

## DESIGN GUIDES FOR GUIDELINES AND STANDARDS

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# INTRODUCTION TO THE DESIGN GUIDE

## I. PURPOSE

The Guidelines and Standards (G&S's) were developed by the Santa Clara Valley Water Resources Protection Collaborative (Collaborative) to address land use near streams and protect surface and groundwater quality and quantity in Santa Clara County. The goal was to develop and implement a consistent set of G&S's to enhance water and watershed resource protection through local agency land use planning and permitting. The Proposed G&S's provide guidance for addressing a wide range of activities (including riparian habitat protection, slope stability, erosion control, trail construction, grading). The purpose of the Design Guides is to provide further detail and clarification on specific application of the G&S's.

## II. AUDIENCE

The audience for this Design Guides is city/County/SCVWD staff responsible for reviewing and permitting project applications. The G&S's and these related Design Guides are to be used as appropriate by permitting agency staff in reviewing all of the various permits required for development on affected streamside parcels (unless an exempt single family use on an already developed lot). This would include permits for grading, drainage, structures, landscaping, planning, zoning and any other related activities and improvements.

## III. INTEGRATION INTO EXISTING PROCESSES

The Design Guides included are models to be incorporated as appropriate by local agencies into their existing practices. In general, the content of the Design Guides is fairly consistent with existing practices of the SCVWD and local jurisdictions. It is anticipated that these Design Guides will be used unless determined otherwise by agreement between the local agency and SCVWD. Where there is a variety of options, the preferred option is indicated. It is acknowledged, however, that the preferred option may not always be feasible or preferred depending on the circumstances, so other options, which are allowable but not typically recommended have been included as well.

## IV. PROTECTION OF STREAM RESOURCES

A major purpose of providing the Design Guides is to protect and enhance streams and streamside natural resources. When deciding on what type of improvements to be made to a streamside parcel, please keep in mind what is best for the ecological health of the stream. If there is a conflict between a Design Guides and a specific G&S, staff should defer to the G&S. Some judgment will need to be made based on site-specific conditions and the dynamic nature of stream systems.

## PROTECTION OF EXISTING RIPARIAN VEGETATION

### INTRODUCTION

This Design Guide is designed to provide more detail to G&S I.B on protection of native riparian plants. The G&S's include several requirements related to the protection, removal and planting of riparian vegetation for new and major development. The sections that follow provide more detail on how to best implement these requirements. They also serve as helpful guidelines for single family home owners involved in landscaping and revegetation projects.

### THE IMPORTANCE OF RIPARIAN VEGETATION

Riparian vegetation plays a vital role in maintaining stream stability, providing valuable wildlife habitat, and moderating downstream flooding. In addition, the presence and/or absence of riparian areas is directly correlated to water quality as the riparian vegetation serves to filter pollutants from stormwater, such as oil and grease from roadways, fertilizer runoff from lawns, and excess sediments from upstream.

Due to the importance and relative lack of riparian vegetation in Santa Clara County, particularly in urban areas, one goal of any planning project is **to avoid removal of any native riparian vegetation and to prevent the types of conditions that would threaten or degrade existing riparian habitat and/or contribute to soil loss** critical to the continued health and regeneration of riparian trees. To this end, all development activities need to be outside this riparian corridor where at all possible. Any exceptions to this rule need to be justified and mitigated.

### VALUE OF ESTABLISHING RIPARIAN BUFFERS

The amount and condition of the riparian habitat has been significantly reduced in Santa Clara County over time, primarily due to channel encroachment and modification. This has led to incised channels, as well as a lowering of the water table, loss of riparian vegetation, decline in water quality and most beneficial uses, as well as increased risk of erosion, bank failure and flooding. To stop and reverse this trend, an additional buffer area should be established between the edge of the existing riparian zone and any development, where feasible. This buffer should be planted with native vegetation in order to better protect the riparian corridor and the watercourse. The goal is to eventually establish and increase the riparian buffer area all along the riparian corridor. The value of riparian buffers areas has been well documented, in addition to reducing flash runoff and improving water quality, they provide supplemental foraging resources and corridors for wildlife to access the streams and even increase streamside property values.

This Design Guide describes standard criteria for determining how far from existing riparian habitat to locate construction and development activities in order to help ensure its protection. The Design Guides that follow provide more detail on the types of plants to use in landscaping and revegetation of areas, in or adjacent, to riparian areas. For more information on design of trails in specific, see Design Guide number 15.

