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APPENDIX A

Regulatory Setting

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# Appendix A

## Environmental Regulations for Sensitive Resources

The following section describes sensitive natural resources that could trigger regulatory action and the national, state, and county-wide environmental regulatory laws and ordinances that are in place to protect sensitive resources and maintain environmental quality. Protecting these resources and complying with these laws drive many elements of the Road and Trail Management Plan.

### A.1 CEQA

The California Environmental Quality Act (CEQA) is a statute that requires state and local agencies to identify the significant environmental impacts of their actions and to avoid or mitigate those impacts to the extent feasible. CEQA is a driving force behind the development of this RTMP which identifies sensitive resources on MCOSED lands and provides a programmatic set of road and trail management guidelines to avoid and mitigate environmental impacts to the maximum extent feasible.

### A.2 Regulations and Policies for Biological Resources

#### A.2.1 Special-Status Species

Special-status species include those plants and wildlife species that have been formally listed, are proposed as endangered or threatened, or are candidates for such listing under the Federal Endangered Species Act (ESA) or California Endangered Species Act (CESA). These acts afford protection to both listed and candidate species. In addition, California Department of Fish and Game (CDFG) Species of Special Concern, which are species that face extirpation in California if current population and habitat trends continue, U.S. Fish and Wildlife Service (USFWS) Birds of Conservation Concern, sensitive species included in USFWS Recovery Plans, and CDFG special-status invertebrates are all considered special-status species. Although CDFG Species of Special Concern generally have no special legal status, they are given special consideration under CEQA. In addition to regulations for special-status species, most birds in the United States, including non-status species, are protected by the Migratory Bird Treaty Act of 1918. Under this legislation, destroying active nests, eggs, and young is illegal. Plant species on California Native Plant Society (CNPS) Lists 1 and 2 are also considered special-status plant species. Impacts to these species are considered significant according to CEQA.

#### A.2.2 Critical Habitat

Critical habitat is a term defined and used in the Federal Endangered Species Act as a specific geographic area that contains features essential for the conservation of a threatened or endangered species and that may require special management and protection. The FESA requires federal agencies to consult with the USFWS to conserve listed species on their lands and to ensure that any activities or projects they fund, authorize, or carry out will not jeopardize the survival of a threatened or endangered species. In consultation for those species with critical habitat, federal agencies must also ensure that their activities or projects do not adversely modify critical habitat to the point that it will no longer aid in the species' recovery. In many cases, this level of protection is similar to that

already provided to species by the FESA “jeopardy standard.” However, areas that are currently unoccupied by the species but which are needed for the species’ recovery, are protected by the prohibition against adverse modification of critical habitat.

### A.2.3 Sensitive Biological Communities

Sensitive biological communities include habitats that fulfill special functions or have special values, such as wetlands, streams, and riparian habitat. These habitats are protected under federal regulations (such as the Clean Water Act), state regulations (such as the Porter-Cologne Act, the CDFG Streambed Alteration Program, and CEQA), or local ordinances or policies (City or County Tree Ordinances, Special Habitat Management Areas, and General Plan Elements).

#### WATERS OF THE UNITED STATES

The U.S. Army Corps of Engineers (Corps) regulates “Waters of the United States” under Section 404 of the Clean Water Act. “Waters of the U.S.” are defined broadly as waters susceptible to use in commerce, including interstate waters and wetlands, all other waters (intrastate waterbodies, including wetlands), and their tributaries (33 CFR 328.3). Potential wetland areas, according to the three criteria used to delineate wetlands stated in the *Corps of Engineers Wetlands Delineation Manual* (1987), are identified by the presence of: (1) hydrophytic vegetation, (2) hydric soils, and (3) wetland hydrology. Areas that are inundated for sufficient duration and depth to exclude growth of hydrophytic vegetation are subject to Section 404 jurisdiction as “other waters” and are often characterized by an ordinary high water mark (OHWM). Other waters, for example, generally include lakes, rivers, and streams. The placement of fill material into “Waters of the U.S.” (including wetlands) generally requires an individual or nationwide permit from the Corps under Section 404 of the Clean Water Act.

#### WATERS OF THE STATE

The term “Waters of the State” is defined by the Porter-Cologne Act as “any surface water or groundwater, including saline waters, within the boundaries of the state.” The Regional Water Quality Control Board (RWQCB) protects all waters in its regulatory scope, but has special responsibility for wetlands, riparian areas, and headwaters. These waterbodies have high resource value, are vulnerable to filling, and are not systematically protected by other programs. RWQCB jurisdiction includes “isolated” wetlands and waters that may not be regulated by the Corps under Section 404. “Waters of the State” are regulated by the RWQCB under the State Water Quality Certification Program which regulates discharges of fill and dredged material under Section 401 of the Clean Water Act and the Porter-Cologne Water Quality Control Act. Projects that require a Corps permit, or fall under other federal jurisdiction, and have the potential to impact “Waters of the State,” are required to comply with the terms of the Water Quality Certification determination. If a proposed project does not require a federal permit, but does involve dredge or fill activities that may result in a discharge to “Waters of the State,” the RWQCB has the option to regulate the dredge and fill activities under its state authority in the form of Waste Discharge Requirements.

## STREAMS, LAKES, AND RIPARIAN HABITAT

Streams and lakes, as habitat for fish and wildlife species, are subject to jurisdiction by CDFG under Sections 1600-1616 of the State Fish and Game Code. Alterations to or work within or adjacent to streambeds or lakes generally require a 1602 Lake and Streambed Alteration Agreement. The term stream, which includes creeks and rivers, is defined in the California Code of Regulations (CCR) as follows: “a body of water that flows at least periodically or intermittently through a bed or channel having banks and supports fish or other aquatic life. This includes watercourses having a surface or subsurface flow that supports or has supported riparian vegetation” (14 CCR 1.72). In addition, the term stream can include ephemeral streams, dry washes, watercourses with subsurface flows, canals, aqueducts, irrigation ditches, and other means of water conveyance if they support aquatic life, riparian vegetation, or stream-dependent terrestrial wildlife (CDFG ESD 1994). Riparian is defined as, “on, or pertaining to, the banks of a stream;” therefore, riparian vegetation is defined as, “vegetation which occurs in and/or adjacent to a stream and is dependent on, and occurs because of, the stream itself” (CDFG ESD 1994). Removal of riparian vegetation also requires a Section 1602 Lake and Streambed Alteration Agreement from CDFG.

## ESSENTIAL FISH HABITAT

Essential Fish Habitat (EFH) is regulated through the National Marine Fisheries Service (NMFS), a division of the National Oceanic and Atmospheric Administration (NOAA). Protection of EFH is mandated through changes implemented in 1996 to the Magnuson-Stevens Fishery Conservation and Management Act (Magnuson-Stevens Act) to protect the loss of habitat necessary to maintain sustainable fisheries in the United States. The Magnuson-Stevens Act defines EFH as “those waters and substrate necessary to fish for spawning, breeding, feeding, or growth to maturity” (16 U.S.C. 1802(10)). NMFS further defines essential fish habitat as areas that “contain habitat essential to the long-term survival and health of our nation’s fisheries” (NMFS 2007). EFH can include the water column, bottom substrate types such as gravels suitable in size for salmonid spawning, and vegetation and woody structures that provided habitat for rearing. Under regulatory guidelines issued by NMFS, any federal agency that authorizes, funds, or undertakes action that may affect EFH is required to consult with NMFS (50 CFR 600.920).

## OTHER SENSITIVE BIOLOGICAL COMMUNITIES

Other sensitive biological communities not discussed above include habitats that fulfill special functions or have special values. Natural communities considered sensitive are those identified in local or regional plans, policies, regulations, or by the CDFG. CDFG ranks sensitive communities as “threatened” or “very threatened” and keeps records of their occurrences in its Natural Diversity Database. Sensitive plant communities are also identified by CDFG on their *List of California Natural Communities Recognized by the CNDDDB*. Impacts to sensitive natural communities identified in local or regional plans, policies, regulations or by the CDFG or USFWS must be considered and evaluated under CEQA (California Code of Regulations: Title 14, Div. 6, Chap. 3, Appendix G).

### A.2.4 Marin County Policies and Ordinances

Specific habitats and resources are also identified as sensitive in the Marin Countywide Plan (adopted November 6, 2007) and other applicable ordinances (i.e. tree ordinances, see below). In general the Countywide Plan upholds existing state and federal regulations regarding sensitive

habitat and species protection, but may often go beyond the scope of those laws such as in the case of stream and wetland setbacks (Stream Conservation Areas (SCAs) and Wetland Conservation Areas (WCAs)). These setback zones provide a buffer designed to protect the sensitive habitat from adjacent disturbances and may provide additional plant and wildlife habitats.

### MARIN COUNTY TREE ORDINANCE

Pursuant to the Marin County Native Tree Protection and Preservation Ordinance, Chapter 22.27, the County will strive to protect large native trees, trees with historical importance, and oak woodland habitat. The County limits removal of native trees in the non-agricultural unincorporated areas of Marin County. Permits to remove trees will take into account the environmental effects of removal, possible alternatives to removal, and whether preservation unreasonably interferes with development of the parcel. Required mitigation may include establishment and maintenance of replacement trees; a detailed mitigation management plan; removal of invasive exotics; and posting of a bond to cover the cost of an inspection to ensure the success of measures described above.

### MARIN COUNTY STREAM AND WETLAND CONSERVATION AREAS

In Marin County, a Stream Conservation Area (SCA) is a setback from the bank of a natural watercourse, which is intended to protect the active channel, water quality, and flood control functions and associated fish and wildlife habitat values along streams. A Wetland Conservation Area (WCA) is a setback from jurisdictional wetlands to be retained, which includes the protected wetland and associated buffer area.

Development in SCAs and WCAs must be set back a minimum distance to protect the stream or wetland, and to provide an upland buffer. Larger setback standards may apply to streams and wetlands supporting special-status species or associated with riparian systems and baylands under tidal influence, given the importance of protecting the larger ecosystems for these habitat types (Marin Countywide Plan 2007).

Development activities that may occur within an SCA or WCA are closely regulated by the County and require consideration of impacts of proposed developments on species and habitats during the environmental review process. The Countywide Plan provides specific guidelines for identifying and protecting SCAs and WCAs, and should be consulted when these areas are part of a road and trail management project.

### MARIN COUNTYWIDE PLAN

The Marin Countywide Plan includes the following policies and programs to maintain healthy habitats and protect aquatic and terrestrial biological resources. These policies may at times be applicable during implementation of the RTMP.

**Table A-1 Marin Countywide Plan Biological Resource Protection Policies**

Goal, Policy, or Program	Policy Number and Title	Description
<b>Biological Resources</b>		
<b>Goal BIO-1</b>	Enhanced Native Habitat and Biodiversity	Effectively manage and enhance native habitat, maintain viable native plant and animal populations, and provide for improved biodiversity throughout the County.
Policies	BIO-1.1	Protect Wetlands, Habitat for Special-Status Species, Sensitive Natural Communities, and Important Wildlife Nursery Areas and Movement Corridors.
	BIO-1.3	Protect Woodlands, Forests, and Tree Resources.
	BIO-1.6	Control Spread of Invasive Exotic Plants.
	BIO-1.7	Remove Invasive Exotic Plants.
	BIO-1.8	Restrict Use of Herbicides, Insecticides, and Similar Materials.
	BIO-1.9	Control Spread of Non-Native Invasive Animal Species.
<b>Goal BIO-2</b>	Protection of Sensitive Biological Resources	Require identification of sensitive biological resources and commitment to adequate protection and mitigation, and monitor development trends and resource preservation efforts.
Policies	BIO-2.1	Include Resource Preservation in Environmental Review.
	BIO-2.2	Limit Development Impacts.
	BIO-2.3	Preserve Ecotones.
	BIO-2.4	Protect Wildlife Nursery Areas and Movement Corridors.
	BIO-2.5	Restrict Disturbance in Sensitive Habitat During Nesting Season.
	BIO-2.6	Identify Opportunities for Safe Wildlife Movement.
	BIO-2.7	Protect Sensitive Coastal Habitat.
Implementing Programs	BIO-2.a	Require Site Assessments.
	BIO-2.b	Conduct Habitat Connectivity Assessment.
	BIO-2e	Participate in FishNet4C Program
<b>Goal BIO-3</b>	Wetland Conservation	Require all feasible measures to avoid and minimize potential adverse impacts on existing wetlands and to encourage programs for restoration and enhancement of degraded wetlands.
Policies	BIO-3.1	Protect Wetlands.
	Coastal, Inland Rural, and Baylands Corridors.	For all parcels, provide a minimum 100-foot development setback from wetlands.
	BIO-3.2	Require Thorough Mitigation. Where avoidance of wetlands is not possible, require provision of replacement habitat on-site through restoration and/or habitat creation at a minimum ratio of 2 acres for each acre lost (2:1 replacement ratio) for on-site mitigation and a minimum 3:1 replacement ratio for off-site mitigation.
<b>Goal BIO-4</b>	Riparian Conservation	Protect and, where possible, restore the natural structure and function of riparian systems.
Policies	BIO-4.1	Restrict Land Use in Stream Conservation Areas. SCAs are designated along perennial, intermittent, and ephemeral streams as defined in the Countywide Plan Glossary.
	BIO-4.4	Promote Natural Stream Channel Function.
	BIO-4.5	Restore and Stabilize Stream Channels. Promote Natural Stream Channel Function.
	BIO-4.6	Control Exotic Vegetation.
	BIO-4.7	Protect Riparian Vegetation.
	BIO 4.8	Reclaim Damaged Portions of SCAs.
	BIO-4.9	Restore Culverted Streams.
	BIO-4.13	Provide Appropriate Access in SCAs.
	BIO-4.14	Reduce Road Impacts in SCAs.
	BIO-4.15	Reduce Wet Weather Impacts.

**Table A-1 Marin Countywide Plan Biological Resource Protection Policies**

<b>Goal, Policy, or Program</b>	<b>Policy Number and Title</b>	<b>Description</b>
	BIO-4.16	Regulate Channel and Flow Alteration.
	BIO-4.19	Maintain Channel Stability.
Implementing Programs	BIO-4.h	Comply with SCA Criteria and Standards.
	BIO-4.i	Replace Vegetation in SCAs.
	BIO-4.k	Locate Trails Appropriately
	BIO-4.o	Consider Culvert Restoration.
<b>Goal BIO-5</b>	Baylands Conservation	Preserve and enhance the diversity of the baylands ecosystem, including tidal marshes and adjacent uplands, seasonal marshes and wetlands, rocky shorelines, lagoons, agricultural lands, and low-lying grasslands overlying historical marshlands.
Policies	BIO-5.2	Limit Development and Access.
	BIO-5.7	Limit Access to Wetlands.
<b>Water Resources</b>		
<b>Goal WR-1</b>	Healthy Watersheds	Achieve and maintain proper ecological functioning of watersheds, including sediment transport, groundwater recharge and filtration, biological processes, and natural flood mitigation, while ensuring high-quality water.
Policies	WR-1.1	Protect Watersheds and Aquifer Recharge.
	WR-1.2	Restore and Enhance Watersheds.
	WR-1.4	Protect Upland Vegetation.
<b>Open Space</b>		
<b>Goal OS-1</b>	Sustainably Managed Open Space	Manage open space in a sustainable manner for environmental health and the long-term protection of resources.
Policies	OS-1.1	Enhance Open Space Stewardship.
	OS-1.2	Protect Open Space for Future Generations.
Implementing Programs	OS-1c Utilize Integrated Pest Management.	Minimize the use of pesticides and herbicides in open space management.
	OS-1.d Inform and Enforce.	Utilize a variety of methods to disseminate information about what agencies are doing to protect open space and what the public can do to help. Continue efforts to inform and educate open space visitors about the importance of open space and its appropriate use. Use enforcement authority as necessary to ensure compliance with regulations.
	OS-1.e Inventory Resources.	Conduct inventories of sensitive resources and resource management issues — erosion sites or areas where populations of non-native species are expanding, for example — to determine resource management priorities.
	OS-1.g Encourage Resource Monitoring.	Document trends in resource quality and public use to help guide long-term resource management decision making.
	OS-1.i Identify and Apply Best Management Practices.	Review existing stewardship practices and the experiences of other land managers to identify best practices and make cost-effective, sustainable, environmentally sound land management decisions.

**Table A-1 Marin Countywide Plan Biological Resource Protection Policies**

Goal, Policy, or Program	Policy Number and Title	Description
<b>Trails</b>		
<b>Goal TRL-2</b>	Appropriate Trail Design, Location, Management, and Maintenance	Design, build, manage, and maintain trails, as appropriate, in a manner compatible with natural resource protection. Ensure safe trails. Ensure that trails are managed and maintained in a sustainable manner.
Policies	TRL-2.1 Preserve the Environment.	In locating and designing trails, protect sensitive habitat and natural resources by avoiding those areas.
	TRL-2.7 Ensure Sustainable Maintenance.	Continue to ensure that trails are responsibly maintained.
Implementing Programs	TRL-2.a Locate Trails to Protect Habitat.	Align or relocate trails to avoid impacting sensitive habitats such as wetlands and areas where endangered species are present. Avoid aligning trails along the boundaries of sensitive habitats.
	TRL-2.b Design, Build, and Manage Trails in a Sustainable Manner.	Incorporate design measures that protect vegetation, protect habitats, and minimize erosion. Suggested measures include the following: <ul style="list-style-type: none"> <li>✓ Limit grading and vegetation removal.</li> <li>✓ Discourage people and pets from entering sensitive habitats or disturbing wildlife through education, signage, enforcement, and, as a last resort, fencing.</li> <li>✓ Provide vegetative buffers between trails and wetlands or other sensitive habitats.</li> <li>✓ Consider using existing roads or trails rather than building new ones when possible.</li> <li>✓ Temporarily close trails when necessary to minimize erosion or resource impacts, or to prevent threats of disease to livestock.</li> </ul>
	TRL-2.c Eliminate Trail Redundancy.	Identify, abandon, and restore redundant or otherwise unnecessary trails or trail segments.
	TRL-2.m Maintain Trails in a Sustainable Manner.	Consider and implement as appropriate: <ul style="list-style-type: none"> <li>✓ Reducing or avoiding use of chemicals</li> <li>✓ Scheduling maintenance activities to avoid disturbing the nesting and breeding seasons of sensitive species</li> <li>✓ Seasonal trail closures</li> <li>✓ Removal of invasive exotic plants</li> <li>✓ Removal of invasive exotic plants</li> </ul>

### A.3 Regulations and Policies for Surface Water and Groundwater Resources

The following summarizes federal, state and regional laws and requirements established to protect surface and groundwater resources and water quality that will need to be considered when implementing various elements of this Road and Trail Management Plan. Additional regulations related to the protection of sensitive water resources including streams, lakes and riparian habitat are discussed under Section A.2, *Biological Resources*.

### A.3.1 Federal Clean Water Act

The 1972 Clean Water Act (CWA) regulates discharges into waters of the United States including a range of potential point and non-point sources of water-transported pollutants and fill into stream channels and wetlands. The purpose of the CWA is to restore and maintain the chemical, physical and biological integrity of the Nation's waters through pollution prevention and elimination.

A key provision under the CWA is for a Section 404 permit to be acquired from the United States Army Corps of Engineers (USACE) prior to any dredge or fill materials being placed into wetlands or waters of the United States. A water quality certificate is also required for any activity which may result in a discharge to a water body from the appropriate Regional Water Quality Control Board under Section 401 as described in more detail below. A commonly encountered program of the CWA is the National Pollutant Discharge Elimination System (NPDES) permit under Section 402(p) added in 1987, and expanded upon in 1990 and 1999. Section 402(p) is administered by the State under the supervision of the United States Environmental Protection Agency (EPA) and establishes effluent water discharge limitations to protect water quality for beneficial uses.

Section 303(d) of the CWA requires states to identify impaired waters and establish Total Maximum Daily Loads (TMDLs) for those waters. The current San Francisco Regional Water Quality Control Board (SF RWQCB) Basin Plan provides Water Quality Attainment Strategies and Total Maximum Daily Loads (TMDLs) for Marin County's Central and Coastal Basins which include Richardson and Tomales Bays. Pathogens are a target of the TMDL program for each of these bays, due to fecal coliform bacteria levels exceeding water quality objectives for shellfish harvesting and water contact recreational uses. The countywide Marin County Stormwater Pollution Prevention Program (MCSTOPPP) is assisting in efforts to reduce pathogens in stormwater runoff by working with equestrian facilities, implementing educational outreach, and monitoring the maintenance of pet waste dispensers (SF RWQSB 2011 and MCSTOPPP 2011).

