | Maintain/replace | | Each | As specified |
| | Bridge | Construct/reconstruct | | Linear foot | Varies by design |
| | Bridge | Maintain | | Linear foot | As specified |
| | Bridge | Remove | | Linear foot | Varies by design |
| | Bridge—mid-span supports | Construct/reconstruct | | Linear foot | As specified |
| | Causeway | Construct/reconstruct | | Cubic foot | |
| | Climbing turn | Construct/reconstruct | | Each | |
| | Concrete | Install | | Cubic foot | |
| | Culvert | Install/remove | | Linear foot | Varies by type and design |
| | Culvert; rock | Construct/reconstruct | | Cubic foot | |
| | Down trees | Remove | | Diameter (inches) | |
| | Drainage dip | Construct/reconstruct | | Each | As specified—could be cubic foot excavation |
| | Drainage lense | Construct/reconstruct | | Cubic foot | |
| | Ford | Construct/reconstruct | | Cubic foot | |
| | Hand rail removal | Remove | | Linear foot | |
| | Hand rails | Construct/reconstruct | | Linear foot | |
| | Puncheon | Construct/reconstruct | | Linear foot | |
| | Puncheon | Maintain | | Linear foot | As specified |
| | Retaining wall—causeway rock walls | Construct/reconstruct | | Cubic foot | |
| | Retaining wall—cellular confinement | Construct | | Cubic foot | |
| | Retaining wall—cribbed abutments | Construct/reconstruct | | bd. foot | |
| | Retaining wall—geotextile fabric | Construct | | Square foot | |
| | Retaining wall— | Construct/reconstruct | | Cubic | |

## TRAIL LOG KEY, Continued

| Feature Distance | Feature | Action | Size/Quantity | Unit | Comment |
|---|---|---|---|---|---|
| | mortared rock | | | foot | |
| | Retaining wall—mortared rock | Maintain | | Cubic foot | As specified |
| | Retaining wall—rock | Construct/reconstruct | | Cubic foot | |
| | Retaining wall—turnpike walls | Construct/reconstruct | | Cubic foot | |
| | Retaining wall—wood | Construct/reconstruct | | Square foot | |
| | Riprap—rock, dry wall | Construct/reconstruct | | Cubic foot | Drains, tread, step landings |
| | Sign | Maintain/replace | | Each | As specified |
| | Slide removal | Remove | | Cubic foot | |
| | Soil stabilizer placed | Install/maintain | | Square foot | |
| | Split rail fence | Remove | | Linear foot | |
| | Step | Maintain | | Each | As specified |
| | Step removal | Remove | | Each | |
| | Steps—cable | Construct/reconstruct | | Each | |
| | Steps—cut out stringer | Construct/reconstruct | | Each | |
| | Steps—full crib | Construct/reconstruct | | Each | |
| | Steps—mortared rock | Construct/reconstruct | | Cubic foot | |
| | Steps—rock | Construct/reconstruct | | Cubic foot | |
| | Steps—wood | Construct/reconstruct | | Each | |
| | Steps—wood interlocking double | Construct/reconstruct | | Each | |
| | Steps—wood interlocking single | Construct/reconstruct | | Each | |
| | Swale | Construct/reconstruct | | Each | Note as a feature, but not for budget information |
| | Switchback | Construct/reconstruct | | Each | |
| | Trail | Brush | | Linear foot | |
| | Trail | Construct | | Linear foot | |
| | Trail narrowing | Remove | | Square foot | |
| | Trail obliteration | Remove | | Square foot | |

## TRAIL LOG KEY, Continued

| Feature Distance | Feature | Action | Size/Quantity | Unit | Comment |
|---|---|---|---|---|---|
| | Trail tread | Reconstruct | | Linear foot | |
| | Trail rehabilitation | Perform | | Linear foot | |
| | Turnpike | Construct/reconstruct | | Cubic foot | |
| | Wall-less turnpike | Construct/reconstruct | | Cubic foot | |
| | Water bar—rock | Install/remove/maintain | | Cubic foot | |
| | Water bar—wood | Install/remove/maintain | | Each | |