## DESIGN GUIDE 1

### GUIDELINES AND STANDARDS 1.B

#### CALCULATING RECOMMENDED TREE PROTECTION ZONES

Calculation of the recommended distance between an existing riparian tree and closest construction, staff need to consider at least three variables:

1. The maturity of the tree
2. The trunk diameter
3. The sensitivity (or tolerance) of that particular species to nearby activities

To calculate recommended minimum distance for each species, please use the species-specific formula shown on page 74 of 'Trees and Development, A Technical Guide to Preservation of Trees During Land Development' by Matheny and Clark. This book published in 1998 by the International Society of Arboriculture (<http://www.isa-arbor.com/publications/publications.aspx>) integrates the three criteria into an optimal offset distance for development or trail construction, or the "Tree Protection Zone", (Chart to be inserted pending copyright permission.)

If excavation occurs inside the identified "Tree Protection Zone", roots will be severed, the tree's health will decline, the incidence of insect and diseases will increase and people may be endangered by eventual failure of the destabilized tree. Where there are other site constraints, anticipated encroachment within the recommended tree protection zone, an arborist should be consulted to determine the appropriate protection measures or alternative setbacks.

#### EXAMPLE TREE PROTECTION ZONES

##### **Western Cottonwood (*Populus fremontii*): Poor Tolerance**

The Western Cottonwood has a poor tolerance to root disturbance. The tree protection zone for an overmature tree is 1.5' per inch of tree diameter or a 45 foot radius for a 30 inch diameter tree. Other trees with a poor tolerance include the black cottonwood and bigleaf maple.

##### **Western Sycamore (*Platanus racemosa*): Moderate Tolerance**

A Western Sycamore has a moderate sensitivity to impacts around its roots. The tree protection zone for an overmature tree measured from its trunk is 1.25 feet per inch of trunk diameter. A 30" diameter mature Western Sycamore needs a tree protection zone with a 37.5' radius. Other species with a moderate tolerance include the valley oak, California bay and willows.

##### **Coast Live Oak (*Quercus agrifolia*): Good Tolerance**

The Coast Live Oak has a good tolerance to disturbance. The species is sensitive to the addition of fill around its trunk and does not tolerate frequent summer watering. The tree protection zone for a mature tree is one foot per inch of trunk diameter. A 30 inch diameter tree needs a protection zone with a 30 foot radius. Other trees with a good tolerance include alders, box elders, and California buckeye.

## USE OF LOCAL NATIVE SPECIES

### INTRODUCTION

The use of locally native plants for all landscaping and revegetation projects adjacent to streams and riparian areas is required for new and major redevelopment. It should also be the preferred choice for homeowners involved in any landscaping and revegetation projects within the riparian corridor since native plants are ecologically best suited to a particular creek environment and will provide the most habitat and slope protection with the least amount of maintenance over time.

### HOW TO FIND AND SELECT NATIVES IN THE WATERSHED

When vegetating the creek, choose species growing nearby and make sure the plants used were propagated from seeds, cuttings or divisions collected from the same local creek or watershed. Try local home-grown native plants via direct installation of seeds, divisions and cuttings on the creek bank. Oaks, buckeye and bay trees are easy to grow from seed planted directly into moist creek bank soil. Cottonwood and willow are easy to grow from cuttings stuck directly into moist sandbars. California rose, California blackberry, snowberry, mugwort, beardless wildrye and others can be propagated readily from vegetative offsets and division.

### GUIDELINES FOR PLANTING NATIVE SPECIES

- Geared toward establishing or enhancing the native habitat.
- **Ensure that the initial planting density is high**, averaging 6 to 12 feet on center, to create canopy coverage and closure quickly. Include a range of species in the plant palette to fill in the understory, mid-story and overstory.
- **Avoid hardscape** such as patios, walkways and decks within these areas to minimize human impacts and maximize habitat value.
- **Maintain and monitor plantings** for a 3 to 5 year period to ensure healthy establishment. Performance and success criteria include percentage of allowable mortality and goals for an annual percentage of vegetative cover.
- Slowly eliminate the need for human intervention, including irrigation, weed control, replanting, pruning, etc. The final goal is to discontinue maintenance activities when habitat is self sustainable.

California Native Plant Society's Web site:  
[www.cnps.org](http://www.cnps.org)

## DESIGN GUIDE 2

### GUIDELINES AND STANDARDS 1.B & 1.C

#### LIST OF NATIVE PLANT SPECIES

The following list is a conglomerate of riparian plant species that exist within the boundaries of Santa Clara County. The distribution of one plant may or may not overlap with the next one on the list. Some of them would never be seen together in the wild due to preferences for different

microclimates, soil substrates and hydrologic regimes. If you are unfamiliar with local native plant ecology, consult local experts for help selecting the best plant palette for your particular creek or follow Nature's example and copy what you see in a wild area located close to your project site.