Section 402(p) of the CWA requires a NPDES permit for storm water discharges from municipal separate storm sewer systems, industrial activities, construction activities, and designated dischargers that are considered significant contributors of pollutants to waters of the United States. The General NPDES Permit for discharges associated with construction activities (Order No. 99-08-DWQ) regulates storm water discharge from construction project land disturbance for storm water discharge from sites equal to or greater than one acre. More recently, the SWRCB adopted Order No. 2009-0009-DWQ (NPDES No. CAS000002), which supersedes Order No. 99-08-DWQ) and became effective on July 1, 2010. The General Permit under Order NO. 2009-0009-DWQ contains significant differences from the existing permit. The existing permit required dischargers to file a Notice of Intent (NOI) to be covered under the permit and to:

- Develop and implement an adequate Storm Water Pollution Prevention Plan (SWPPP) with Best Management Practices (BMPs) that prevent all construction pollutants from contacting storm water and with the intent of keeping all products of erosion from moving off site into receiving waters;
- Eliminate or reduce non-storm water discharges to storm sewer systems and other waters of the nation; and
- Perform inspections of all BMPs.

As of July 1, 2010, in addition to above, the permit requires several modified elements, including:

- Three Risk-Based variations based on both project sediment potential and receiving water;
- More minimum BMPs and monitoring requirements;
- Numeric effluent limitations and action levels for pH and turbidity for Risk Level 3 and 2 sites;
- Required effluent monitoring and reporting for pH and turbidity in stormwater discharges for Risk Level 3 and 2 sites;
- Additional receiving water monitoring for some Risk Level 3 dischargers;
- Requirements for a Rain Event Action Plan to protect exposed portions of some sites within 48 hours;
- Options for small construction sites (greater than 1 to less than 5 acres) to apply for a low rainfall erosivity waiver;
- Annual reporting for all projects enrolled for more than one continuous three-month period; and,
- Specific training/certification requirements for key personnel performing the compliance.

### A.3.2 Regulated Floodplains

Floodplain Management Executive Order (EO) 11988 (May 24, 1977) directs all federal agencies to evaluate potential effects of any actions it may take in the floodplain and to avoid all adverse impacts associated with modifications to floodplains. It also directs federal agencies to avoid floodplain development whenever there is a practicable alternative and to restore and preserve the natural and beneficial values served by the floodplains (EPA 2008).

The Federal Emergency Management Agency (FEMA) oversees floodplain management and runs the nation's flood insurance program (NFIP) adopted under the National Flood Insurance Act of 1968. FEMA prepares Flood Insurance Rate Maps that delineate the regulatory floodplain to assist communities with land use and floodplain management decisions in order to meet the requirements of the NFIP. In general, the NFIP mandates that development is not to proceed within the 100-year regulatory floodplain if the development is expected to increase flood elevation by one foot or more and zero development is allowed in 100-year floodways.

### A.3.3 California Water Code

In California, the State Water Resource Control Board (SWRCB) and the nine Regional Water Quality Control Boards (RWQCBs) are the primary State agencies that regulate impacts to waters of the state. Their regulatory authority comes from the Porter-Cologne Water Quality Control Act (Porter Cologne) and Sections 22560 through 22565 of Title 27 of the California Code of Regulations (CCR). The Basin Plan for the San Francisco Region (SF RWQCB 2011) incorporates by reference the SWRCB water quality control plans and policies to protect beneficial uses of state water resources. The Basin Plan states the beneficial uses of specific water bodies and the levels of quality introduced in the sections above that must be met and maintained to protect those uses. Regional plan objectives and discharge requirements are included in waste discharge requirements (WDRs) or NPDES permits.

### A.3.4 San Francisco Bay Conservation and Development Commission

The San Francisco Bay Conservation and Development Commission (BCDC) produced a series of sea level rise maps to be used as information for future planning efforts within the Bay Area. The maps show shoreline and tributary areas along the San Francisco, Richardson and San Pablo Bays that are vulnerable to 16 inches of sea level rise predicted for mid-century and 55 inches for the end of the century based on data from the United States Geological Survey. (SFBCDC 2002).

### A.3.5 Marin County Polices and Ordinances

#### URBAN RUNOFF POLLUTION PREVENTION ORDINANCE

Residing largely in unincorporated Marin County, the District's continued establishment and operation of preserves must abide by the County of Marin's Urban Runoff Pollution Prevention Ordinance. The objectives of the local ordinance are:

- Minimizing discharges other than storm runoff to storm drains or watercourses
- Controlling the discharge to storm drains or watercourses from spills, dumping or disposal of materials other than rain water
- Reducing pollutants in stormwater discharges to the maximum extent practicable
- Complying with the County's NPDES permit that requires implementation of appropriate source control and site design measures and stormwater treatment measures for projects
- Maintaining pre-development stormwater runoff rates and preventing nonpoint source pollution whenever possible, through stormwater management controls and ensuring that these management controls are properly maintained.

The ordinance requires that any construction in the County meet the requirements of the federal Clean Water Act and the current and future versions of the SF RWQCB Basin Plan and NPDES permits. Additionally any operational facilities shall include programs for prohibiting illicit discharges and reducing stormwater pollutants to the maximum extent practicable (Marin County 2011b).

#### MARIN COUNTYWIDE PLAN

The Marin Countywide Plan includes the following policies and programs to maintain healthy watersheds, protect surface- and groundwater quality and minimize any risks to persons or property from flooding and inundation. These policies may at times be applicable during implementation of the RTMP.

Table A-2 Marin Countywide Plan Flooding Hazard Policies		
Goal, Policy, or Program	Policy Number and Title	Description
Water Resource Protection		
Policies	WR-1.1 Protect Watersheds and Aquifer Recharge	Give high priority to the protection of watersheds, aquifer-recharge areas, and natural drainage systems in any consideration of land use.
	WR-1.2 Restore and Enhance Watersheds	Support watershed restoration efforts, coordinate County watershed activities with efforts by other groups, and simplify permit acquisition for watershed restoration and enhancement projects.
	WR-1.3 Improve Infiltration	Enhance water infiltration throughout watersheds to decrease accelerated runoff rates and enhance groundwater recharge. Whenever possible, maintain or increase a site's predevelopment infiltration to reduce downstream erosion and flooding.
	WR-1.4 Protect Upland Vegetation	Limit development and grazing on steep slopes and ridgelines in order to protect downslope areas from erosion and to ensure that runoff is dispersed adequately to allow for effective infiltration.
Implementation Programs	WR-1.b Establish Development Standards for Infiltration	Establish qualitative standards to maximize groundwater infiltration and minimize surface water runoff based on criteria developed by the Bay Area Stormwater Management Agency Associates. Standards should regulate the amount of impervious surfaces; vary by project type, land use, building-site placement, soils, and area characteristics; and provide for water impoundments, protecting and planting vegetation, cisterns, and other measures, such as restricting wet weather grading to increase groundwater recharge and reduce sedimentation.
	WR-1.c Seek Watershed Assessment and Monitoring Assistance	Pursue federal and State funding to conduct baseline assessments and trend monitoring of water quality, aquatic habitat, sensitive species, and restoration in County watersheds.
	WR-1.d Coordinate Watershed Efforts	Work with land and water management agencies, community-based watershed restoration groups, and private property owners to explore methods and programs for maintaining and improving watershed health, including carrying out the actions recommended in the Marin County and Tomales Bay Watershed Plans and Redwood Creek Watershed, Vision for the Future, July 2003.
	WR-1.e Require Restoration of Degraded Areas	Require replanting of vegetation and remediation of associated erosion in conjunction with requested land use approvals, especially those including roads and over-grazing on steep slopes.
	WR-1.f Require Stream Restoration Projects	Require restoration of streams in conjunction with associated land use approvals to improve groundwater recharge and filtration and to ensure high-quality water. Restoration projects should follow the design principles of natural channel restoration utilizing geomorphic concepts.
	Water Quality Protection	
Policies	WR-2.2 Reduce Pathogen, Sediment, and Nutrient Levels	Support programs to maintain pathogen and nutrient levels at or below target levels set by the Regional Water Quality Control Board, including the efforts of ranchers, dairies, agencies, and community groups to address pathogen, sediment, and nutrient management in urban and rural watersheds.

<b>Table A-2 Marin Countywide Plan Flooding Hazard Policies</b>		
<b>Goal, Policy, or Program</b>	<b>Policy Number and Title</b>	<b>Description</b>
	WR-2.3 Avoid Erosion and Sedimentation	Minimize soil erosion and discharge of sediments into surface runoff, drainage systems, and water bodies. Continue to require grading plans that address avoidance of soil erosion and on-site sediment retention. Require developments to include on-site facilities for the retention of sediments, and, if necessary, require continued monitoring and maintenance of these facilities upon project completion.
	WR-2.4 Design County Facilities to Minimize Pollutant Input	Design, construct, and maintain County buildings, landscaped areas, roads, bridges, drainages, and other facilities to minimize the volume of toxics, nutrients, sediment, and other pollutants in stormwater flows, and continue to improve road maintenance methods to reduce erosion and sedimentation potential.
<b>Flood Protection</b>		
Policies	EH-3.2 Retain Natural Conditions	Ensure that flow capacity is maintained in stream channels and floodplains, and achieve flood control using biotechnical techniques instead of storm drains, culverts, riprap, and other forms of structural stabilization.
Implementation Programs	EH-3.f Require Hydrologic Studies	Continue to require submission of detailed hydrologic and geologic studies for any proposed development that could increase sedimentation of a watercourse or alter natural drainage patterns.
	EH-3.h Retain Ponding Areas	Maintain publicly controlled flood ponding areas in a natural state for flood control, and continue to promote compatible uses in ponding areas, such as agriculture, open space, and recreation.
	EH-3.k Anticipate Sea Level Rise	Work with the U.S. Geological Survey, the San Francisco Bay Conservation and Development Commission, and other monitoring agencies to track bay and ocean levels; utilize estimates for mean sea level rise to map potential areas subject to future inundation (including by updating information about watershed channel conditions and levee elevations); and amend the Development Code to incorporate construction standards consistent with the policies of BCDC's Bay Plan for any areas subject to increased flooding from a rise in sea level.
	EH-3.l Limit Seawall Barriers	Limit repair, replacement, or construction of coastal sea walls and erosion barriers consistent with Local Coastal Program requirements, and as demonstrated to be necessary to protect persons and properties from rising sea level.
	EH-3.p Assess the Cumulative Impacts of Development in Flood Prone Areas	Consider the effects of upstream development, including impervious surfaces, alteration of drainage patterns, reduction of vegetation, increased sedimentation, and others, on the potential for flooding in low-lying areas. Consider watershed studies to gather detailed information.
	EH-3.q Develop Watershed Management and Monitoring Plans	Develop watershed-specific, integrated watershed management and monitoring plans that include development guidelines, natural flood mitigation measures, biomechanical technologies, and the enhancement of hydrological and ecological processes. The guiding principles of the watershed plans shall equally consider habitat and species protection and monitoring as well as the protection of human life and property.

*Source: Marin County 2007.*

### A.3.6 Marin County Stormwater Pollution Prevention Program

The Marin County Stormwater Pollution Prevention Program (MCSTOPPP) is a joint effort of the cities, towns and unincorporated areas of Marin County that began in 1993 to address stormwater pollution prevention with the following objectives:

- prevent stormwater pollution
- protect and enhance water quality in creeks and wetlands
- preserve beneficial uses of local waterways.

MCSTOPPP helps coordinate and provide consistency between the individual participants and documents their efforts in annual reports. These reports include information on illegal discharges, street cleaning efforts, creek maintenance, new development, and other issues of concern (MCSTOPPP 2012).

### A.3.7 Marin County Watershed Program

The Marin County Watershed Program (Program) was initiated in 2008 to develop a partnership and framework for integrating flood protection, creek and wetland restoration, fish passage, and water quality improvements to enhance Marin's watersheds. Master plans and technical studies for certain Marin County watersheds are being developed under the Program. Funds will need to be identified in the future to implement and construct the improvements under the individual master plans (RVFPWP 2012). Individual watershed and flood protection programs relevant to the District's preserves that are underway under this Program include (Marin County 2009):

- Gallinas Creek
- Miller Creek
- Novato
- Ross Valley
- San Geronimo Valley
- Southern Marin (includes Arroyo Corte Madera del Presidio and East and West Creek watersheds).

### A.3.8 North Bay Watershed Association

The North Bay Watershed Association (NBWA) is a partnership of 16 regional and local public agencies throughout Marin, Sonoma, and Napa counties working to promote the stewardship of the San Pablo Bay watershed (NBWA 2011).

## A.4 Regulations and Policies for Geological and Soil Resources and Hazards

The following summarizes regulatory laws and regional policies established to protect public safety in regards to geologic and soil hazards that may require consideration when implementing various elements of this RTMP.

### A.4.1 THE ALQUIST-PRIOLO EARTHQUAKE FAULT ZONING ACT (APEFZA) (1972) AND THE SEISMIC HAZARDS MAPPING ACT (1991):

These acts were established to protect the public from the effects of ground shaking and ground failure during large earthquakes. Fault Zone Mapping, established by the State Geologist, is used to regulate most development projects within these zones. The APEFZA prohibits construction of any buildings over or within 50 feet of an active fault trace as identified by the State Geologists Fault Zone Mapping.

### A.4.2 Marin Countywide Plan

The Marin Countywide Plan includes policies to protect people and property from risks associated with seismic activity and geologic conditions. The following policies may be relevant in implementation of the RTMP.

Table A-3 Marin Countywide Plan Geologic Hazard Policies		
Goal, Policy, or Program	Policy Number and Title	Description
Policies	EH-2.1 Avoid Hazard Areas	Require development to avoid or minimize potential hazards from earthquakes and unstable ground conditions.
	EH-2.2 Comply with Alquist Priolo Act	Continue to implement and enforce the Alquist-Priolo Earthquake Fault Zoning Act
Implementation Programs	EH 2.a Require Geotechnical Reports	Require Geotechnical Reports. Continue to require any applicant for land division, master plan, development approval, or new construction in a geologic hazard area to submit a geotechnical report prepared by a State-certified Engineering Geologist or a Registered Geotechnical Engineer that: <ul style="list-style-type: none"> <li>evaluates soil, slope, and other geologic hazard conditions;</li> <li>commits to appropriate and comprehensive mitigation measures sufficient to reduce risks to acceptable levels, including post-construction site monitoring, if applicable;</li> <li>addresses the impact of the project on adjacent lands, and potential impacts of offsite conditions; and</li> <li>meets the requirements of other agency regulations with jurisdiction in the hazard area, such as BCDC requirements for the safety of fills consistent with the Bay Plan.</li> </ul>
	EH-2.b Require Construction Observation and Certification	Require any work or construction undertaken to correct slope instability or mitigate other geologic hazard conditions to be supervised and certified by a geotechnical engineer and/or an engineering geologist.

<b>Table A-3 Marin Countywide Plan Geologic Hazard Policies</b>		
<b>Goal, Policy, or Program</b>	<b>Policy Number and Title</b>	<b>Description</b>
	EH-2.f Avoid Known Landslide Areas	Continue to prohibit development in landslide areas and on landslide-prone deposits on steep slopes, except where the required geotechnical report indicates that appropriate mitigation measures can stabilize the site for construction.
	EH-2.g Identify Compressible Soil Potential	Require that geotechnical reports for projects on land underlain by compressible materials (such as fill, bay mud, and marsh or slough areas) delineate locations where settlement will be greatest and subsidence may occur, and recommend site preparation and construction techniques necessary to reduce risk and public liability to an acceptable level.
	EH-2.i Minimize Impacts of Site Alteration	Amend the Development Code to strictly limit the extent of any proposed fill, excavation, or other grading activities that could create or exacerbate risks in areas susceptible to geologic hazards.
	EH-2.l Reliability of Lifelines and Access (Evacuation) Routes	In cooperation with utility system providers, emergency management agencies, and others, assist in the development of strategies to reduce adverse effects of geologic hazards, especially fault surface rupture and landslides to critical public lifelines, and access (i.e., evacuation) routes in an emergency.

*Source: Marin County 2007*

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APPENDIX B

Road and Trail Typical Design Specifications

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**DRAFT**  
**SUBJECT TO REVISION**

# **ROAD AND TRAIL TYPICAL DESIGN SPECIFICATIONS**

**June 8, 2008**



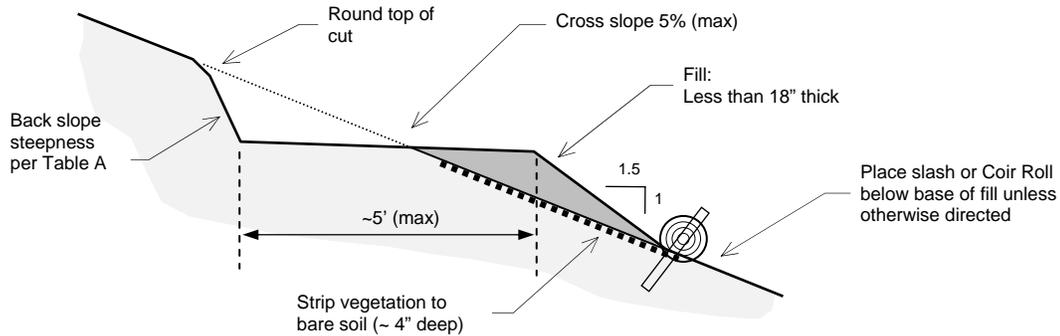
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	<b><u>SECTION 1: NOTES</u></b>	<b>Status</b>
1A	Notes	Incomplete
	<b><u>SECTION 2: VEGETATION</u></b>	
	Section vegetation removal	Not done
	<b><u>SECTION 3: TRAILS</u></b>	
3A	Partial bench	X
3B	Cut bench	X
3C	Fill bench	X
3D	Rock bench	X
3E	Road width trail	X
3F	Road to trail conversion	X
	<b><u>SECTION 4: ROADS</u></b>	
4A	Partial bench	Not done
4B	Cut bench	Not done
4C	Fill bench	Not done
4D	Aggregate surfacing	X
4E	Ranch Road Partial Bench	X
	<b><u>SECTION 5: STREAM CROSSINGS</u></b>	
5A	Culvert	X
5B	Embedded culvert	X
5C	Rock ford	Needs more edits
5D	Trail ford	Needs more edits
5E	Puncheon	Incomplete
5F	Bridge bank armor	Incomplete
5G	Downspout	Needs to be updated
5H	Energy dissipater	
	<b><u>SECTION 6: ROAD/TRAIL DRAINAGE</u></b>	
6A	Reverse grade dip	X
6B	Knick	X
6C	Waterbar	X
6D	Ditch relief culvert	X
6E	Ditch	X
6G	Road Surface Geometry	X
6F	Subdrain	
	<b><u>SECTION 7: STRUCTURES</u></b>	
7A	Wood lag retaining wall	X
7B	Rock trail buttress	X
7C	Single crib log trail buttress	X
7D	Trail steps	X
7E	Rip Rap	X
	<b><u>SECTION 8: EROSION CONTROL</u></b>	
8A	Erosion control notes	Needs to be updated
8B	Straw roles	X
8C	Straw bales	X
	<b><u>SECTION 9: TRAIL ABANDONMENT</u></b>	
9A	Perched fill removal	X
9B	Crossing removal	X
9C	Grade Check – Rip rap	Needs to be updated
9D	Grade Check - Log	Needs to be updated

## ROAD PARTIAL BENCH (< 30% Slopes)



### NOTES

- Trail shall be constructed at 5 foot max width unless otherwise specified
- Trail shall be constructed on balanced cut and fill
- Areas to receive fill shall be stripped of vegetation and highly organic soil (~ 4" depth)
- Onsite soils may be reused as fill. Fill shall be compacted to a level equal or greater than the surrounding materials (approximately 85 percent relative compaction per ASTM D 1557); During placement and compaction of fill, the moisture content of the materials being placed shall be maintained as necessary.
- Fill shall be a maximum of 18 inches thick unless otherwise specified
- Fill embankment shall be inclined no steeper than 1.5:1 (unless otherwise specified)
- Cutbank backslope shall be inclined at similar steepness to adjacent unfailed cuts in similar soils and height. Refer to Table A for general guideline. Where cuts are steeper than 6 feet of where seepage of water of unsuitable earth materials are encountered, the backslope shall be selected by the project geotechnical consultant.
- All disturbed areas shall be treated to control erosion per specifications
- Specifications are indented only as guideline, modifications may be made in the field by geotechnical consultant or designee