#### TREES:

**Big Leaf Maple**

*Acer macrophyllum*

**California Box Elder**

*Acer negundo var. californicum*

**California Buckeye**

*Aesculus californica*

**White Alder**

*Alnus rhombifolia*

**Western Sycamore**

*Platanus racemosa*

**Fremont Cottonwood**

*Populus fremontii ssp. fremontii*

**Black Cottonwood**

*Populus trichocarpa*

**Coast Live Oak**

*Quercus agrifolia*

**Valley Oak**

*Quercus lobata*

**Narrow-leaved Willow**

*Salix exigua*

**Red Willow**

*Salix laevigata*

**Yellow Willow**

*Salix lucida ssp. lasiandra*

**Arroyo Willow**

*Salix lasiolepis*

**Blue Elderberry**

*Sambucus mexicana*

**California Bay Laurel**

*Umbellularia californica*

#### SHRUBS AND VINES:

**California Sagebrush**

*Artemisia californica*

**Mule Fat**

*Baccharis salicifolia*

**Virgin's Bower**

*Clematis ligusticifolia*

**Toyon**

*Heteromeles arbutifolia*

**Coffeeberry**

*Rhamnus californica*

**California Wild Grape**

*Vitis californica*

**Brown Dogwood**

*Cornus glabrata*

**California Rose**

*Rosa californica*

**California Blackberry**

*Rubus ursinus*

**Snowberry**

*Symphoricarpos albus var. laevigatus*

#### GROUND COVERS AND HERBACEOUS PERENNIALS:

**Mugwort**

*Artemisia douglasiana*

**Western Aster**

*Aster chilensis*

**Douglas' Baccharis**

*Baccharis douglasii*

**Western Goldenrod**

*Euthamia occidentalis*

**Beardless Wildrye**

*Leymus triticoides*

**Sticky Monkey Flower**

*Mimulus aurantiacus*

**California Figwort**

*Scrophularia californica*

California Native Plant Society's Web site:  
[www.cnps.org](http://www.cnps.org)

## USE OF ORNAMENTAL OR NON-NATIVE LANDSCAPING

### INTRODUCTION

If the use of local native plants propagated from local stock does not fit your landscaping goals, choose:

- **Non invasive drought-tolerant, non native ornamental plants** having no potential to cross pollinate native riparian species. For example, if native valley and coast live oaks, willows, sycamores or cottonwoods exist in the riparian corridor, don't plant ornamental oaks, willows, sycamores or poplars.
- **Non invasive, drought tolerant, non-local California natives** (aka ornamental natives), with no potential to cross-pollinate local native species; for example- Fremontodendron or Romneya.

When selecting plants and choosing their location in an ornamental landscape, the project design goals are generally geared to human aesthetics. In choosing ornamental landscaping, hardscape features, such as patios, decks, and walkways, are design components. **These features should be avoided within the riparian habitat area at all locations.**

### PLANT SELECTION GUIDE

The choices of plants that meet the criteria described above for ornamental landscaping is vast. Selection of a plant species for a particular site will depend on goals of the landscape plan, site constraints, the owner's desires and budget. There are a variety of resources available from which selections can be made. Cities generally have plant lists available that were assembled for water conservation purposes. The East Bay Municipal Utility District has prepared a book, entitled "Plants and Landscapes for Summer Dry Climates" and the Sunset Western Garden Book, commonly available at most nurseries, has plant selections identified that are suitable for dry places. **Select plants from these sources as long as you avoid invasive plants and take the caution provided above for selecting native species that have not been propagated from your local watershed.**

### REFERENCES

The California Native Plant Society's 'Guidelines for Protecting Native Plants from Genetic Degradation' is a helpful reference on the subject.

### NON – LOCAL CALIFORNIA NATIVE PLANTS

The following California native plants have a very low potential of hybridizing with our Santa Clara County natives since they do not naturally occur in northern California

#### TREES

Chilopsis linearis, (Desert Willow), Lyonothamnus floribundus, (Catalina Ironwood), Prosopis glandulosa var. torreyana, (Mesquite)

#### SHRUBS

Fremontodendron californicum or Fremontodendron mexicanum, (Flannel Bush), Galvesia speciosa, (Island Bush Snapdragon) Rhus integrifolia, (Lemonade Berry), Rhus ovata, (Sugar Bush), Romneya coulteri, (Matilija Poppy), Simmondsia chinensis, (Jojoba)

California Invasive Plant Council Web site:  
[www.cal-ipc.org](http://www.cal-ipc.org)

## DESIGN GUIDE 3

### GUIDELINES AND STANDARDS 1.C.2

#### COMMONLY FOUND INVASIVE SPECIES TO BE AVOIDED

**Acacia**

*Acacia* spp.