TABLE A

Material	ASTM Classification	Back slope (H:V)
Competent Rock	--	½ : 1
Dense soil – weathered bedrock (sand/gravel with fines)	SM, SC, GM, GC	¾ -1 : 1:1
Soft soil (sandy clay and cohesionless sands)	CL, ML, SW, SP, GW, SP	1-1½ : 1



### **PARTIAL BENCH TRAIL CONSTRUCTION** NTS



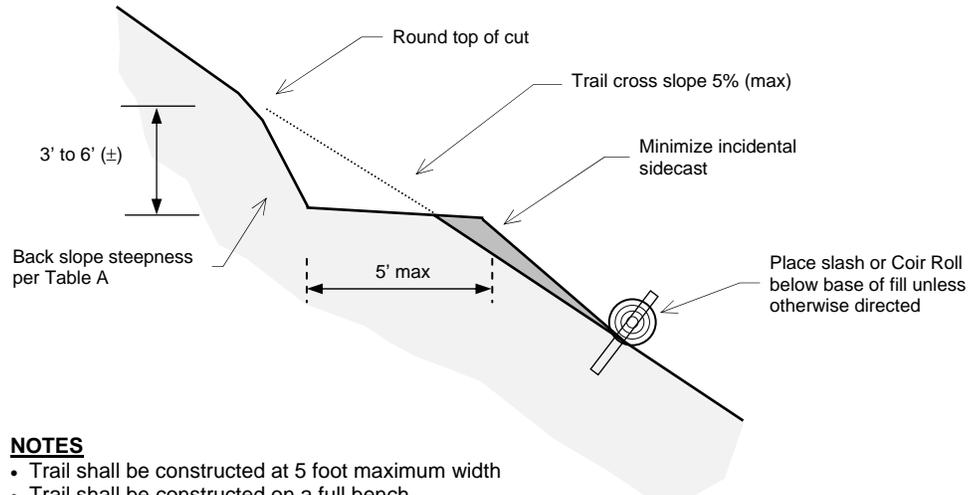
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## PARTIAL BENCH TRAIL TYPICAL SPECIFICATIONS

**Standard Detail 3A**

Date: May 3, 2009

### TRAIL CUT BENCH (> 60% Slopes)



#### NOTES

- Trail shall be constructed at 5 foot maximum width
- Trail shall be constructed on a full bench
- Spoils shall be either endhailed to a stable location or "scattered casted" below the trail. Incidental sidecast shall not exceed 8" inches in thickness nor extend downslope more than 15 feet
- Within 50 feet of a designated watercourse spoils shall be endhailed to an approved location
- Cutbank backslope shall be inclined at similar steepness to adjacent unfailed cuts in similar soils and height. Refer to Table A for general guideline. Where cuts are steeper than 6 feet of where seepage of water of unsuitable earth materials are encountered, the backslope shall be selected by the project geotechnical consultant.
- All disturbed areas shall be treated to control erosion per specifications
- Specifications are indented only as guideline, modifications may be made in the field by geotechnical consultant or designer

**TABLE A**

Material	ASTM Classification	Back slope (H:V)
Competent Rock	--	½ : 1
Dense soil – weathered bedrock (sand/gravel with fines)	SM, SC, GM, GC	¾ - 1 : 1:1
Soft soil (sandy clay and cohesionless sands)	CL, ML, SW, SP, GW, SP	1-1½ : 1

**3B** CUT BENCH TRAIL CONSTRUCTION  
NTS



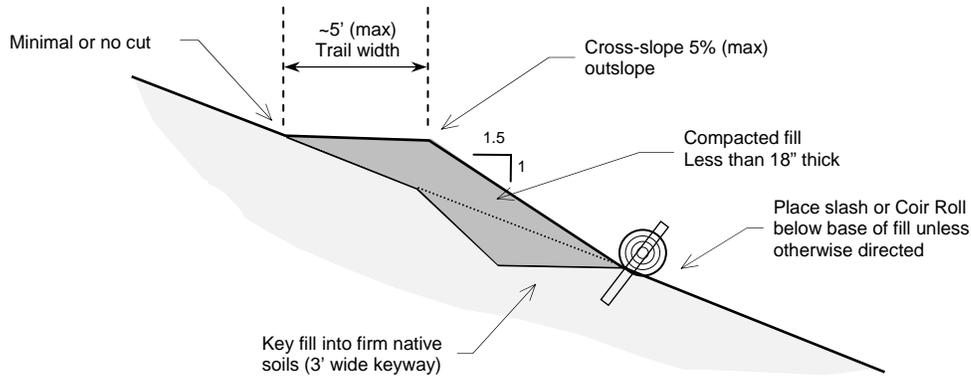
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## TRAIL CUT BENCH TYPICAL SPECIFICATIONS

**Standard Detail 3B**

Date: May 3, 2009

## TRAIL FILL BENCH



### NOTES

- Trail shall be constructed at 5-foot maximum width
- Areas to receive fill shall be stripped to remove vegetation, near surface roots, brush, highly organic soils and other unsuitable fill material. Depth of stripping is assumed to be 6 inches.
- Fill shall be keyed and bench into firm native soils. Keyways shall be minimum 3 feet wide and inclined 5% into slope.
- Onsite soils may be reused as fill. Fill shall be adequately moisture condition and compacted to a level equal or greater than the surround materials (about 85 percent relative compaction per ASTM D 1557); During placement and compaction of fill, the moisture content of the materials being placed shall be maintained as necessary.
- Fill embankment shall be inclined no steeper than 1.5:1 unless otherwise specified or directed
- All disturbed areas shall be treated to control erosion per specifications
- Specifications are indented only as guideline, modifications may be made in the field by geotechnical consultant or designee

### **3C** FILL BENCH TRAIL CONSTRUCTION NTS



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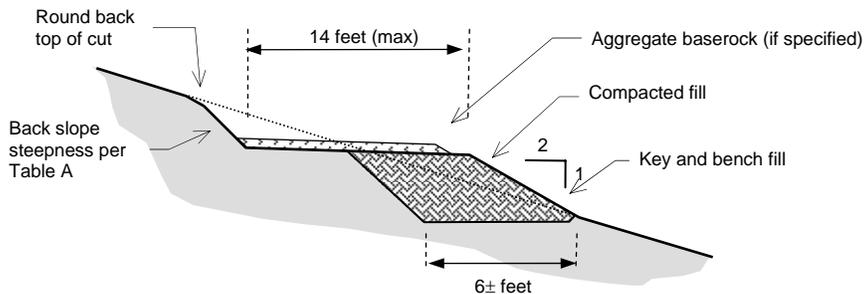
## PARTIAL BENCH TRAIL TYPICAL SPECIFICATIONS

**Standard Detail 3C**

Date: May 3, 2009

## ROAD WIDTH TRAIL:

### Partial Bench construction



#### NOTES

- Road shall be constructed at a maximum width less than 14 feet
- Areas to receive fill shall be stripped to remove all vegetation, roots, brush, highly organic soils and other unsuitable fill material. Depth of stripping is assumed to be 6 to 12 inches.
- Fill shall be keyed and benched into firm native soils. Keyways shall be minimum 6 feet wide and inclined 5% into slope
- In areas where expansive subgrade is encountered, the subgrade should be moisture conditioned to between 2 and 4 percent over optimum moisture. These areas will be located in the field by the geotechnical consultant.
- Over-excavation may be required in limited areas to obtain the required compaction. In addition, the use of stabilization fabric (Mirafi 500X or equivalent) may be used to stabilize localized areas. The depth of over-excavation and placement of stabilization fabric should be reviewed by the geotechnical consultant during grading.
- Onsite soils may be reused as engineered fill. Backfill should consist of select structural back fill consisting of 50 percent of the material being retained on the #200 sieve, the fines portion being non-expansive, no rock or cobbles greater than 3 inches in size, and free of organic material. Any imported fill should consist of non-expansive soil. All fill shall be reviewed by the geotechnical consultant 48 hours prior to placement.
- Fill shall be placed in maximum 8 inch thick horizontal lifts and compacted to a minimum of 90 percent per ASTM D 1557. During placement and compaction of fill, the moisture content of the materials being placed shall be maintained.
- Fill shall be brought up to grade at a 2:1 slope unless otherwise specified
- Cutbank backslope shall be inclined at similar steepness to adjacent unfailed cuts in similar soils and height. Refer to Table B for general guideline. Where cuts are steeper than 6 feet of where seepage of water of unsuitable earth materials are encountered, the backslope shall be selected by the project geotechnical consultant.
- Where specified aggregate baserock should consist of Class II baserock conforming to the latest Caltrans standards. Aggregate baserock should be minimum 6" thick and compacted to a minimum of 95 percent relative compaction.
- All disturbed areas shall be treated to control erosion per specifications
- Specifications are indented only as guideline, modifications may be made in the field by geotechnical consultant or designee

**TABLE B**

Material	ASTM Classification	Back slope (H:V)
Competent Rock	--	¾ : 1
Dense soil – weathered bedrock (sand/gravel with fines)	SM, SC, GM, GC	1:1
Soft soil (sandy clay and cohesionless sands)	CL, ML, SW, SP, GW, SP	1½ :1



### ROAD WIDTH TRAIL PARTIAL BENCH CONSTRUCTION

NTS



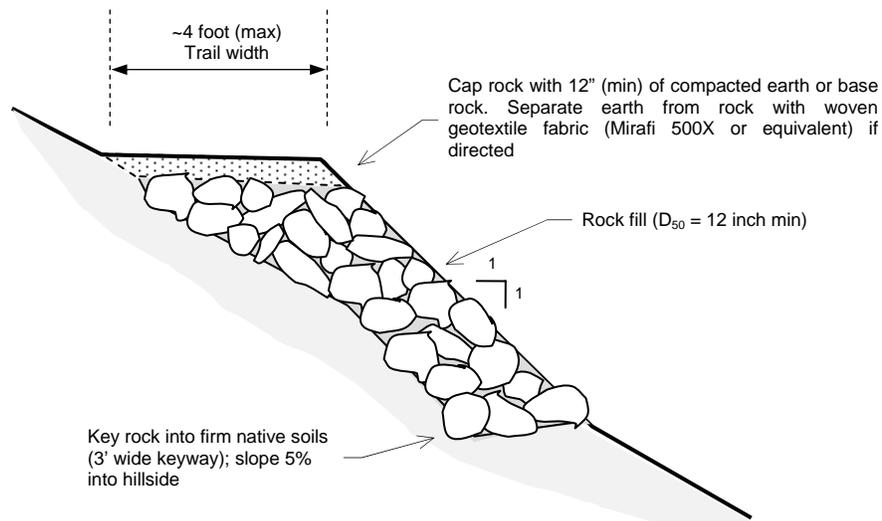
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## PARTIAL BENCH TRAIL TYPICAL SPECIFICATIONS

**Standard Detail 3E**

Date: May 3, 2009

## TRAIL ROCK FILL BENCH (< 60% Slopes)



### NOTES

- Trail shall be constructed at 4-foot maximum width unless otherwise specified
- Areas to receive fill shall be stripped of vegetation and highly organic soil (~ 4" depth)
- Fill shall be keyed and bench into firm native soils. Keyways shall be minimum 3 feet wide and inclined 5% into slope.
- Rock fill shall consist of sound durable rock with 50% equal or greater than 12 in diameter. Rock shall be placed for maximum stability.
- Rock shall be brought up to within 1 foot of final trail grade at 1:1 slope
- Rock embankment shall be capped by 12 inches of compacted fill or baserock. Fill/baserock shall be adequately moisture conditioned and compacted to a level equal or greater than the surround materials.
- Separate fill from rock with woven geotextile fabric (Mirafi 500X or equivalent) unless otherwise specified
- Specifications are indented only as guideline, modifications may be made in the field by geotechnical consultant or designee



### ROCK FILL TRAIL CONSTRUCTION NTS



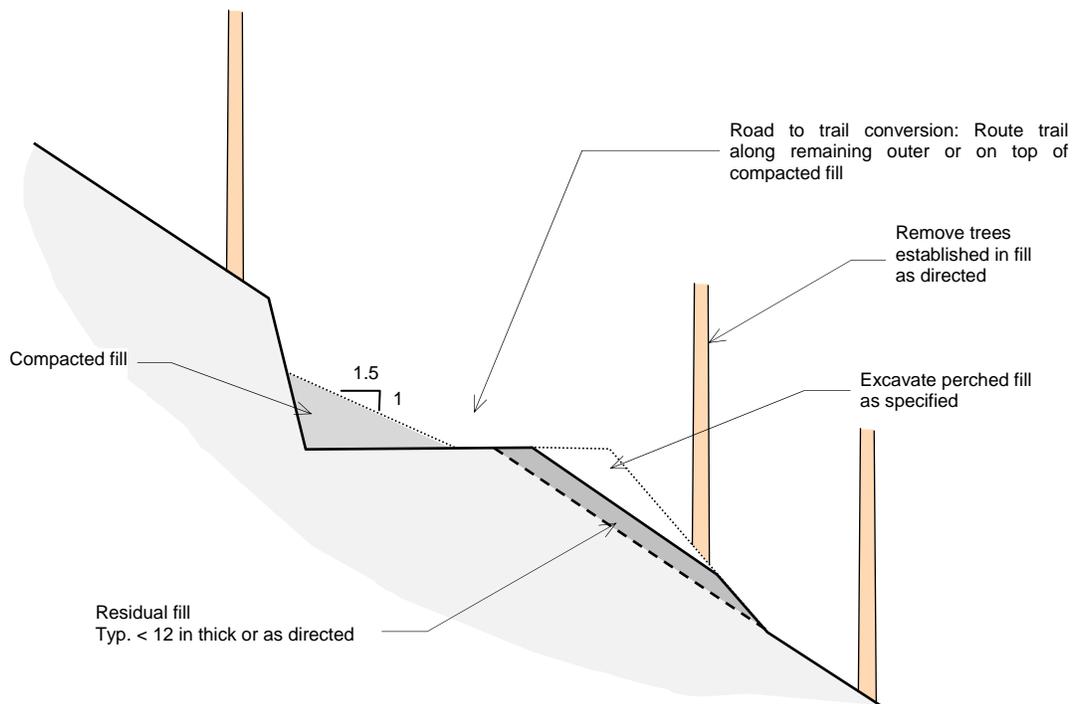
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## PARTIAL BENCH TRAIL TYPICAL SPECIFICATIONS

**Standard Detail 3D**

Date: May 3, 2009

## PERCHED FILL REMOVAL / ROAD TO TRAIL CONVERSION



### NOTES

- Remove trees established in roadway and in fill as directed
  - Trees greater than 6 inch diameter shall be marked by District prior to removal
- Excavate perched fill as specified and directed
  - Limits of fill removal to be identified in the field by project geologist or designee
- Spoils shall be compacted along inboard edge of road
  - Spoils shall not be placed in any areas where seasonal bank seeps or wet areas are present
  - Areas to receive fill shall be cleared of vegetation
  - Spoils shall be placed in thin lifts not to exceed 8 inches in maximum thickness and compacted (minimum 85 percent relative compaction). Compacting may include track walking with a dozer, bucket of the excavator, roller or hand tamper. Spoils may need to be moisture conditioned to achieve a suitable level of compaction.
  - Spoils shall be placed a maximum of 5 feet deep with an embankment face inclined no steeper than 1.5:1 (65%) unless otherwise directed or specified
  - Project geotechnical consultant or designee shall approve all spoil sites prior to fill placement
- Specifications are indented only as guideline, modifications may be made in the field by project geotechnical consultant or designee



**PERCHED FILL REMOVAL /ROAD TO TRAIL CONVERSION**  
NTS



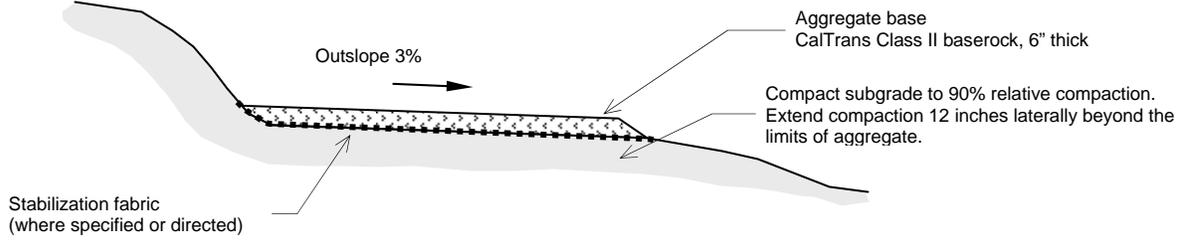
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PERCHED FILL REMOVAL /  
ROAD TO TRAIL CONVERSION

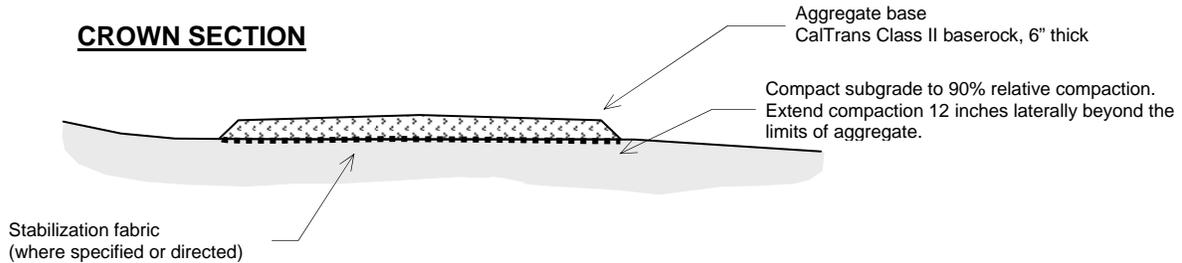
**Standard Detail 3F**

Date: May 3, 2009

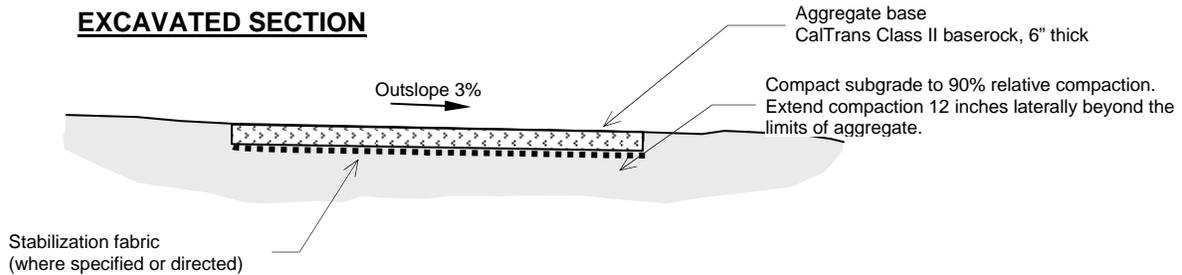
### OUTSLOPE SECTION



### CROWN SECTION



### EXCAVATED SECTION



#### NOTES

- The subgrade for the road trail should be scarified to a depth of 6 inches, moisture conditioned and compacted to a minimum of 90 percent relative compaction. The subgrade should be compacted to a minimum of 12 inches beyond (laterally) the edge of the base rock surface.
- In areas where expansive subgrade is encountered, the subgrade should be moisture conditioned to between 2 and 4 percent over optimum moisture. These areas will be located in the field by the geotechnical engineer.
- Over-excavation may be required in limited areas to obtain the required compaction. In addition, the use of stabilization fabric (Mirafi 500X or equivalent) may be used to stabilize localized areas. The depth of over-excavation and placement of stabilization fabric should be reviewed by the geotechnical engineer during grading.
- Aggregate baserock should consist of Class II baserock conforming to the latest Caltrans standards. Aggregate baserock should be compacted to a minimum of 95 percent relative compaction.