**Almond**

*Prunus dulcis*

**Ash, evergreen**

*Fraxinus uhdei*

**Bamboo, running types**

*Arundinaria*, *chimonobambusa*,  
*phyllostachys*, etc.

**Black locust**

*Robinia pseudoacacia*

**Broom, french**

*Genista monspessulana*,  
previously *cytissus monspessulanus*

**Broom, scotch**

*Cytissus scoparius*

**Broom, spanish**

*Spartium junceum*

**Cape weed**

*Arctotheca calendula*

**Cotoneaster**

*Cotoneaster* spp.

**Elm**

*Ulmus* spp.

**Eucalyptus**

*Eucalyptus* spp.

**Fig**

*Ficus carica*

**Flowering plum, fruitful varieties**

*Prunus* spp.

**Fountain grass**

*Pennisetum setaceum*); purple  
variety "cupreum" is sterile and  
acceptable

**Foxglove**

*Digitalis purpurea*

**Giant reed**

*Arundo donax*

**Glossy privet**

*Ligustrum lucidum*

**Gorse**

*Ulex europaea*

**Himalayan blackberry**

*Rubus discolor*

**Holly oak**

*Quercus ilex*

**Iceplants**

*Carpobrotus edulis*, c. *Chilensis*,  
*mesembryanthemum* spp.

**Ivy, algerian**

*Hedera canariensis*

**Ivy, cape**

*Delairea odorata*,  
previously *senecio mikanioides*

**Ivy, english**

*Hedera helix*

**Kikuyu grass**

*Pennisetum clandestinum*

**Lemon balm**

*Melissa officinalis*

**Lombardy poplar**

*Populus nigra* 'italica'

**London plane tree**

*Platanus acerifolia*

**Mint, any kind including  
pennyroyal, peppermint,  
spearmint**

*Mentha* spp.

**Monterey pine**

*Pinus radiata*

**Myoporum**

*Myoporum laetum*

**Olive**

*Olea europaea*

**Pampas grass,  
jubata grass**

*Cortaderia selloana*, *C. Jubata*

**Pepper trees**

*Schinus* spp.

**Periwinkle**

*Vinca major*

**Pyracantha**

*Pyracantha* spp.

**Tamarisk, salt cedar**

*Tamarix* spp.

**Tree of heaven**

*Ailanthus altissima*

**Walnut, english or black**

*Juglans regia*, *juglans californica*  
var. *Hindsii*

Find it at: <http://www.cnps.org/archives/archives.htm>

Scroll down to:

- 1) Policies and Guidelines
- 2) Conservation Policies
- 3) Guidelines for Landscaping to Protect Native Vegetation from Genetic Degradation.

California Invasive Plant Council Web site:  
[www.cal-ipc.org](http://www.cal-ipc.org)



## RIPARIAN REVEGETATION OR MITIGATION PROJECTS

### INTRODUCTION

This Design Guide is most applicable for larger scale revegetation or mitigation projects but also provides helpful information for anyone planning a revegetation project. Because of the complexity of revegetation design and the variety of ecosystems that exist within the county, it is nearly impossible to create succinct detailed Design Guidelines. Instead, a list of general, broad brush design planning guidelines is included below for riparian revegetation projects in Santa Clara County. Each individual project should be mentored through all stages of project planning and design by experienced biological staff on a case by case basis.

### WATERSHED FIDELITY

- **To preserve genetic integrity in county watersheds, propagation material (seeds, cuttings, divisions) must originate from local native stock, i.e. individuals found as close as possible to the project site and within the same watershed.**
- If propagation material cannot be obtained from within the watershed, material may be collected from an immediately adjacent watershed that shares common ecological characteristics (climate, elevation, soil type, headwaters in the same mountain range, etc.).
- An ecological justification is required before any species may be planted using container stock grown from propagules that originate outside Santa Clara County.

### SEED AND CONTAINER PLANTS

- Direct seeding should be used when possible. *Quercus* sp. and *Aesculus californica* have high success rates when installed in this manner.
- Direct stuck cuttings of willows, cottonwoods and mule fat is encouraged.
- Containerized native plants for revegetation or landscape plantings should be grown and installed in the smaller, deeper container sizes typically offered by revegetation nurseries rather than commercial nurseries to ensure they are healthy. For that reason, quality native plants will normally be smaller and younger than conventional nursery container stock, usually 1-gallon equivalent or smaller size. **Contract nursery production takes one-year minimum lead time before installation. Designers should take these factors into account when commitments are made to project stakeholders.**

## DESIGN GUIDE 4

### GUIDELINES AND STANDARDS 1.C

#### SPECIES SELECTION

- Select plant species that are historically and ecologically appropriate to the project area unless site conditions have been radically modified. The plant palette should be well-suited to these conditions and blend with the existing native vegetation types.
- Non-local, showy, native **“landscape” species should not be intermingled with native revegetation species on projects where habitat restoration is the goal.**
- Do not plant invasive, non-native species near streams.

#### DESIGN CRITERIA

- Revegetation design should be predicated upon thorough analysis of groundwater and surface water hydrology, soil profiles, and other physical information obtained from direct site investigations. Existing site conditions should be preserved and modification into an artificially sustained condition should be discouraged.
- Revegetation projects should be designed to quickly attain sustainability rather than to require long-term human intervention.
- Irrigation, weed and pest control, soil manipulation, etc., should become unnecessary within one to three years.
- Land use on adjacent sites that could disrupt or damage the project goals should be factored into design decisions for revegetation projects.
- Experienced biological staff should be active participants during the entire design process for revegetation, native landscape, mixed (native & non-native) landscape, erosion control, etc. plans and specifications.

California Native Plant Society Web site:  
[www.cnps.org](http://www.cnps.org)

## TEMPORARY EROSION CONTROL OPTIONS

### INTRODUCTION

This design guide provides more detail on G&S I.C.3 and GS IV.B.7 by explaining what steps can be taken during post construction to provide erosion control in short order on stream banks through temporary vegetative measures. These measures are typically employed:

- when the grading and/or construction is being done in phases,
- when it does not make sense to plant more permanent vegetation or
- if grading and/or construction has not been completed by the rainy season.

These temporary techniques are also sometimes used in conjunction with final more permanent revegetation. The following guidelines can be used to determine if and how erosion control seed mixes should be used.

### SEED MIXES TO BE AVOIDED

Some commercially available seed mixes contain species, which are invasive weeds, aggressive competitors with native plants and/or future fire hazards. **These seed mixes should be excluded from streamside areas.** Examples are Blando brome, rose or red clover and annual rye.

### EROSION CONTROL OPTIONS FOR WORK SITES WITH EXISTING NATIVE PLANTS

These erosion control options should be followed in most areas along natural creeks, where native trees, shrubs and herbs reside on or near the work site. A site visit or referral of a good series of photos to a landscape professional familiar with native plants or a revegetation specialist may be needed to determine the best approach.

If no irrigation is available, if the slope is very steep, or if it's late in the season

- Use a non-biological method, such as straw, straw with tackifier, erosion control blankets (jute netting with straw or coir filling), etc. instead of seeding.

#### *Benefits:*

- The blankets are functional immediately after installation.
- The adjacent native plants will fill in at their own pace.

Use if there is absolutely no time to investigate site conditions.

- Use a Failsafe mix with 50 lb/ac 'Regreen' sterile wheat (*Triticum X Elymus 'Regreen'*), with 95% minimum purity, and minimum germination of 85%.

#### *Benefits:*

- This plant mix makes few if any seeds, so it cannot become a weed, and it usually lives only one year.
- The adjacent native plants can seed in thereafter.

## DESIGN GUIDES 5

### GUIDELINES AND STANDARDS 1.C.3 AND IV.B7

#### EROSION CONTROL OPTIONS FOR WORK SITES WITHOUT EXISTING NATIVE PLANTS

These erosion control options should be followed in areas where there is no remaining native vegetation for miles around. An example of such a site is the back slope of a levee in an urbanized area.

*For Sunny Slopes 3:1 or Flatter*

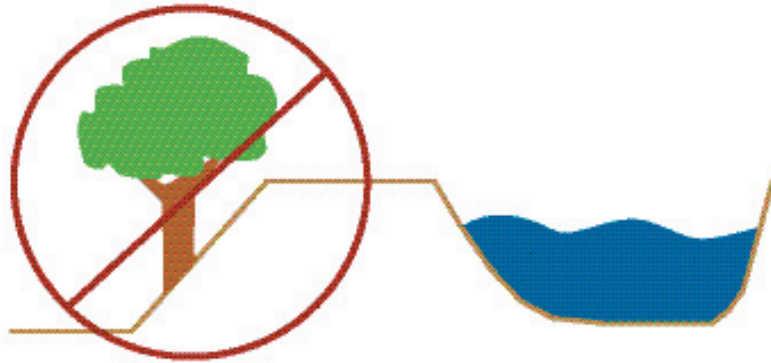
- **California Native Grass**  
Use a mix of:  
Prostrate Hordeum californicum (Prostrate California Barley) @ 16 lb/ac, minimum purity 90%, minimum germination 80%.  
  