**4D** **AGGREGATE SURFACING - ROAD**  
NTS



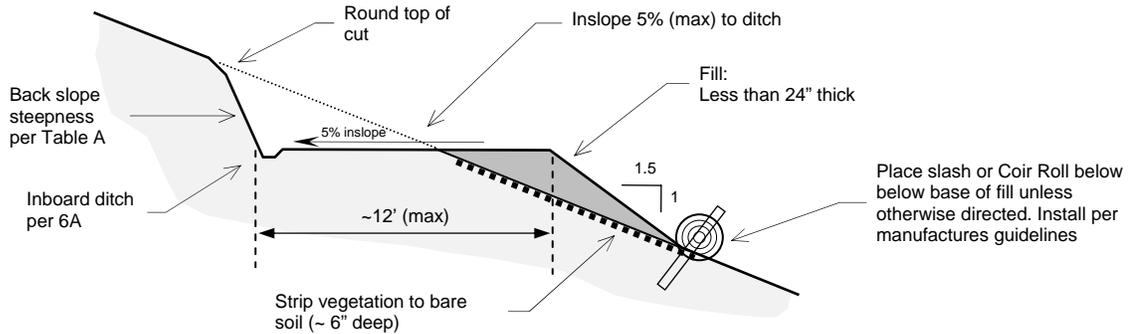
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ROAD AGGREGATE SURFACING  
TYPICAL SPECIFICATIONS

**Standard Detail 4D**

Date: May 3, 2009

## RANCH ROAD PARTIAL BENCH (< 30% Slopes)



### NOTES

- Ranch road shall be constructed at 12 foot max width unless otherwise specified
- Road shall be constructed on balanced cut and fill
- Areas to receive fill shall be stripped of vegetation and highly organic soil and keyed where necessary (~ 6" depth)
- Onsite soils may be reused as fill. Fill shall be compacted to a level equal or greater than the surrounding materials (approximately 85 percent relative compaction per ASTM D 1557); During placement and compaction of fill, the moisture content of the materials being placed shall be maintained as necessary.
- Fill shall be a maximum of 24 inches thick unless otherwise specified
- Fill embankment shall be inclined no steeper than 1.5:1 (unless otherwise specified)
- Cutbank backslope shall be inclined at similar steepness to adjacent unfilled cuts in similar soils and height. Refer to Table A for general guideline. Where cuts are steeper than 6 feet or where seepage of water of unsuitable earth materials are encountered, the backslope shall be selected by the project geotechnical consultant.
- Road shall be insloped 5% (max) to a 2 foot wide, 1 foot deep inside ditch per 6E Typical Specification.
- All disturbed areas shall be treated to control erosion per specifications
- Specifications are intended only as guideline, modifications may be made in the field by geotechnical consultant or designer

**TABLE A**

Material	ASTM Classification	Back slope (H:V)
Competent Rock	--	½ : 1
Dense soil – weathered bedrock (sand/gravel with fines)	SM, SC, GM, GC	¾ -1 : 1:1
Soft soil (sandy clay and cohesionless sands)	CL, ML, SW, SP, GW, SP	1-1½ : 1



### **RANCH ROAD PARTIAL BENCH CONSTRUCTION** NTS



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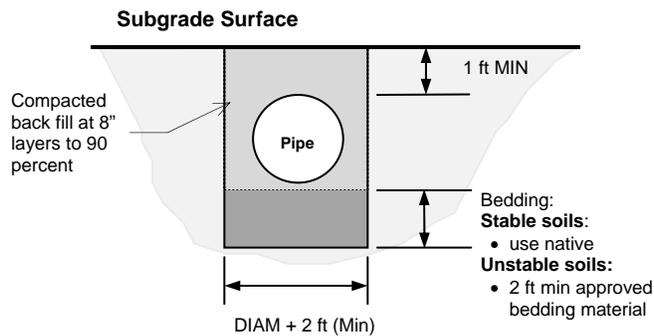
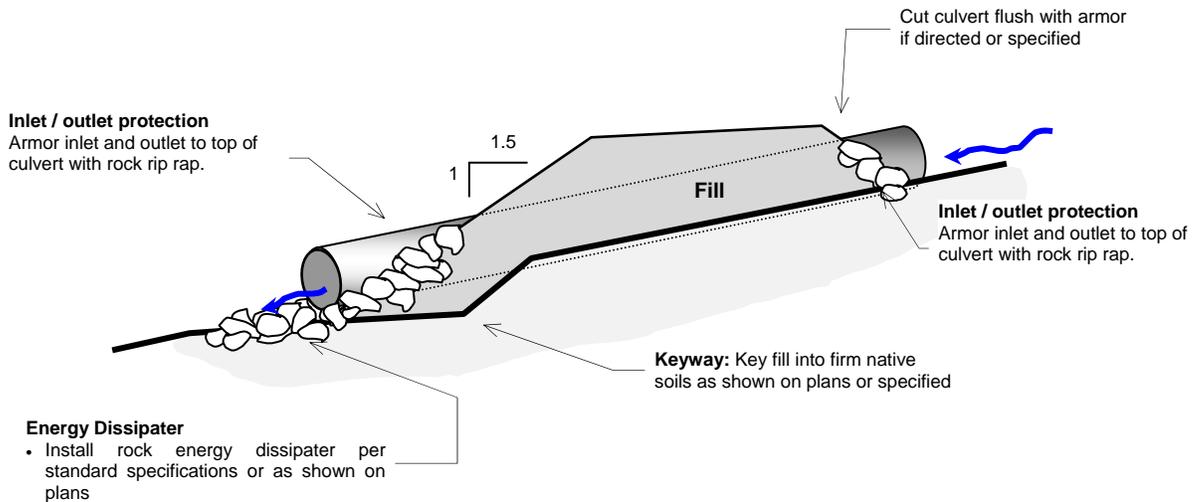
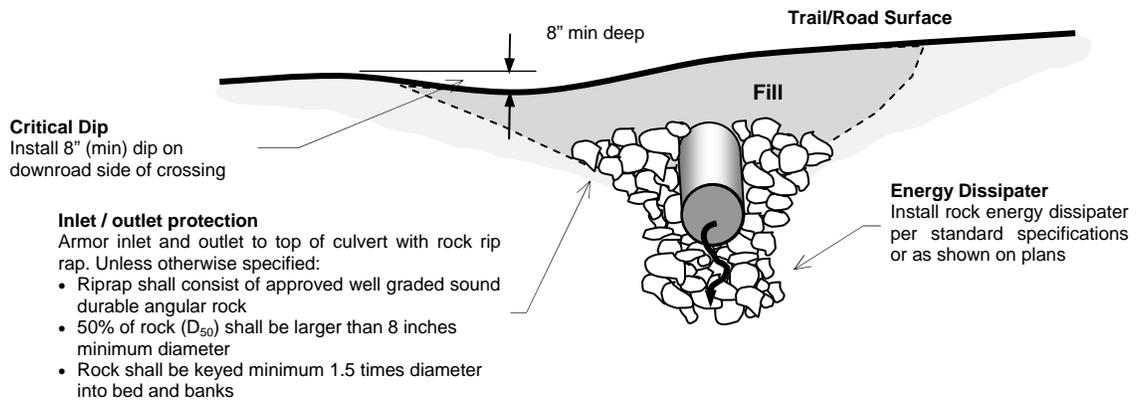
### PARTIAL BENCH RANCH ROAD TYPICAL SPECIFICATIONS

**Standard Detail 4E**

Date: May 3, 2009

5A

**PERMANENT CULVERT- RURAL ROAD**  
NTS



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**PERMANENT CULVERT  
TYPICAL SPECIFICATIONS**

**Standard Detail 5A**

Date: May 3, 2009

## **NOTES**

- **Culvert Orientation**
  - Culvert should be installed at the natural stream level, grade and orientation
- **Culvert bed**
  - The width of trenches shall permit satisfactory joining and through tamping of the backfill material
  - The culvert bed shall be clean and free of large woody debris and large rocks. Unsuitable material shall be replaced with selected granular foundation material and compacted to obtain uniform bed
  - Where rock, hardpan, or other unyielding material is encountered, it shall be removed below the foundation grade for a depth of at least 1 foot and a width of at least 2 feet plus the culvert diameter. This material shall be replaced with selected engineer fill.
  - The inlet to the culvert should be a countersunk 10% of the pipe diameter below stream grade so that the water falls into the culvert inlet.
- **Laying Pipe**
  - Culvert shall be laid in center of trench on uniform grade line to conform to the flow line of the stream. The entire length of pipe shall be in contact with the culvert bedding
  - Unless otherwise specified, the culvert shall have a minimum grade of 2%.
  - Culvert shall be joined and anchored per manufactures guidelines
- **Backfill**
  - Fill shall be keyed and bench into firm native soils. Areas to receive fill shall be stripped to remove vegetation, near surface roots, brush, highly organic soils and other unsuitable fill material.
  - Select mineral soil shall be used for culvert back fill. The back fill shall have no rocks greater than 3 inches in any dimensions placed closer than 1 foot to the culvert.
  - Backfill shall be adequately compacted throughout the entire process to a degree greater than the surrounding materials (approximately 85 percent relative compaction). During placement and compaction of fill, the moisture content of the materials being placed shall be maintained.
  - Fill shall be brought up to grade at a 1.5:1 slope unless otherwise specified
- **Culverts**
  - Culverts shall be smooth bore, double wall (ASTM D3350 and AASHTO M294, Type S)
  - Culverts distorted more than 10% of normal dimension, ruptured or broken shall be replaced
  - Culverts shall be cut flush with armored embankment/headwall if directed or specified
- **Inlet/outlet protection**
  - Armor inlet and outlet to top of culvert with rock rip rap
  - Riprap shall consist of approved well graded sound durable angular rock unless otherwise specified
  - 50% of rock ( $D_{50}$ ) shall be larger than 8 inches minimum diameter unless otherwise specified
  - Rock shall be keyed minimum 1.5 times diameter into bed and banks unless otherwise specified
- **Energy dissipater**
  - Culvert shall discharge onto rock apron per general specifications
- **Erosion Control**
  - On running streams, water will be pumped or diverted past the crossing and into the downstream channel during the construction process.
  - Critical dip (8" min) shall be installed on the down road side of crossing
  - Exposed soils shall be mulched per standard specification. Install coir roll at base of exposed soils
- **Department of Fish and Game Agreement**
  - Conform to Department of Fish and Game 1600 agreement where applicable



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## PERMANENT CULVERT NOTES TYPICAL SPECIFICATIONS

**Standard Detail 5A**

Date: May 3, 2009

5B

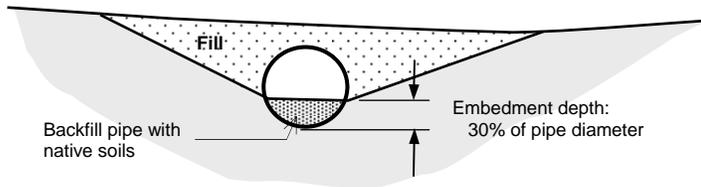
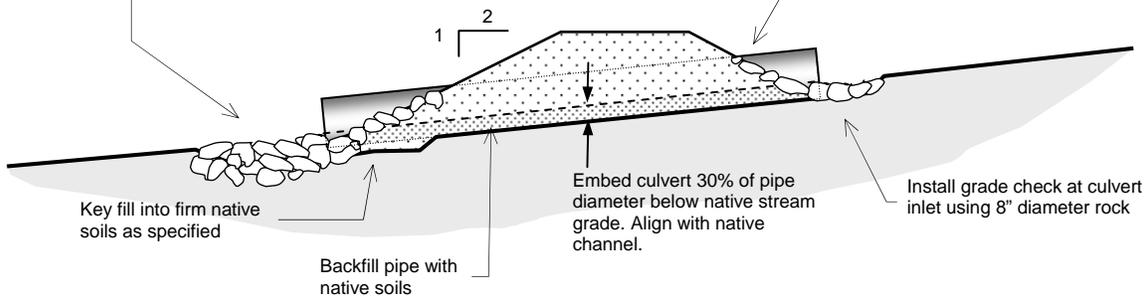
**EMBEDDED CULVERT**  
NTS

**Energy Dissipater**

- Install rock energy dissipater per standard specifications or as shown on plans

**Inlet / outlet protection**

Armor inlet and outlet to top of culvert with rock rip rap.



**Critical Dip**

Install 8" (min) dip on downroad side of crossing

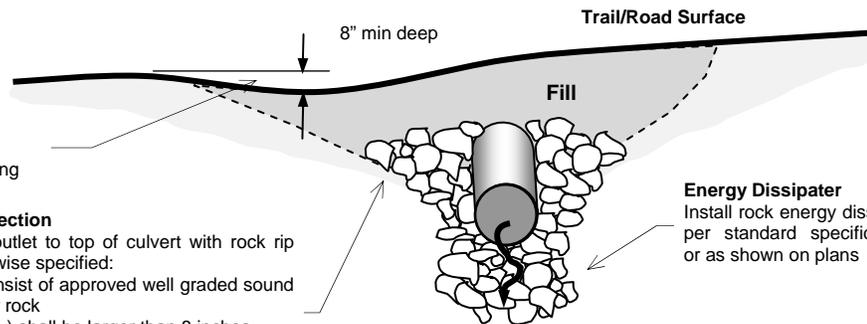
**Inlet / outlet protection**

Armor inlet and outlet to top of culvert with rock rip rap. Unless otherwise specified:

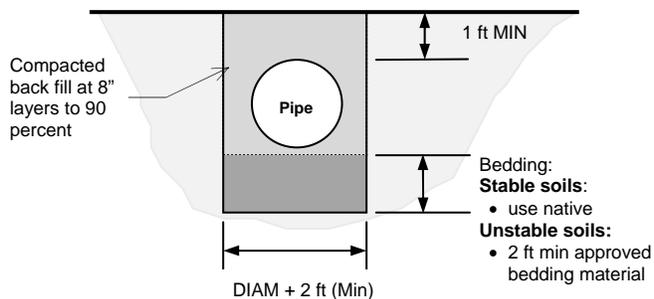
- Riprap shall consist of approved well graded sound durable angular rock
- 50% of rock (D<sub>50</sub>) shall be larger than 8 inches minimum diameter
- Rock shall be keyed minimum 1.5 times diameter into bed and banks

**Energy Dissipater**

Install rock energy dissipater per standard specifications or as shown on plans



**Subgrade Surface**



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**EMBEDDED CULVERT**  
**TYPICAL SPECIFICATIONS**

**Standard Detail 5B**

Date: May 3, 2009

## **NOTES**

- **Culvert Orientation**
  - Culvert should be installed at the natural stream level, grade and orientation
- **Culvert bed**
  - The width of trenches shall permit satisfactory joining and through tamping of the backfill material
  - The culvert bed shall be clean and free of large woody debris and large rocks. Unsuitable material shall be replaced with selected granular foundation material and compacted to obtain uniform bed
  - Where rock, hardpan, or other unyielding material is encountered, it shall be removed below the foundation grade for a depth of at least 1 foot and a width of at least 2 feet plus the culvert diameter. This material shall be replaced with selected engineer fill.
  - The bottom of the culvert shall be buried (embedded) into the native channel not less than 30%
- **Laying Pipe**
  - Culvert shall be laid in center of trench on uniform grade line to conform to the flow line of the stream. The entire length of pipe shall be in contact with the culvert bedding
  - The bottom of the culvert shall be buried (embedded) into the native channel not less than 30% of the culvert diameter and backfilled with approved native soil
  - Culvert shall be joined and anchored per manufactures guidelines
- **Backfill**
  - Fill shall be keyed and bench into firm native soils. Areas to receive fill shall be stripped to remove vegetation, near surface roots, brush, highly organic soils and other unsuitable fill material.
  - Select mineral soil shall be used for culvert back fill. The back fill shall have no rocks greater than 3 inches in any dimensions placed closer than 1 foot to the culvert.
  - Backfill shall be adequately compacted throughout the entire process to a degree greater than the surrounding materials (approximately 85 percent relative compaction). During placement and compaction of fill, the moisture content of the materials being placed shall be maintained.
  - Fill shall be brought up to grade at a 1.5:1 slope unless otherwise specified
- **Culverts**
  - Culverts shall be smooth bore, double wall (ASTM D3350 and AASHTO M294, Type S)
  - Culverts distorted more than 10% of normal dimension, ruptured or broken shall be replaced
  - Culverts shall be cut flush with armored embankment/headwall if directed or specified
- **Inlet/outlet protection**
  - Armor inlet and outlet to top of culvert with rock rip rap
  - Riprap shall consist of approved well graded sound durable angular rock unless otherwise specified
  - 50% of rock ( $D_{50}$ ) shall be larger than 8 inches minimum diameter unless otherwise specified
  - Rock shall be keyed minimum 1.5 times diameter into bed and banks unless otherwise specified
  - Install rock grade check at culvert inlet using 8 inch minimum diameter rock. Extend rock 2 times culvert diameter upstream.
- **Energy dissipater**
  - Culvert shall discharge onto rock apron per general specifications
- **Erosion Control**
  - On running streams, water will be pumped or diverted past the crossing and into the downstream channel during the construction process.
  - Critical dip (8" min) shall be installed on the down road side of crossing
  - Exposed soils shall be mulched per standard specification. Install coir roll at base of exposed soils
- **Department of Fish and Game Agreement**
  - Conform to Department of Fish and Game 1600 agreement where applicable



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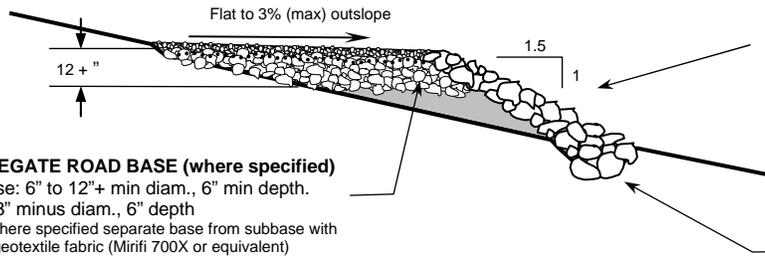
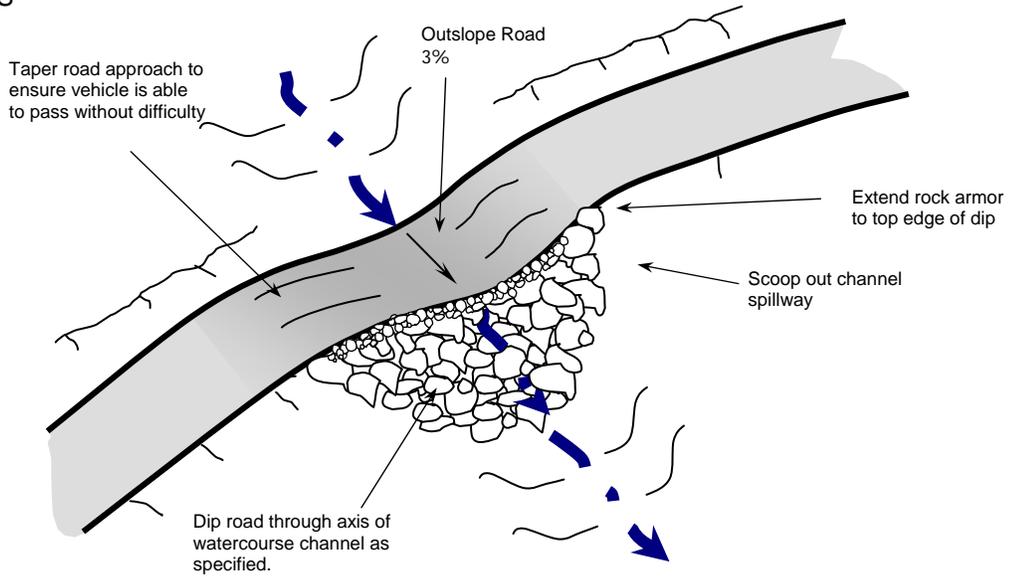
## EMBEDDED CULVERT NOTES TYPICAL SPECIFICATIONS

**Standard Detail 5B**

Date: May 3, 2009

5C

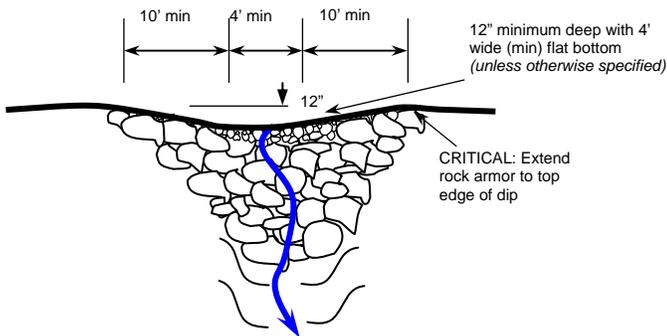
**ROCK FORD – RURAL ROAD**  
NTS



**ROCK ARMOR:**

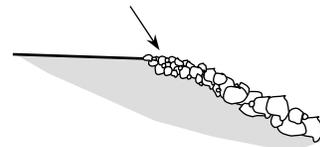
- Rock shall consist of approved sound durable angular rock
- 50% ( $D_{50}$ ) of rock shall be greater than 18 inches minimum diameter (*unless otherwise specified*).
- Rock should generally be well graded (incorporating mix of sizes)
- Voids shall be filled with smaller rock to prevent piping around the larger rock.
- Larger rock to be placed at base of apron

Key rock minimum of 12" into native soils



**LIP**

- Use smaller rock at lip of ford.
- Voids shall be filled with smaller rock to prevent piping around the larger rock.