Elymus glaucus 'Berkeley' ('Berkeley' Blue Wildrye) @12 lb/ac, minimum purity 95%, minimum germination 85%  
  
Bromus carinatus 'S.F. Bay Area' ('S. F. Bay Area' California Brome) @ 10 lb/ac, minimum purity 95%, minimum germination 85%
- **Failsafe mix**  
50 lb/ac 'Regreen' sterile wheat (Triticum X Elymus 'Regreen'), minimum purity 95%, minimum germination 85%

- **Non-biological method** as outlined above

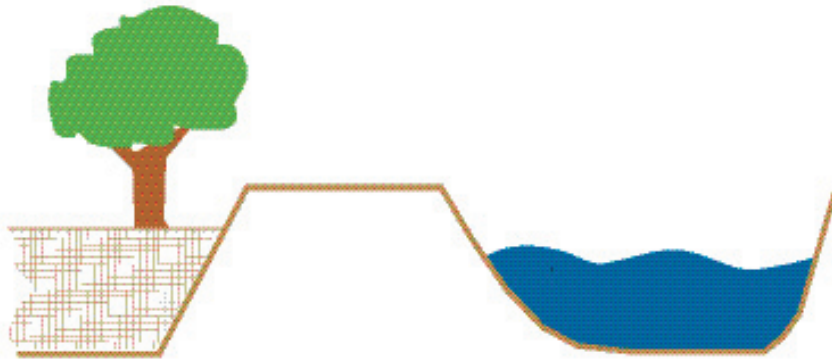
*For Slopes 2:1 or Steeper*

- **California Native Grasses PLUS Mix**  
Use the mix for Slopes 3:1 or Flatter PLUS Vulpia microstachys (Three Weeks Fescue) @ 5 lb/ac, minimum purity 95%, minimum germination 70%
- **Failsafe mix**  
50 lb/ac 'Regreen' sterile wheat (Triticum X Elymus 'Regreen'), minimum purity 95%, minimum germination 85%.
- **Non-biological method** as outlined above

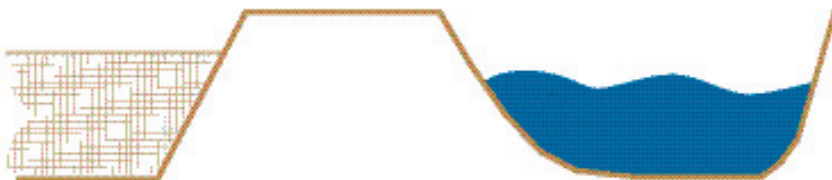
## PLACEMENT OF FILL AND PLANTING OF TREES BY LEVELS



Plants with large root systems (trees and large shrubs) should not be placed on existing levees.