**NOTE**

- Details are typical and intended for use as a guideline. Adjustments to the actual design may need to occur in field during time of construction due to local site conditions.
- Refer to site details for specific design criteria where applicable.



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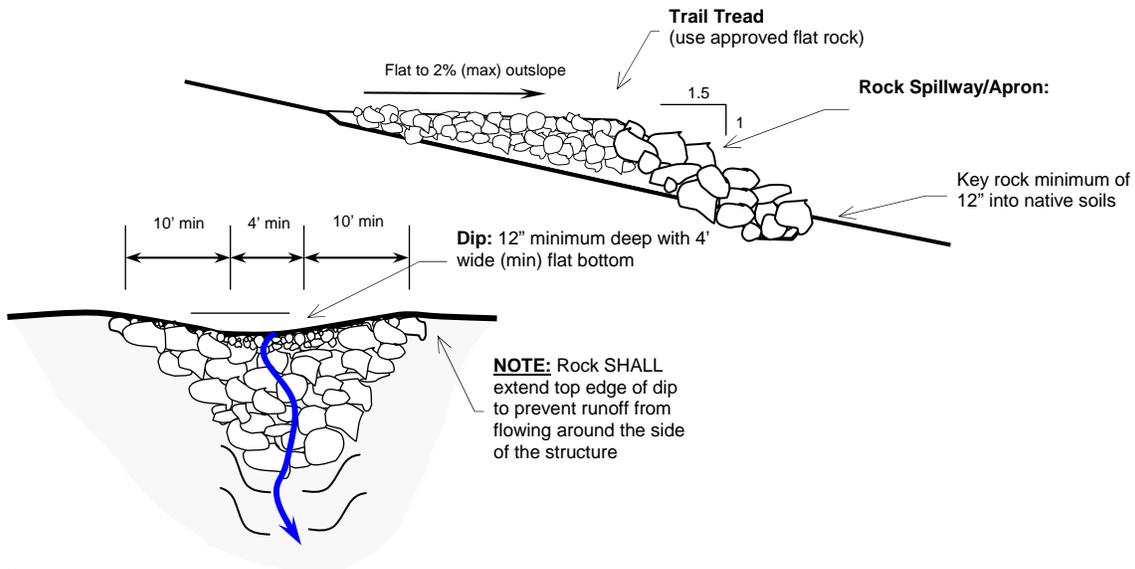
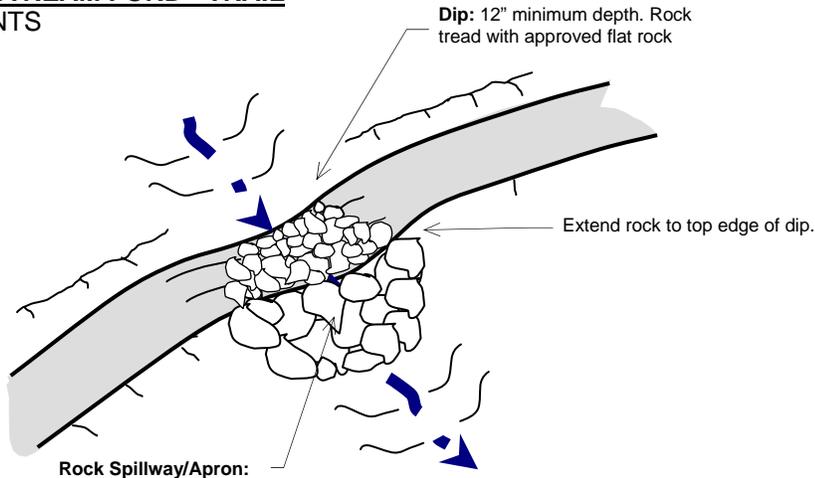
**ROCK FORD – RURAL ROAD**  
TYPICAL SPECIFICATIONS

**Standard Detail 5C**

Date: May 3, 2009



**STREAM FORD - TRAIL**  
NTS



**NOTES**

- Construct trail to dip trough watercourse.
  - Dip to be a minimum of 4 feet wide and 12 inches deep unless otherwise specified or directed
  - Establish well defined spillway at dip outlet
- Armor outside trail edge with rock to form apron in the spillway
  - Rock shall consist of approved sound durable angular rock
  - 50% (D<sub>50</sub>) of rock shall be greater than 18 inches minimum diameter (*unless otherwise specified*).
  - Rock should generally be well graded (incorporating mix of sizes)
  - Voids shall be filled with smaller rock to prevent piping around the larger rock
  - Larger rock to be placed at base of apron
  - Extend rock to top edge of dip. Rock must be placed high enough to form a well defined spillway to prevent high flows from eroding around the edge of the rock.
  - Rock to be placed no steeper than 1.5:1
- Armor trail tread with rock
  - Use 6" or larger diameter sound durable rock (*unless otherwise specified*)
  - Rock shall be flat and placed to create even trail tread
  - Backfill larger rocks with smaller rocks
- Specifications are indented only as guideline, modifications may be made in the field by geotechnical consultant or designee



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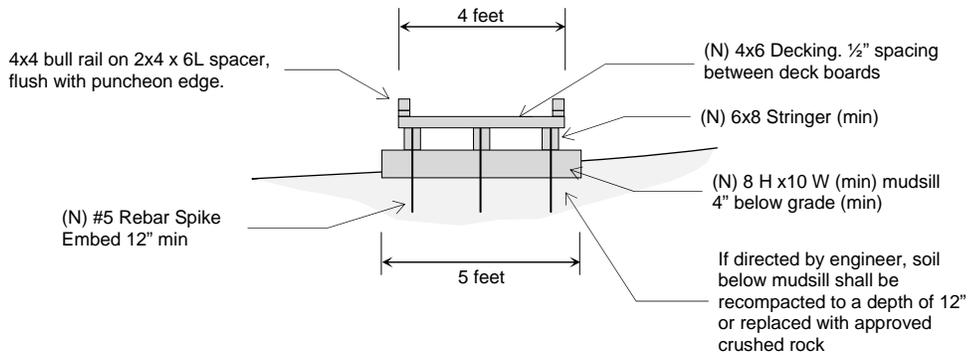
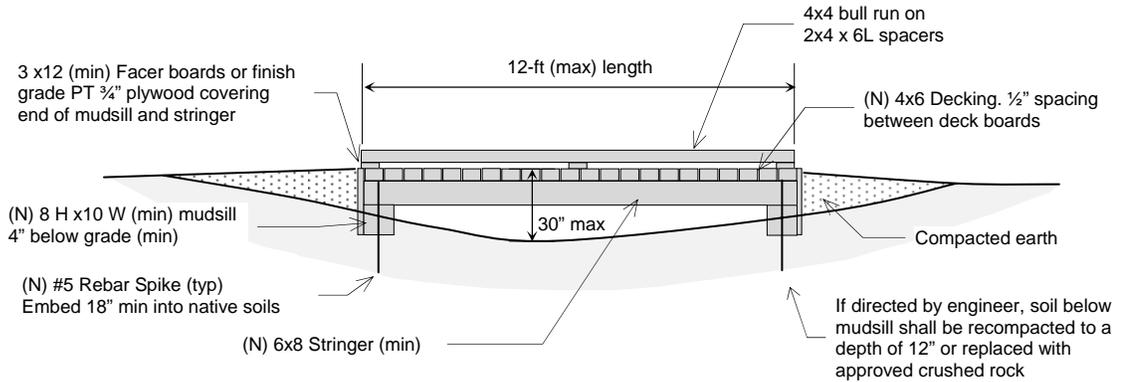
**ROCK FORD - TRAIL**  
**TYPICAL SPECIFICATIONS**

**Standard Detail 5D**

Date: May 3, 2009



**LOW PUNCHEON (BOARDWALK)**  
MROSD STANDARD SPECIFICATIONS (NTS)



**NOTES:**

- Standard puncheon width shall be 4-feet. Refer to site plan if narrower puncheon is proposed.
- All decking, beams, mudsills and wood in contact with earth or within 1 foot of earth shall be Con Heart redwood or approved plastic
- If directed by engineer, soil below mudsill shall be recompacted to a depth of 12" or replaced with approved crushed rock
- All hardware shall be galvanized
- Anchor decking with (2) 3/8" x 8" galvanized wire spikes (typ), predrill holes for spikes
- Anchor bull rail with (2) 3/8" x 10" galvanized wire spikes (typ), predrill holes for spikes
- Maintain 2% maximum slope on puncheon

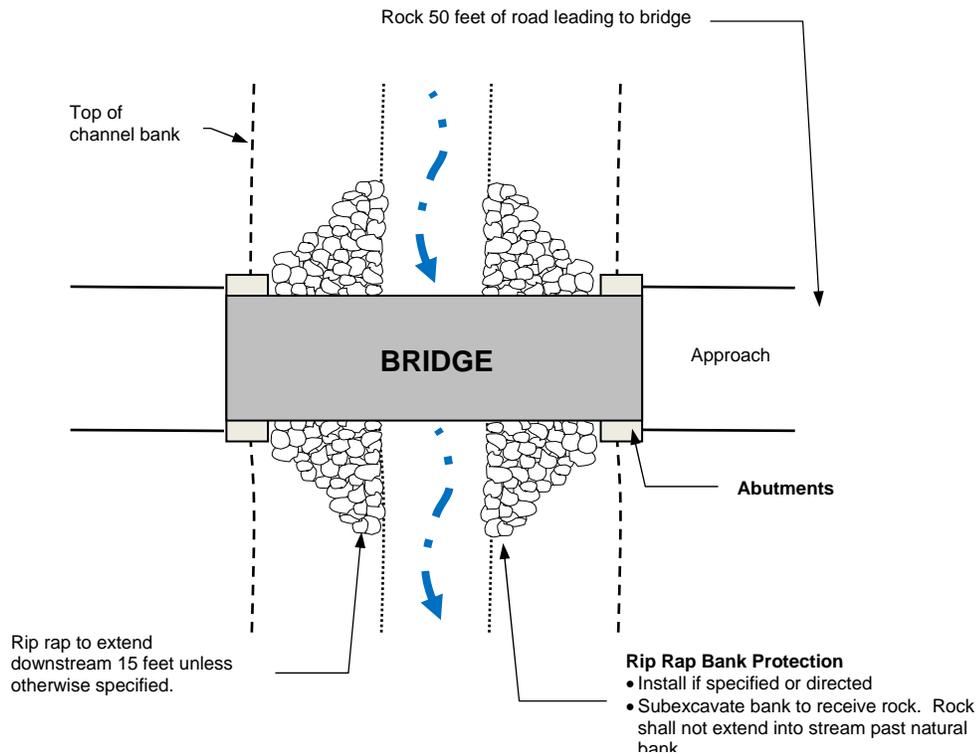
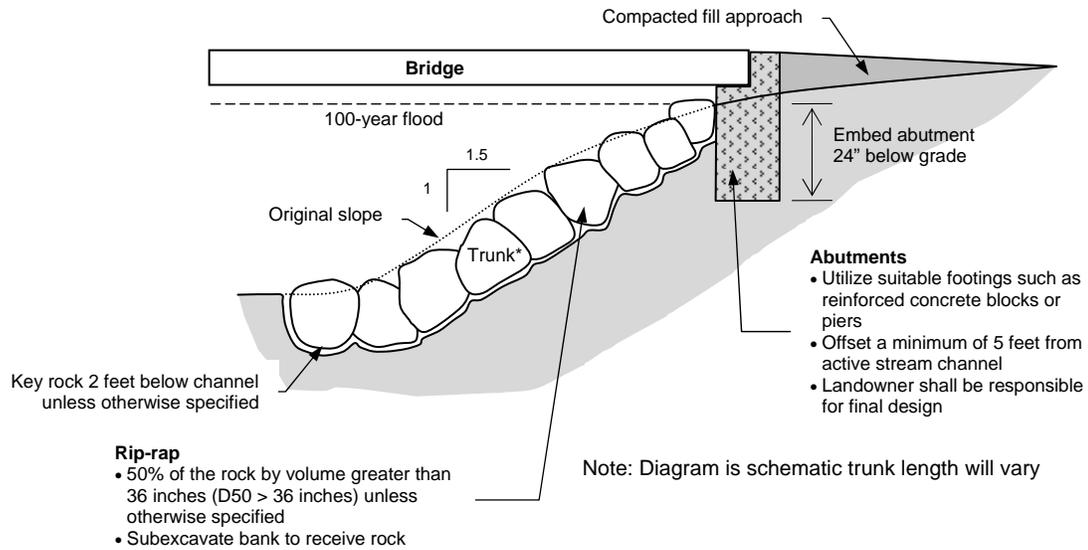


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TRAIL PUNCHEON  
TYPICAL SPECIFICATIONS

Standard Detail 5E

Date: May 3, 2009



**NOTES**

- Landowner shall be responsible for final bridge and abutment design
- Bridge shall be designed to support maximum load for timber operations
- Rock rip rap shall be placed as directed by RPF, specified in plan and as approved in DFG 1600 agreement
- Conform to requirements of the Department of Fish and Game 1600 agreement where applicable
- Bridge placement to be supervised by project engineer



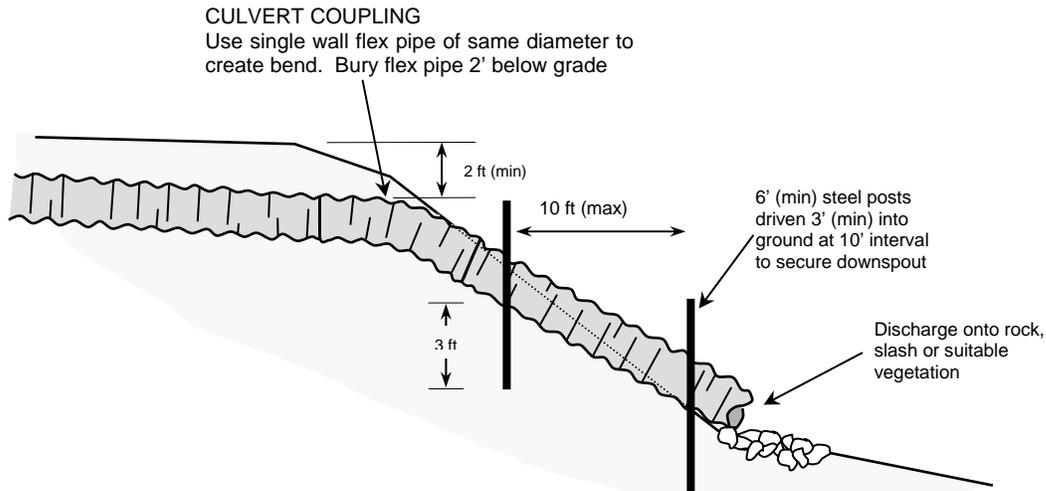
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 1002 Columbia Street, Santa Cruz, CA 95060  
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**BRIDGE ABUTMENT ARMOR  
 STANDARD PLAN**

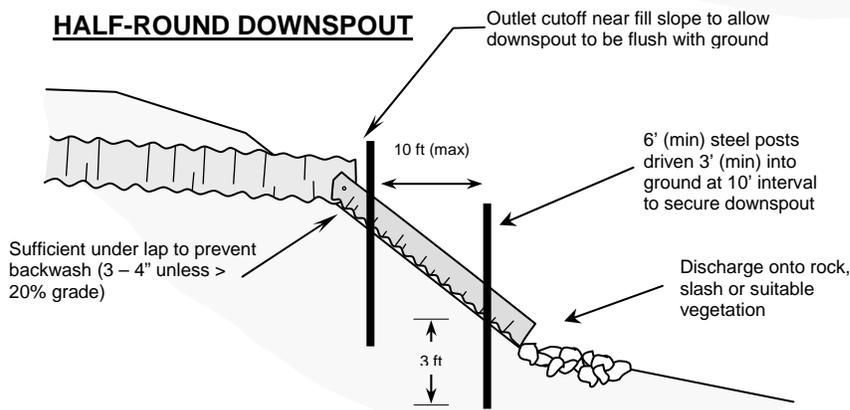
**Standard Detail 5F**

Date: March 1, 2009

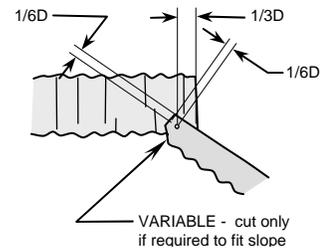
**FULL-ROUND DOWNSPOUT**



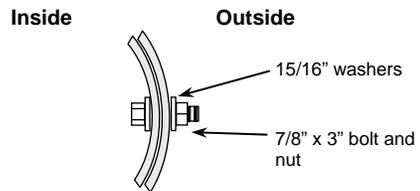
**HALF-ROUND DOWNSPOUT**



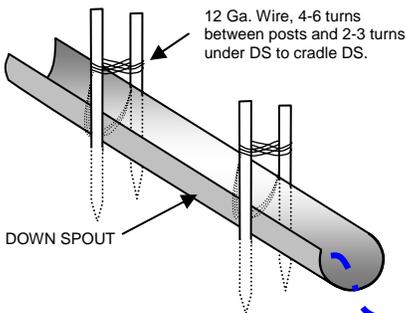
**HALF ROUND CONNECTION**



**BOLT DETAIL**



**DOWNSPOUT STAKE WIRING DETAIL**



**5G** **DOWNSPOUT STANDARD PLAN**  
NTS

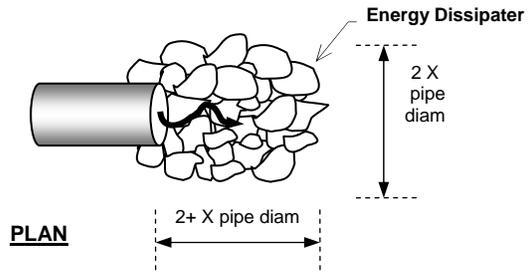
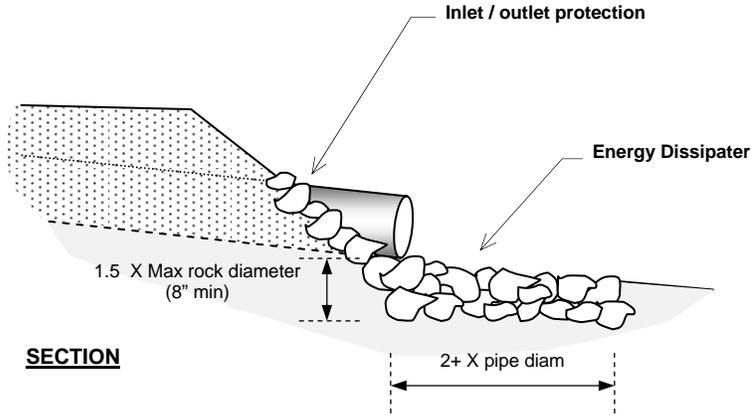


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**DOWNSPOUT**  
**TYPICAL SPECIFICATIONS**

**Standard Detail 5G**

Date: May 3, 2009



**NOTES**

- **Inlet/outlet protection**
  - Armor inlet and outlet to top of culvert with rock rip rap
  - Riprap shall consist of approved well graded sound durable angular rock unless otherwise specified
  - 50% of rock ( $D_{50}$ ) shall be larger than 8 inches minimum diameter unless otherwise specified
  - Rock shall be keyed minimum 1.5 times diameter into bed and banks unless otherwise specified
  
- **Energy dissipater**
  - Culvert shall discharge onto rock energy dissipater / apron aligned with native channel as shown on plans or directed
  - Unless otherwise specified in plans or directed by geotechnical consultant, armor shall consist of approved sound durable angular rock adequately sized for design flow. Preliminary rock size is specified in Table C.
  - Rock apron shall extend a minimum of 2 time pipe diameter downstream of outlet and be a minimum of 2 times pipe diameter wide. Apron may taper downstream on steeper gradient channels.
  - Rock shall be embedded into channel a minimum of 1.5 times maximum rock diameter. Subexcavate channel bed and banks in areas to receive rock. Rock shall be placed to form a uniform grade at the pipe outlet in a manner to prevent flow from eroding around the edge of the apron.
  - Separate rock from native soils with approved geotextile fabric if specified on plans or directed
  - Compact loose soils adjacent to rock rip rap

**TABLE C**

Pipe Diameter	$D_{50}$ Rock Size (50% of rock larger than specified)	
	Diameter	Weight
< 18"	8"	Gabion+
24"	12"	¼ T
36"	24"	½ T
48"	36"	1.5 T



**5H ENERGY DISSIPATER (Typical)**  
NTS

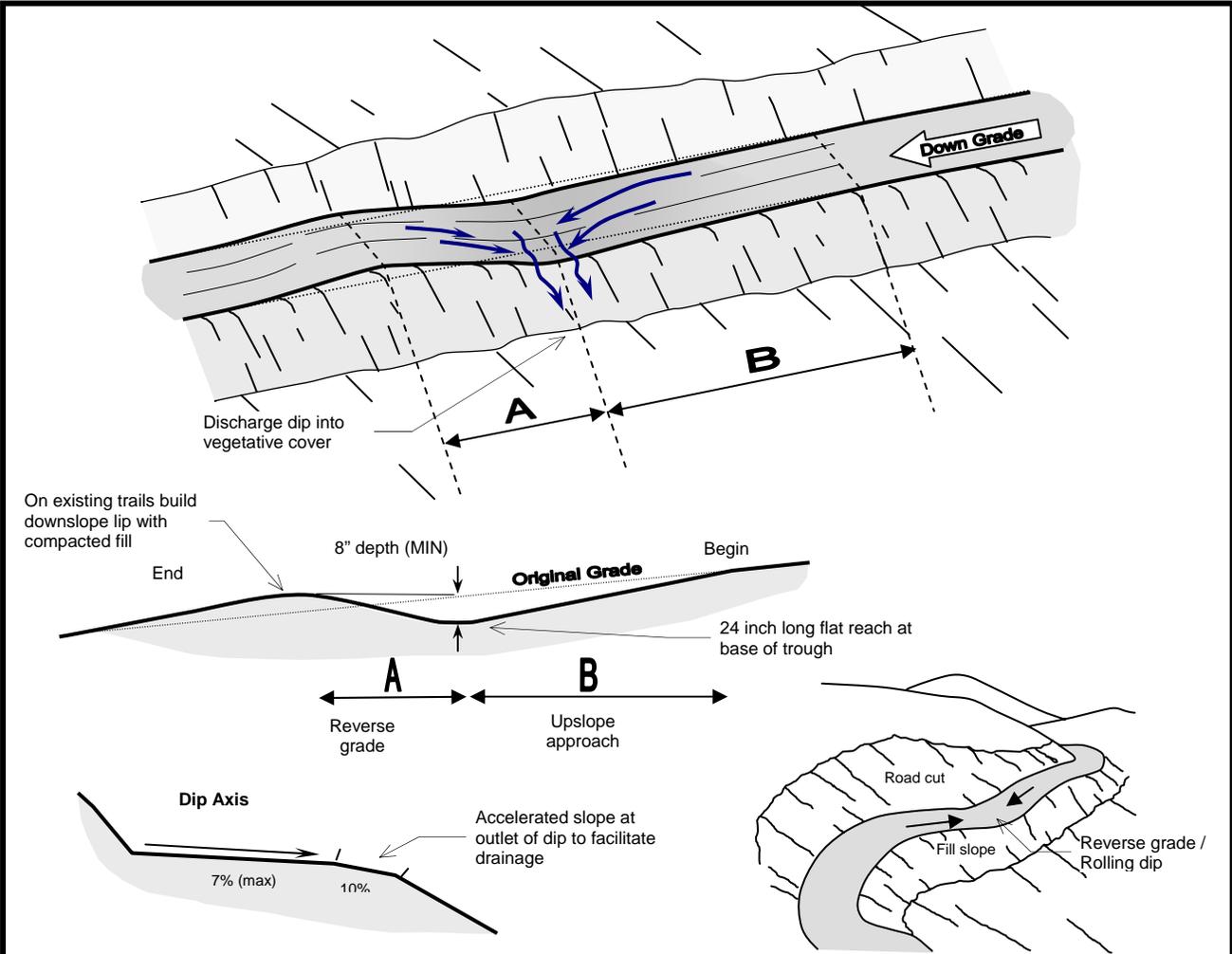


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**ENERGY DISSIPATER  
TYPICAL SPECIFICATIONS**

**Standard Detail 5H**

Date: May 3, 2009



ROAD GRADE (%)	TROUGH	A: REVERSE GRADE		B: UPSLOPE APPROACH	
	Depth below downslope crest	Distance from trough axis to downroad crest (ft)	Grade (%)	Distance from up-road start of rolling dip to trough axis (ft)	Grade (%)
<5%	8"	15	-5%	30	10%
10%	8"	15	-5%	45	15%
15%	8"	15	-5%	60	20%
>15%	8"	10	-10%	60	25%

- NOTES:**
- A reverse grade dip (or rolling dip) is a broad long permanent dip constructed into native soils. It is intended to drain the trail/road while not significantly impeding traffic.
  - On new trails and roads the dip is incorporated into the trail/road design; on existing trails/roads the dip is cut into the existing trail with the down road dip built up on compacted fill.
  - The down road grade of the dip shall be minimum 5% for 15 feet to form a minimum 8 inch deep dip and incorporate a 2-foot long flat reach at the base of the trough (unless otherwise directed). The dip axis should be outsloped 7% (max)
  - Dip outlets should be located to drain into areas with adequate sediment filter quality and non-erodible material such as rock, slash, brush, etc. Where specified, the bottom of the outfall of the dip will be surface rocked.
  - Where natural slopes exceed 50%, fill shall not be pushed over the dip outlet. A backhoe or excavator may be required to pull back fill at outlet of existing dips.
  - Dips shall be placed as specified in the plans. If not specified then dips shall be placed at maximum 75 foot spacings.

**6A REVERSE GRADE DIP (Typical)**  
NTS

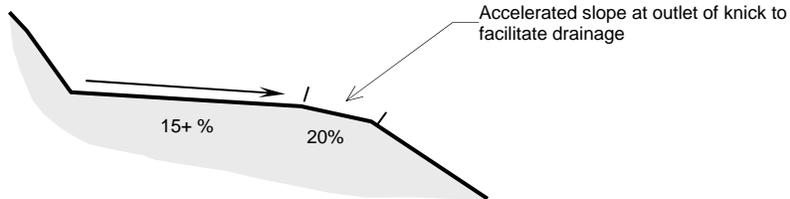
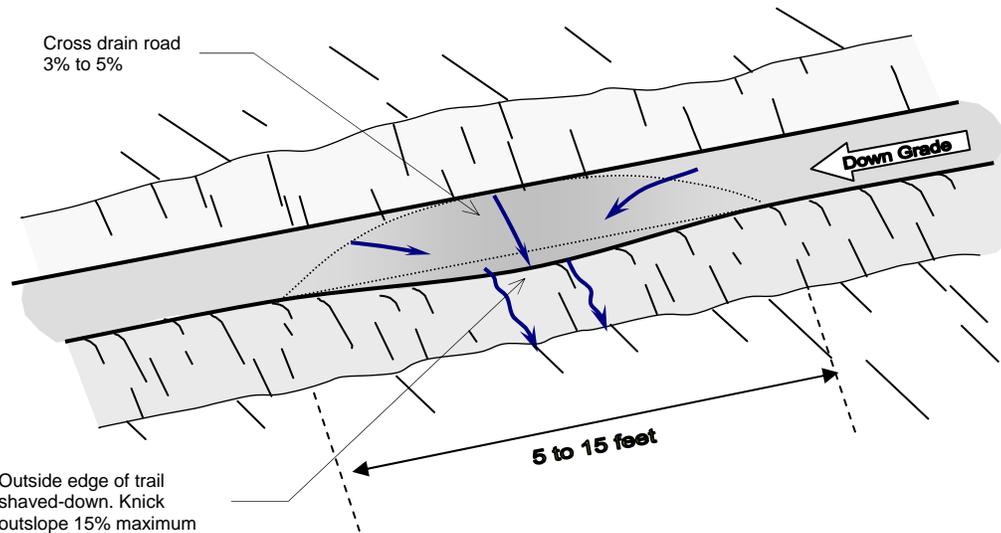


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**REVERSE GRADE DIP  
TYPICAL SPECIFICATIONS**

**Standard Detail 6A**

Date: May 3, 2009



**NOTES:**

- A knick is a semi-circular, shaved down section of the outside edge of the trail.
- The center of the nick is outsloped 15% which draws water off of the trail.
- Knicks are typically installed on gentle segments of trail.
- Dip outlets should be located to drain into areas with adequate sediment filter quality and non-erodible material such as rock, slash, brush, etc.

**6B** **KNICK (Typical)**  
NTS

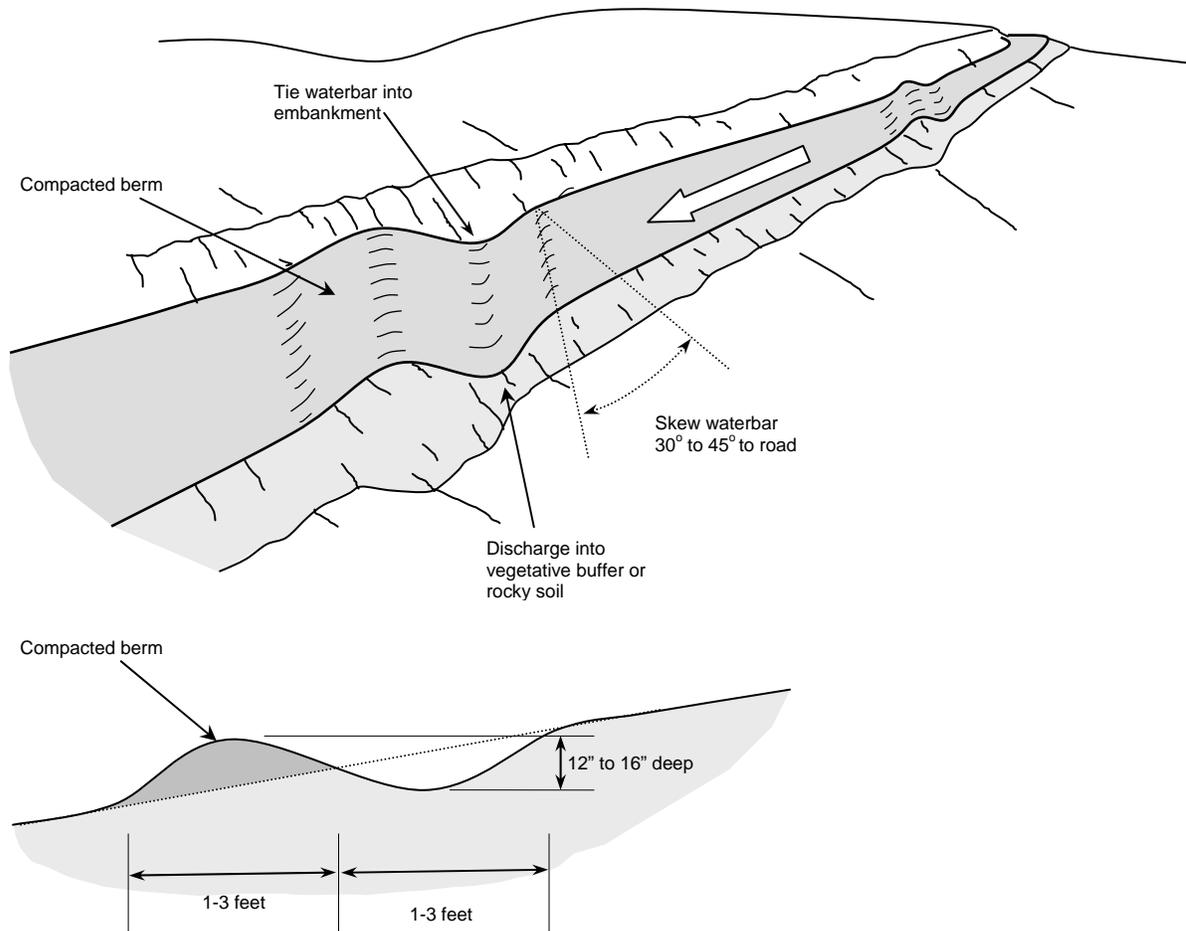


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**KNICK**  
**TYPICAL SPECIFICATIONS**

**Standard Detail 6B**

Date: May 3, 2009



**NOTES**

- Identify waterbar locations that take advantage of natural drainage features and minimize the amount of disturbance required for waterbar construction
- All waterbars shall begin at the intersection of the roadbed surface and the cut slope and run the entire width of the road surface prism.
- Waterbar length shall not exceed 1.5 times the width of the road surface.
- Acceptable waterbars shall be skewed 30 to 45 degrees.
- All waterbars shall have free flowing outlets with minimum 2% grade in the bottom of the channel that discharge onto vegetative surfaces or less erodible material where possible.
- Native materials used to construct downslope berm shall be compacted with equipment to minimize wear resulting from trespass and/or administrative use.
- Waterbar depth measured from the bottom of the waterbar channel to the top of the compacted berm must be between 12" and 16" high.
- Compacted waterbars must be passable in a 4WD vehicle unless otherwise specified in the contract.

**6C** **WATERBAR (Typical)**  
NTS

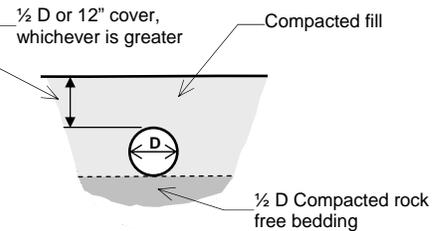
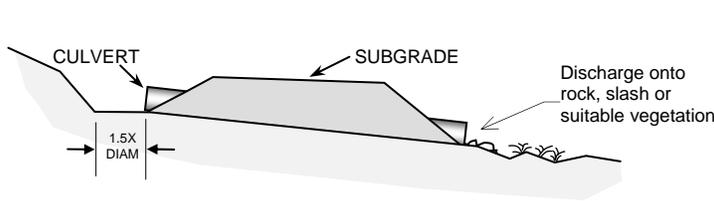
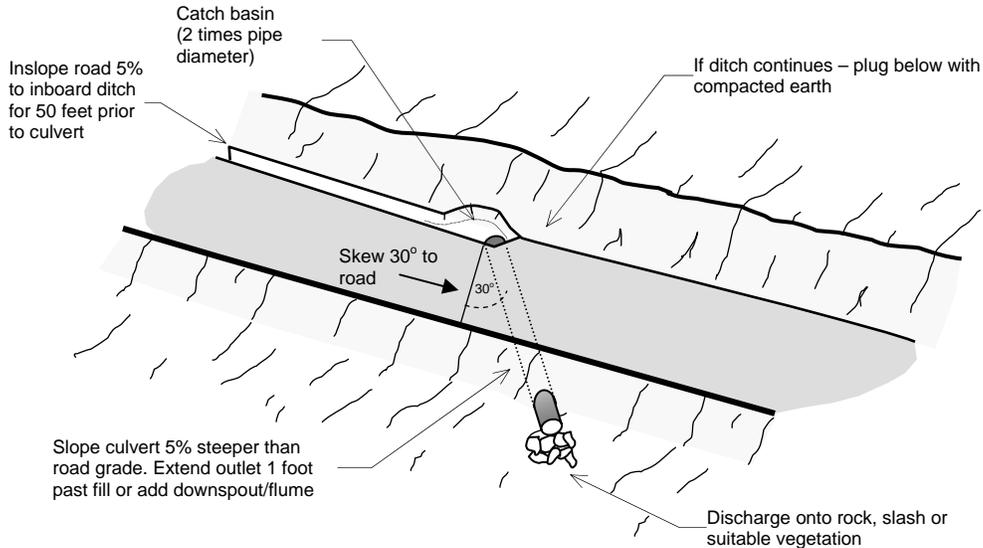


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**WATERBAR  
TYPICAL SPECIFICATIONS**

**Standard Detail 6C**

Date: May 3, 2009



**NOTES**

- Ditch relief culverts shall be installed flagged locations or as identified on plans. The maximum spacing of culverts shall be 150 feet unless otherwise specified or directed.
- Culverts shall be 12-inch diameter smooth bore, double wall HDPE (ASTM D3350 and AASHTO M294, Type S) unless otherwise specified
- The culverts shall be placed at a 30 degree skew angle down grade (where allowable) with a gradient 5% steeper than that of the road. Culverts should extend a minimum of 1' beyond base of road fill.
- Where necessary, outlet ditch shall be constructed at a steeper gradient than the culvert, at least one pipe diameter in width, and with bank tapered back to a 1:1 slope.
- The culvert bed shall  $\frac{1}{2}$  diameter of the culvert and be clean and free of large woody debris and large rocks. Trench shall be adequate width to facilitate compaction.
- Select approved mineral soil shall be used for culvert back fill. The back fill shall have no rocks greater than 3 inches in any dimensions placed closer than 1 foot to the culvert. Backfill shall be adequately compacted throughout the entire process to 95 percent ASTM 1557 unless otherwise specified. During placement and compaction of fill, the moisture content of the materials being placed shall be maintained.
- Compacted fill coverage shall be minimum  $\frac{1}{2}$  pipe diameter or 12 inches, whichever is greater
- Rock, slash or suitable vegetation should be used at discharge point as directed or specified
- A ditch block shall be placed immediately downslope of the culvert intake to prevent ditch flow from bypassing the pipe inlet.
- Specifications are indented only as guideline, modifications may be made in the field by geotechnical consultant or designee



**DITCH RELIEF CULVERT (Typical)**

NTS



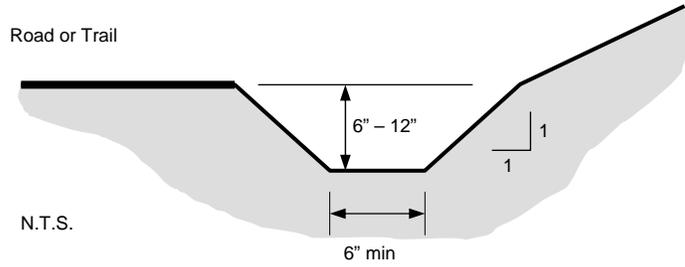
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**DITCH RELIEF CULVERT  
TYPICAL SPECIFICATIONS**

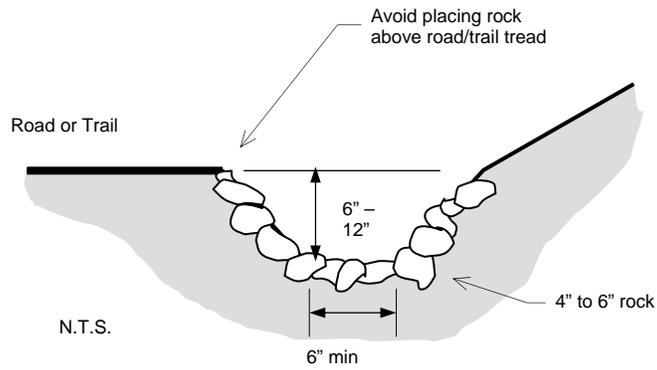
**Standard Detail 6D**

Date: May 3, 2009

### INSIDE DITCH (native)



### INSIDE DITCH (Rock lined)



#### NOTES:

- Slope ditch to drain 3% min
- Armor ditch where specified
- Drain ditch to ditch relief culvert inlet as specified.

**6E** **INSIDE ROAD DITCH (Typical)**  
NTS



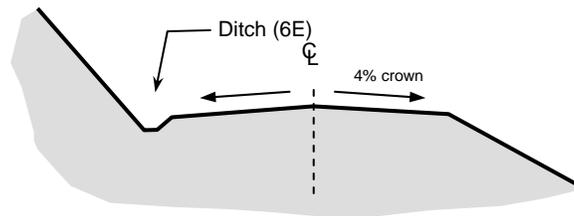
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INSIDE ROAD DITCH  
TYPICAL SPECIFICATIONS

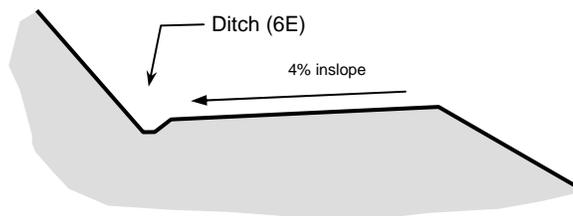
**Standard Detail 6E**

Date: May 3, 2009

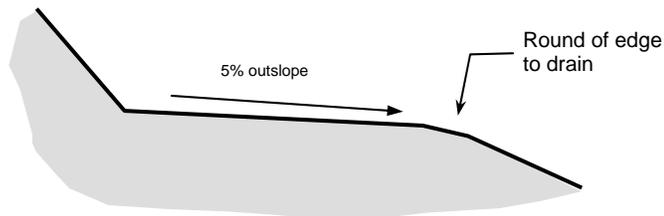
### CROWNED



### INSLOPED WITH DITCH



### OUTSLOPED



Crowned road carries surface runoff to both sides of the road. Inslope roads carry water to the inboard (uphill) side of the roadway and therefore are constructed with a ditch and ditch relief culverts to channel runoff under the roadway. Outsloped roads shed water to the outside of the road and generally do not have a ditch on the inside edge.