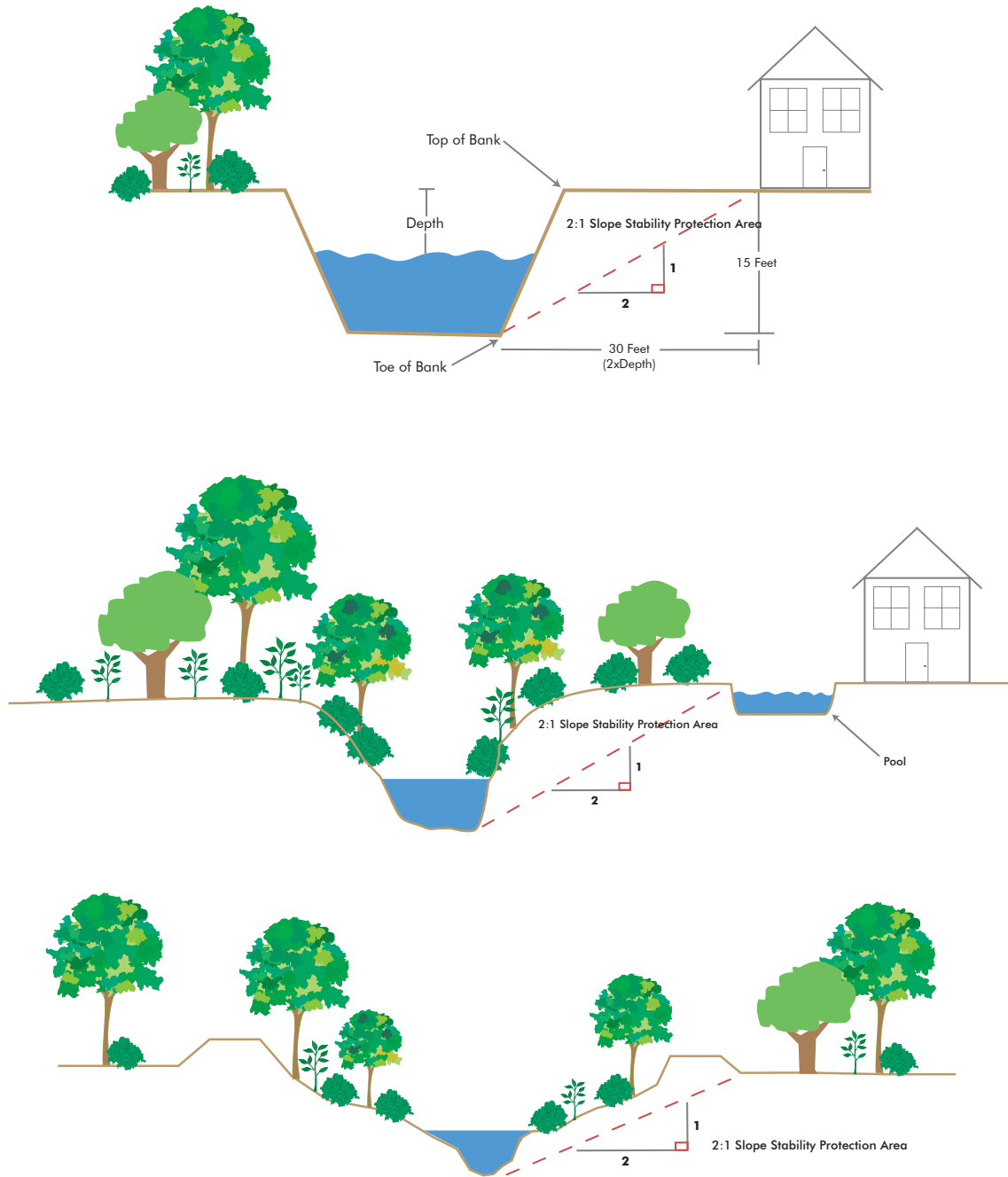


Trees may be planted on a levee if additional fill is placed on the levee.



The placement of fill on/next to the out board slope of the levee will reduce the height of the levee for aesthetics and improves the safety of the levee system. The height of the fill may vary. Geotechnical analyses may be needed to determine the impacts of the fill to the levee slope.

## SLOPE STABILITY PROTECTION AREA



Note: While accessory structures are typically exempt, it is still recommended to locate them outside the 2:1 Slope Stability Protection Area in order to protect the structures, creek bank, and habitat.

## GUIDELINES FOR ESTABLISHING FREEBOARD FOR BRIDGE CROSSINGS AND FLOOD PROTECTION PROJECTS

### BACKGROUND

Freeboard is the additional capacity in a stream above the calculated capacity required for the 1 percent flow. Freeboard provides a safety factor for such things as normal wave action, inaccuracies in determination of friction factors, and minor silt and debris deposits. **The freeboard guidelines should also be followed when streams are modified as part of major land development proposals.** The Federal Emergency Management Agency (FEMA) has set guidelines for the determination of freeboard. In order for an area to be removed from a flood zone designated by FEMA following completion of a flood control project, the project must meet the FEMA guidelines. These freeboard guidelines are followed by the SCVWD in the design of flood protection projects **and should be followed for the design of bridges and other street crossings.**

A. Where the design water surface<sup>1</sup> is above natural ground, the following criteria shall be considered a minimum:

1. Federal Emergency Management Agency (FEMA) guidelines. FEMA currently specifies that levees shall have a minimum of 3 feet of freeboard with an additional foot of freeboard required 100 feet on either side of structures that are within the leveed section of creek or where the flow is constricted such as at bridges. FEMA also requires an additional ½ foot above the minimum at the upstream end of the levee, tapering to not less than the minimum at the downstream end of the levee. To comply with these requirements, use as a minimum 3½ feet of freeboard within leveed sections and 4 feet within 100 feet of bridges or other constrictions.