#### NOTES:

- Crowned and insloped roads shall be drained to inboard road ditch per typical 6E.
- Ditch shall have positive flow to outlet or ditch relief culvert. See 6D Ditch Relief Culvert typical design specifications
- Drainage on outsloped roads shall be complimented with Reverse Grade Dips unless otherwise specified



### ROAD SURFACE GEOMETRY (Typical)

NTS

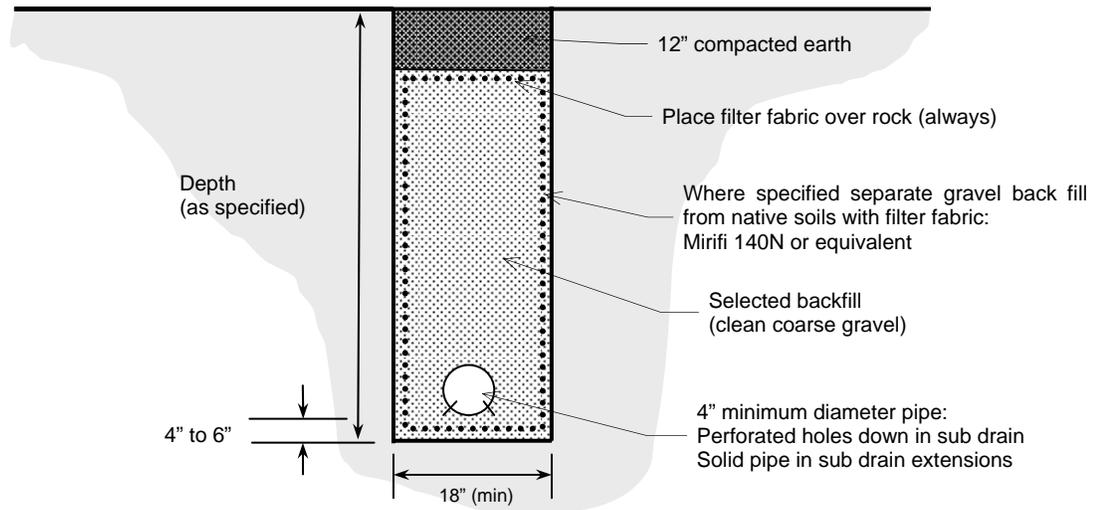


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## ROAD SURFACE GEOMETRY TYPICAL SPECIFICATIONS

**Standard Detail 6F**

Date: June 6, 2009



**NOTES**

- Excavate 12+\" wide trench as specified. Trench should have positive gradient to discharge point.
- Where specified, line trench with approved filter fabric (Mirifi 180N or equivalent)
- Place perforated pipe 4\" to 6\" from bottom of trench. Solid pipe should extend from trench to discharge point.
- Back fill trench with clean coarse gravel to within 12\" of grade
- Place fabric over top of gravel back fill
- Cap with 12\" of compacted earth
- Discharge in a reasonable and controlled manner

**6G** **SUBDRAIN (Typical)**  
NTS

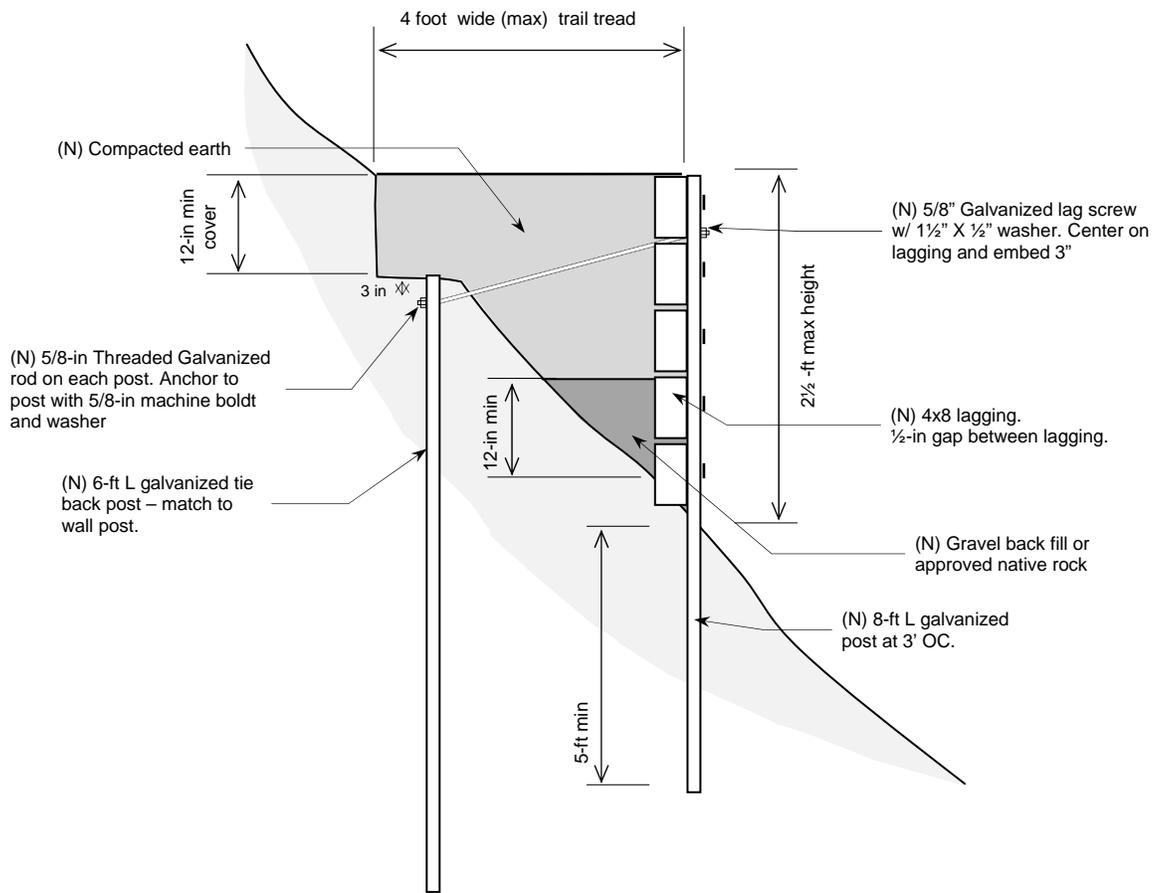


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INSIDE ROAD DITCH  
TYPICAL SPECIFICATIONS

**Standard Detail 6G**

Date: May 3, 2009



**NOTE:**

- Post shall be 8-ft x 2.0 lbs/ft galvanized U-Channel conforming to ASTM A4999, Grade 60
- Final depth of post embedment to be determined in field by project geotechnical consultant based on on-site soil conditions
- All wood shall be PT DF or clear heart redwood unless otherwise specified or approved



**TRAIL WOOD LAG RETAINING WALL (Typical)**  
 MOSD STANDARD SPECIFICATIONS (NTS)

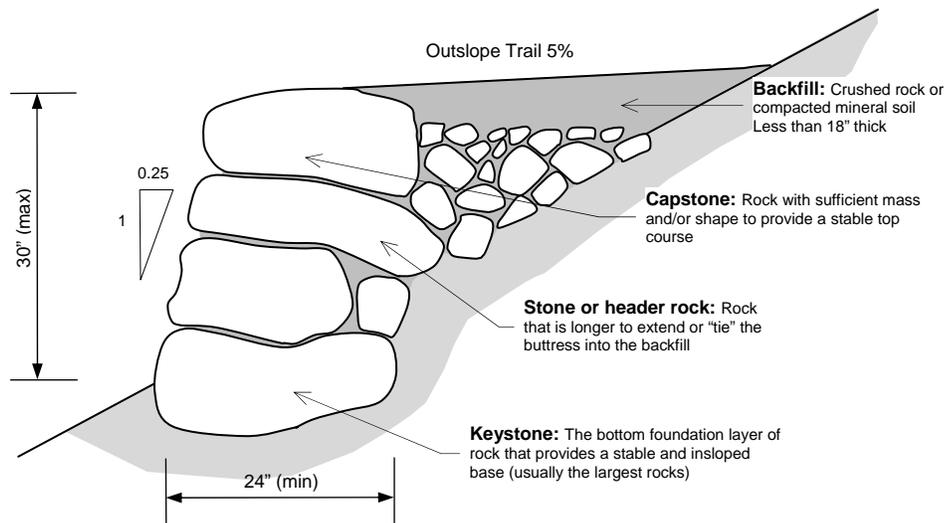


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**WOOD LAG RETAINING WALL**  
 TYPICAL SPECIFICATIONS

**Standard Detail 7A**

Date: May 3, 2009



#### NOTES

- Excavate a keyway footing to firm, stable dirt or to solid rock. Slope the footing slightly into the hillside (**batter**) so the rock buttress will lean into the hill and dig it deep enough to support the foundation tier of rocks (these are usually the largest rocks in the buttress). The footing is dug so that the foundation tier is embedded for the full thickness of the first layer of rocks.
- Construct buttress using sound durable rock. A minimum of 50% of the rock shall be larger than 18" (130 lb min). Ideally, the bigger the rock, the better since big rocks are less likely to shift or become dislodged. The best rock is rectangular with flat surfaces on all sides. Round river rock is the worst.
- The **keystone** is laid into the footing and successive tiers are laid. For each tier, overlap the gaps between rocks in the next lower tier, called breaking the joints. Each tier should be staggered slightly into the hill to create the desired amount of batter. **Header rocks** are long rocks turned and placed so that they extend deep into the hillside. Using header rocks is particularly important if the buttress's cross section widens as the buttress gets higher. The **capstone** is the top rock layer with sufficient mass to provide a stable trail tread.
- Rocks in each successive tier should be set so they have at least three points of good contact with the rocks below. Good contact is defined as no wobble or shifting under a load without relying on shims (or chinking) to eliminate rocking. Shims are prone to shifting and should not be used to establish contact, especially on the face of the buttress, where they can fall out. Add backfill and tamp crushed rocks into the cracks as you build.
- Project geotechnical consultant or designee shall flag the location of the rock buttress prior to construction
- Specifications modified from U.S. Forest Service Trail Construction and Maintenance Notebook, 2007 Edition (Hesselbarth et al., 2007).



#### ROCK RETAINING WALL - TRAIL (Typical) MOSD STANDARD SPECIFICATIONS (NTS)

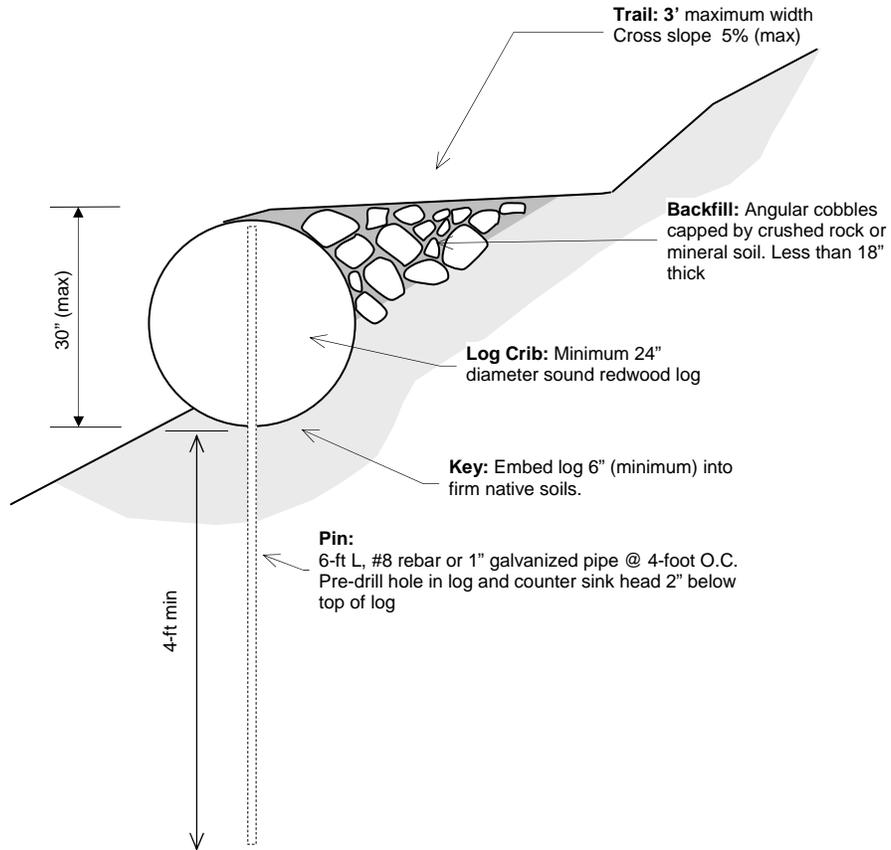


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### ROCK RETAINING WALL TYPICAL SPECIFICATIONS

Standard Detail 7B

Date: May 3, 2009



**NOTES**

- Log shall be a 24" (min) diameter sound durable redwood log. On-site logs used for the buttress shall be approved by District representative and the project geotechnical consultant prior to construction.
- Log shall be placed in a minimum 6 inch deep keyway. Where possible key the log upslope and against existing trees.
- Backfill behind log with crushed angular cobbles and cap trail tread with crushed aggregate or compacted mineral soil
- Pin log using 6-ft L # 8 rebar or 1" galvanized pipe. Predrill hole in log and countersink head 2" below top of log. Pins to be installed at 4-foot O.C. unless otherwise specified or directed.
- Project geotechnical consultant or designee shall flag the location of the log buttress prior to construction
- Specifications represent MROSD standard trail design



**SINGLE LOG RETAINING WALL - TRAIL (Typical)**  
MOSD STANDARD SPECIFICATIONS (NTS)

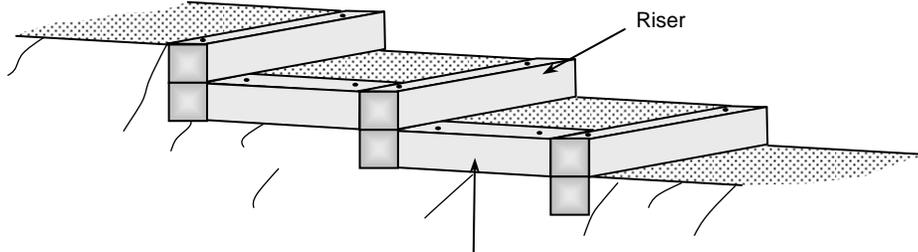


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LOG RETAINING WALL  
TYPICAL SPECIFICATIONS

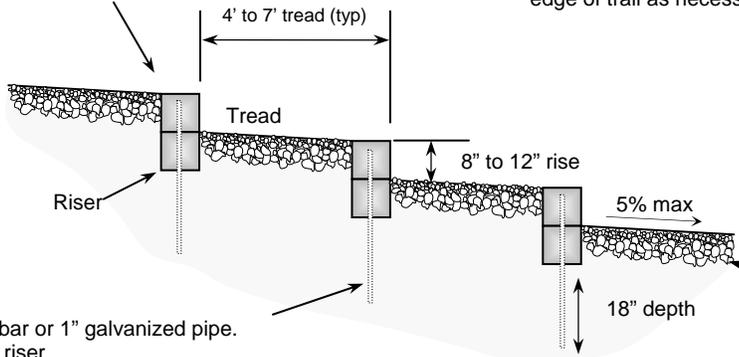
**Standard Detail 7C**

Date: May 3, 2009



Embed riser 1/2 depth  
Stack as necessary.

Buttress and pin outside edge of trail as necessary.



- Pin:**
- #8 rebar or 1" galvanized pipe.
  - 2 per riser
  - Embed min 18"
  - Counter sink head 2" below top

**GRAVEL BACKFILL**

	Rock	Depth
Cap	3/4" Class II aggregate base	1"
Base	3" minus drain rock	4"

**NOTE:**

- Riser to consist of approved durable material such as pressure treated railroad ties, concrete blocks, or rock.
- Riser to be maximum 12" high with minimum 4 foot tread unless otherwise directed by District representative or existing condition preclude.
- Buttress outside edge of trail. Use similar materials and construction method as riser.
- Embed riser 1/2 depth. Stack risers as necessary.
- Pin each riser using rebar (#8 min) or 1" galvanized pipe. Minimum two per step.
- Counter sink pins a minimum of two inches below the top of the riser tread. Tops of pins must be covered and no part of the pin shall be visible.
- Outslope trail 5%
- Buttress outside edge of trail. Use similar materials and construction method as riser.
- Step layout to be made under direct supervision of District representative.
- Specifications are indented only as guideline, modifications may be made in the field by geotechnical consultant or designee

**7D WOOD TRAIL STEPS (Typical)**  
NTS

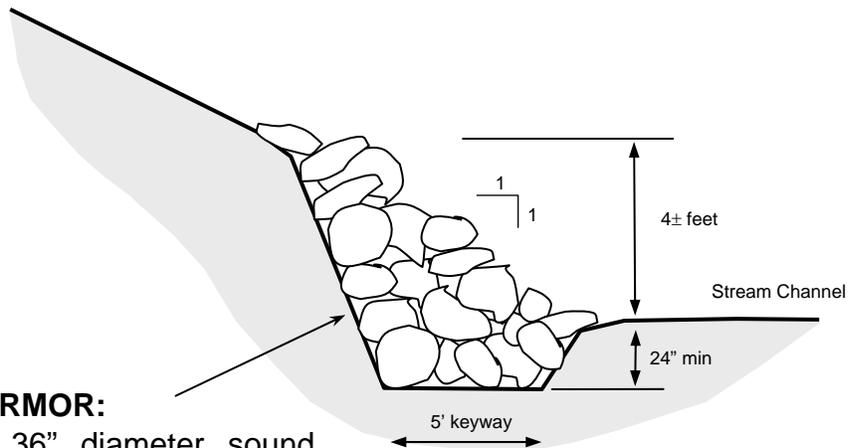


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**LOG RETAINING WALL  
TYPICAL SPECIFICATIONS**

**Standard Detail 7D**

Date: May 3, 2009



**ROCK ARMOR:**

- 24" to 36" diameter sound durable rock
- Voids shall be filled with smaller rock to prevent piping

**7E** RIP RAP (Typical)  
NTS

**DRAFT**



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**LOG RETAINING WALL  
TYPICAL SPECIFICATIONS**

**Standard Detail 7E**

Date: May 3, 2009

## **EROSION CONTROL**

- During project construction, the LTO shall be responsible for implementing appropriate and necessary erosion control measures to minimize storm water runoff from the construction site, pursuant to applicable regulations and permits. The following strategies to ensure that storm water pollution is prevented shall be employed:
  - Minimize erosion and sedimentation during construction.
  - Eliminate pollution of storm runoff by chemicals and materials used in the construction process
  
- Exposed mineral soils greater than 50 square feet (sf) with less than 80% ground coverage of natural vegetation shall be seeded and mulched in order to reduce the potential for short term sheet and rill erosion.
  - Seeding
    - Hand broadcast approved seed mix
  - Mulch:
    - Use native much were feasible
      - Where native much is unavailable and/or as directed by the geotechnical consultant or designee, mulch using 1 1/2" to 2" of approved certified weed-free straw mulch. Exposed slopes steeper than 1:1 may be covered with "Bon Terra, C2" or similar approved fabric placed in accordance with the manufacturer's recommendations and as directed by geotechnical consultant or designee.
      - If available and directed by project geotechnical consultant or designee, disturbed ground may be slash mulched using six-inch minus woody debris with 90% coverage. Slash should be packed using a dozer or the bucket of the excavator.
      - Apply mulch after seed
  
- Install a straw rolls across bare slopes and/or at base of disturbed areas if directed by CEG, RPF and/or designees or specifically called out in recommendations.

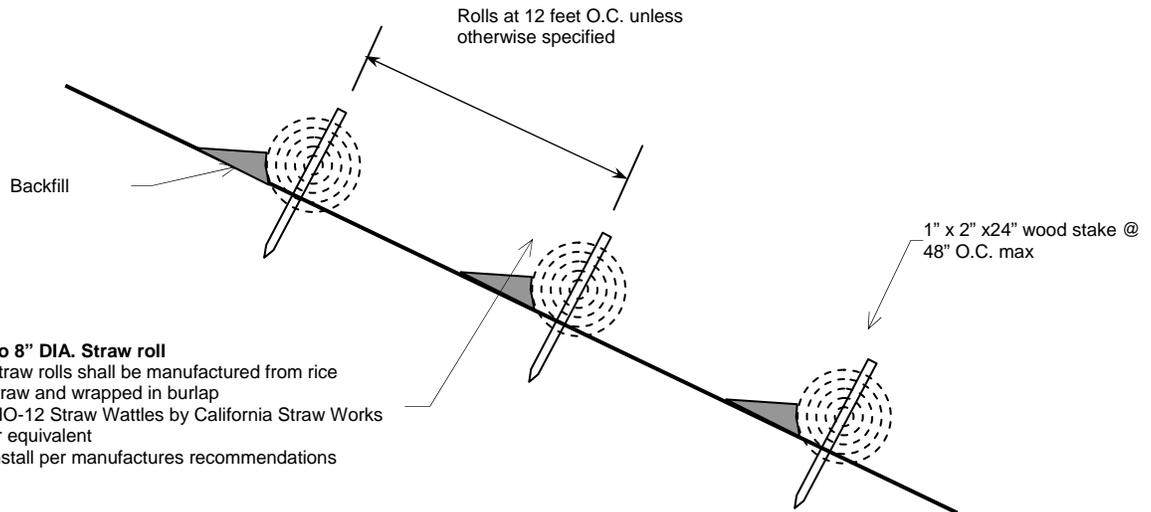


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## EROSION CONTROL NOTES

**Standard Detail 8A**

Date: May 3, 2009



**NOTE:**

- Location
  - Install at base of disturbed areas and at outlets of new or reconstructed reverse grades/rolling dips unless otherwise specific
  - Rolls to extend across entire width of disturbed area unless otherwise specified or directed.
- Placement
  - Install per manufactures recommendations
  - Rolls to be placed on slope contour
  - Adjacent rolls to overlap; turn ends of rolls up
  - Runoff must not be allowed to run under or around the roll

**8B** **STRAW ROLL (Typical)**  
NTS

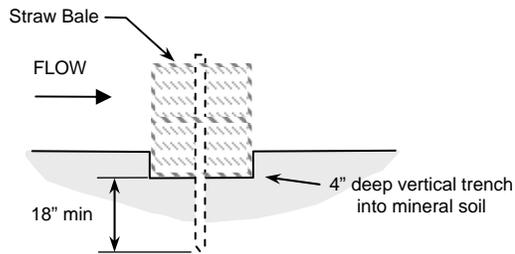


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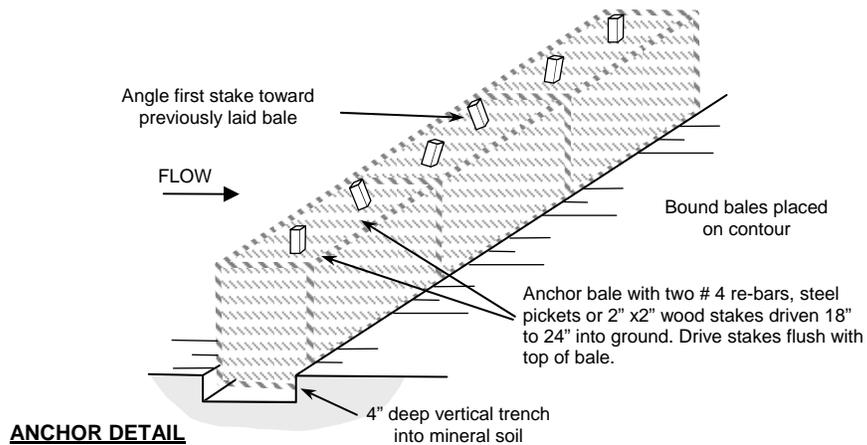
**STRAW ROLL PLACEMENT  
TYPICAL SPECIFICATIONS**

**Standard Detail 8B**

Date: May 3, 2009



**BEDDING DETAILS**



**ANCHOR DETAIL**

**NOTES:**

1. Bales shall be placed at contour locations as specified for slope erosion control
2. Bales shall be placed in ditches at designated locations for sediment reduction as specified.
3. Each bale shall be imbedded a minimum of 4" \.
4. Each bale shall be securely anchored in placed by either two # 4 re-bars, steel pickets or 2" x 2" wood stakes driven through the bales. The first stake in each bale shall be driven at an angle to force the bales together.
5. For bales placed on slope, stakes shall be driven a minimum of 18" into firm soils. For bales placed in inside ditches, stakes shall be driven a minimum of 6" into firm native soils.
6. Inspection shall be frequent and repair replacement shall be made promptly as needed
7. Bales shall be removed as directed



**STRAW SILT FENCE (Typical)**  
NTS

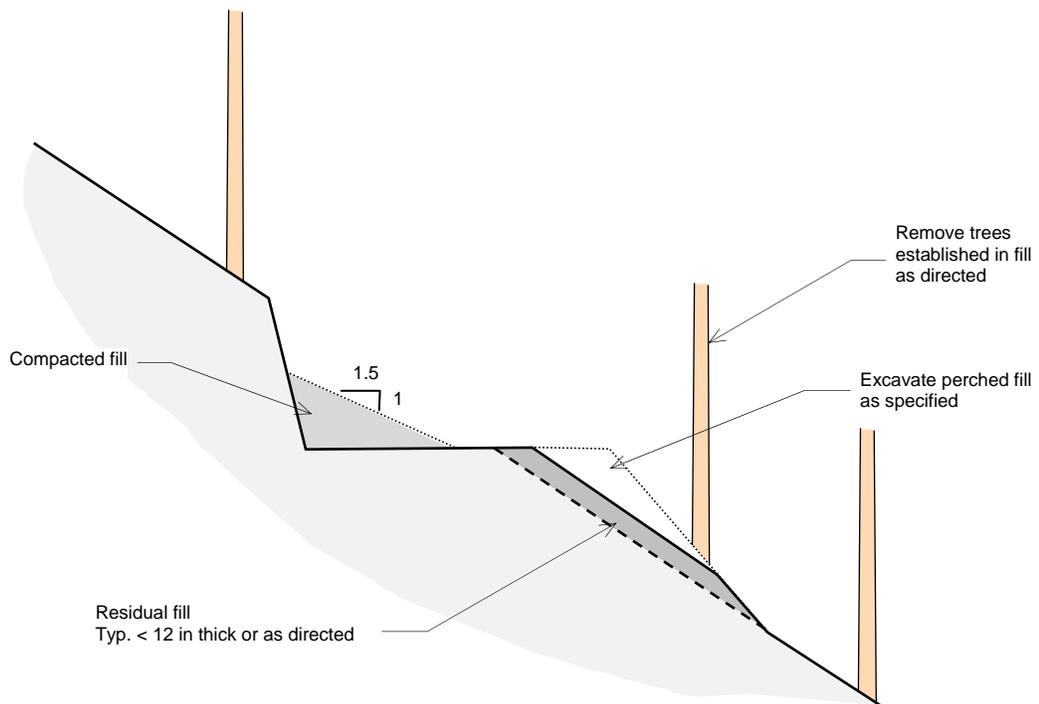


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**STRAW SILT FENCE  
TYPICAL SPECIFICATIONS**

**Standard Detail 8C**

Date: May 3, 2009



**NOTES**

- Remove trees established in roadway and in fill as directed
  - Trees greater than 6 inch diameter shall be marked by District prior to removal
- Excavate perched fill as specified and directed
  - Limits of fill removal to be identified in the field by project geologist or designee
- Spoils shall be compacted along inboard edge of road
  - Spoils shall not be placed in any areas where seasonal bank seeps or wet areas are present
  - Areas to receive fill shall be cleared of vegetation
  - Spoils shall be placed in thin lifts not to exceed 8 inches in maximum thickness and compacted (minimum 85 percent relative compaction). Compacting may include track walking with a dozer, bucket of the excavator, roller or hand tamper. Spoils may need to be moisture conditioned to achieve a suitable level of compaction.
  - Spoils shall be placed a maximum of 5 feet deep with an embankment face inclined no steeper than 1.5:1 (65%) unless otherwise directed or specified
  - Project geotechnical consultant or designee shall approve all spoil sites prior to fill placement
- Specifications are indented only as guideline, modifications may be made in the field by project geotechnical consultant or designee

**9A PERCHED FILL REMOVAL**  
NTS



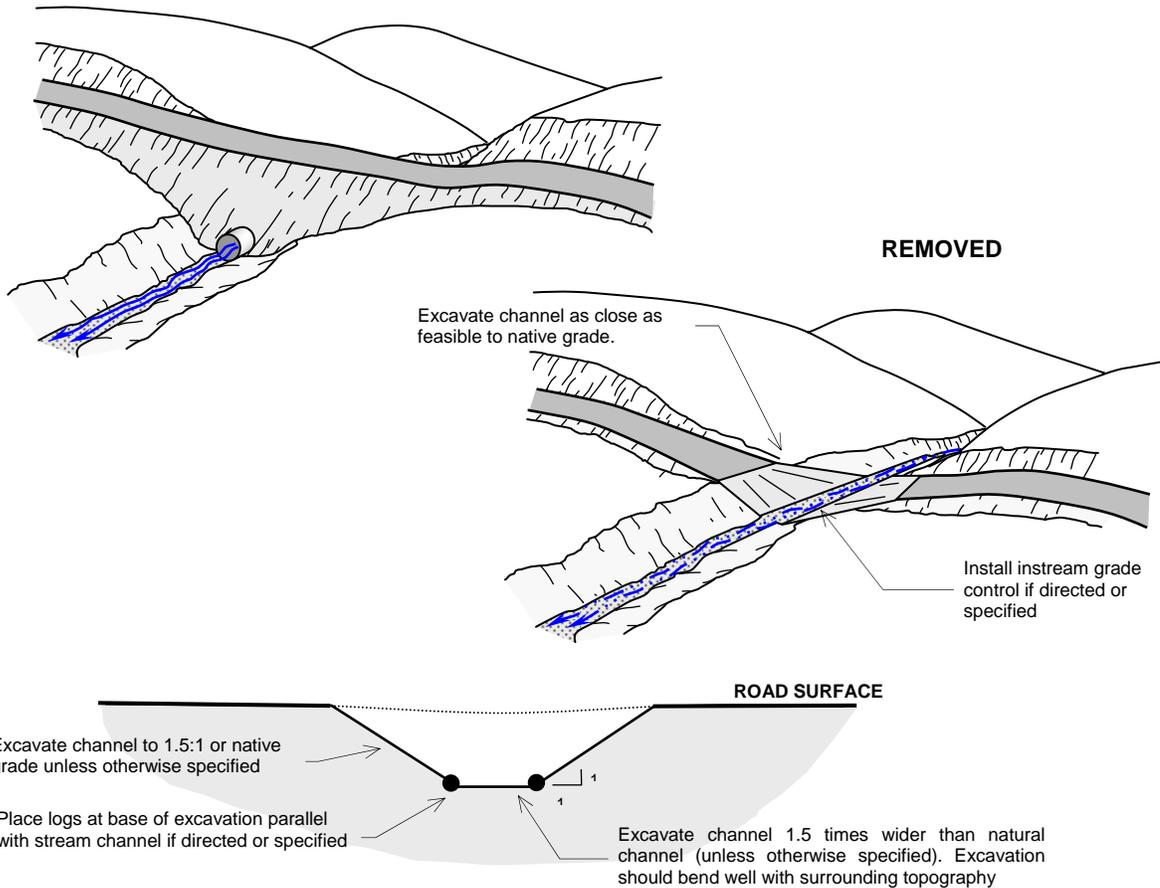
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**PERCHED FILL REMOVAL**  
**TYPICAL SPECIFICATIONS**

**Standard Detail 9A**

Date: May 3, 2009

## EXISTING CROSSING



### NOTES

- Excavate a channel that is 1.5 times wider than the natural channel (unless otherwise specified).
  - Excavated channel shall be as close as feasible to the grade and orientation of the natural channel
  - Channel banks shall be excavated to a 1.5:1 slope or native grade (whichever is steepest) unless otherwise specified in the plan or directed
  - Excavation should blend well with surrounding natural topography
  - Spoils shall be placed and compacted along a stable portion of the inboard edge of the road, unless otherwise specified. Fill shall be placed in a manner to prevent future erosion. Fill shall be compacted to 85% relative compaction unless otherwise specified or directed.
- Install instream grade control if specified in the plan or directed. Grade control shall consist of large wood or rock and is intended to prevent stream down cutting. See general specifications
- Place logs at base of excavated channel if directed. Logs to be placed parallel with stream with upstream log overlapping downstream log. Logs to be embedded into channel bank to minimize stream bank erosion. Log diameter to be determined by project geotechnical consultant or designee.
- Mulch disturbed ground
  - If available and directed by project geotechnical consultant, the excavated channel banks and spoil sites may be slash mulched using 6-inch minus woody debris with 90% coverage. Slash should be packed using a dozer or the bucket of the excavator.
- Install a straw roll at base of disturbed areas as directed by geotechnical consultant and/or District representative
- Conform to requirements Department of Fish and Game 1600 agreements where applicable
- Specifications are indented only as guideline, modifications may be made in the field by geotechnical consultant or designee



## **STREAM CROSSING REMOVAL**

NTS



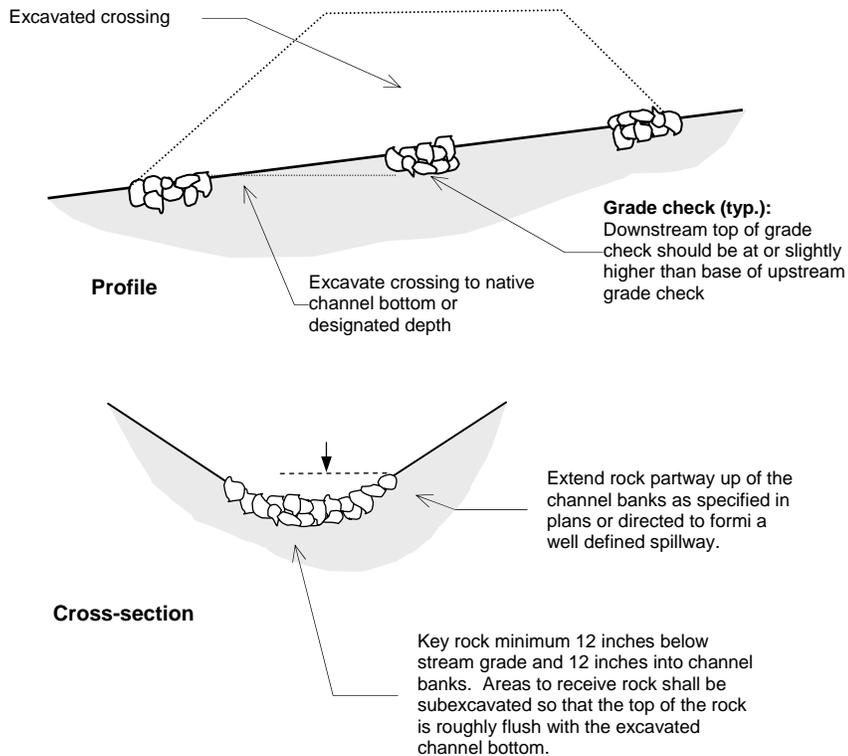
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## PARTIAL BENCH TRAIL TYPICAL SPECIFICATIONS

**Standard Detail 9B**

Date: May 3, 2009

## PRELIMINARY



### NOTES

- Grade check shall consist of large wood or rock rip rap as specified in plans or directed by project geotechnical consultant.
- Rock to be keyed minimum 12 inches below stream grade and 12 inches into channel banks.
- Areas to receive rock shall be subexcavated so that the top of the rock is roughly flush with the excavated channel bottom
- Rock shall extend partway up of the channel banks forming a well defined spillway to confine stream flow.
- Downstream top of grade check should be at or slightly higher than base of upstream grade check
- Length and number of grade checks to be specified in plans or determined in the field
- Specifications are indented only as guideline, modifications may be made in the field by geotechnical consultant or designee



## ROCK GRADE CHECK PRELIMINARY

NTS



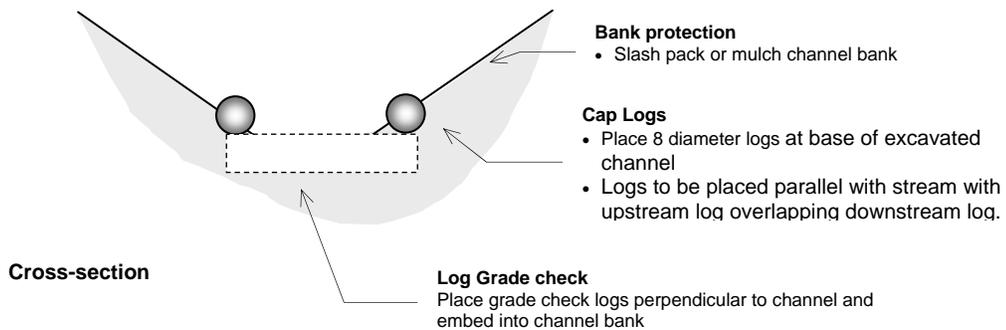
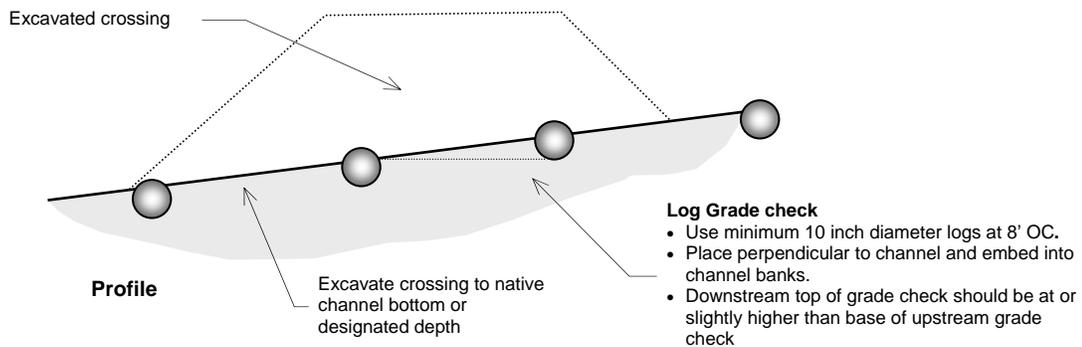
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PARTIAL BENCH TRAIL  
TYPICAL SPECIFICATIONS

**Standard Detail 9C**

Date: May 3, 2009

## PRELIMINARY



### NOTES

- Grade check shall consist of large wood as specified in plans or as directed by project geotechnical consultant.
- Downstream top of grade check should be at or slightly higher than base of upstream grade check
- Length and number of grade checks to be specified in plans or determined in the field
- Specifications are indented only as guideline, modifications may be made in the field by geotechnical consultant or designee



## WOOD GRADE CHECK PRELIMINARY NTS



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## PARTIAL BENCH TRAIL TYPICAL SPECIFICATIONS

Standard Detail 9D

Date: May 3, 2009

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## APPENDIX C

### Los Angeles County Trails Manual

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Available for review at the MCOSD administrative office during standard office hours, Monday through Friday, located at the Marin County Civic Center, 3501 Civic Center Drive, Room 260, San Rafael, California 94903-4157.

Copies of the Trails Manual are available for download at: <[lacountytrailsmanual.com](http://lacountytrailsmanual.com)>

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## APPENDIX D

### Mendocino County Resource Conservation District's Handbook for Forest and Ranch Roads

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Available for review at the MCOSD administrative office during standard office hours, Monday through Friday, located at the Marin County Civic Center, 3501 Civic Center Drive, Room 260, San Rafael, California 94903-4157.

Copies of the Handbook are available for purchase from the Mendocino County Resource Conservation District, 206 Mason Street, Suite F, Ukiah, California 95482, or by telephoning (707) 462-3664.

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