2. For floodwalls, use the same freeboard criteria as for levees. (Basis—SCVWD guideline)
3. If two-tenths of the total energy (depth of flow +  $[v^2/2g]$ ) is greater than the freeboard requirement of A-1 or A-2 above, then the computed value shall be used for freeboard. (Basis—Natural Resource Conservation Service [NRCS] guideline)

B. Where the design water surface is below natural ground, the following criteria shall be considered a minimum:

1. One foot of freeboard shall be used for constructed, nonnatural channels where large amounts of vegetation are not anticipated in the channel. (Basis—Corps of Engineers guideline)
2. For all channels, if two-tenths of the total energy is greater than the freeboard requirement of B-1 above, then the computed value shall be used for freeboard. (Basis—NRCS guideline)

C. For bridges, the following criteria shall be considered minimum:

1. At new bridges, freeboard shall be the same as in the existing or proposed channel either upstream or downstream, whichever is greater. When the bridge structure encroaches into the freeboard area, there shall not be an increase in water surface for bank full flow. The intent is to define a system (bridge and channel) with a uniform level of protection. (Basis—SCVWD guideline)

---

<sup>1</sup> Defined by recent flood protection projects or determined according to local topography and site conditions. For more information, contact SCVWD.

## DESIGN GUIDE 8

### GUIDELINES AND STANDARDS

2. Where an existing bridge or culvert can convey the design flow under pressure, it must be structurally sound and must be able to resist the resultant lateral and uplift forces.  
(Basis—SCVWD guideline)

#### D. Other Considerations:

1. Evaluate all bridges with debris loads on the piers. (suggest Corps practice of three times pier diameter as blockage)
2. Freeboard should also contain the flow defined by the 80 percent confidence

limit statistical parameter where practical to do so.

3. All channels with super-critical flow will use sequent depth plus freeboard.
4. All channels will include freeboard for super-elevation of water surface at curves in addition to requirements specified in Sections A, B, and C above.
5. In areas of the County where there is the possibility of continued land surface subsidence, additional freeboard allowances should be considered.

## DESIGN GUIDE 9

### GUIDELINES AND STANDARDS V.A

## GRADING OPTIONS NEXT TO STREAMS

### INTRODUCTION

The details in this Design Guide are intended to provide clarification to G&S V.A, which calls for all grading next to streams to address drainage and avoid the concentration of flow over the stream bank. For all major redevelopment and new development, grading should be addressed in stormwater permit provisions. The applicants will have to observe urban runoff pollution prevention regulations during grading operations. In addition, the following grading guidelines would also be useful to single family homeowners interested in minimizing erosion and saturation of the streambank and maintaining slope stability and riparian habitat.

### ADDITIONAL INFORMATION REQUIRED

In addition to the urban runoff pollution prevention regulations, permit applicants should also be asked to provide the following information:

- Existing trees that are to remain and those proposed to be removed
- The species of tree and its diameter at 4 feet from the ground
- Source of fill and hazmat certification

This will help in assess if the proposed grading method is the most appropriate for the site so as to avoid other impacts.

### OPTIONS FOR GRADING

This Design Guide provides 5 options of how to design grading. Any other proposal which satisfactorily meets the goals of preventing over-bank drainage and the placement of fill along the riparian protection area by future lot owners may be considered. The selection of a particular option will be influenced by a site's finished grades needed to provide for streets, building pads and positive drainage to the storm sewer system.

**Option #1 is the preferred option because it avoids disturbance to the riparian corridor and does not direct drainage over bank.**

In other cases, applicants might need to use one of the Options 2- 5, because of the need to raise the site elevation. Option 2 avoids disturbance to the riparian corridor and minimizes the drainage directed over bank. Options 3 and 4 are similar but more costly. Option 5 would only be suitable if there is no riparian vegetation and it conforms to adjacent property upstream and downstream. **Fill placed within the riparian area should be suitable for planting.**



# GRADING OPTIONS NEXT TO STREAMS

DEVELOPMENT ← ○ → SCWWD R/W OR RIPARIAN PROTECTION AREA

FINISH GRADE

4:1 OR FLATTER

VARIES

Exist. Ground

**14/1** **DETAIL**  
**OPTION 1**  
**PREFERRED**

---

DEVELOPMENT ← ○ → SCWWD R/W OR RIPARIAN PROTECTION AREA

FINISH GRADE

2' (MAX)

4:1 OR FLATTER

Exist. Ground

**14/2** **DETAIL**  
**OPTION 2**

---

DEVELOPMENT ← ○ → SCWWD R/W OR RIPARIAN PROTECTION AREA

FINISH GRADE

REINF. CONCRETE OR BLOCK RETAINING WALL WITH ARCHITECTURAL TREATMENT ON FACE

Exist. Ground

**14/3** **DETAIL**  
**OPTION 3**

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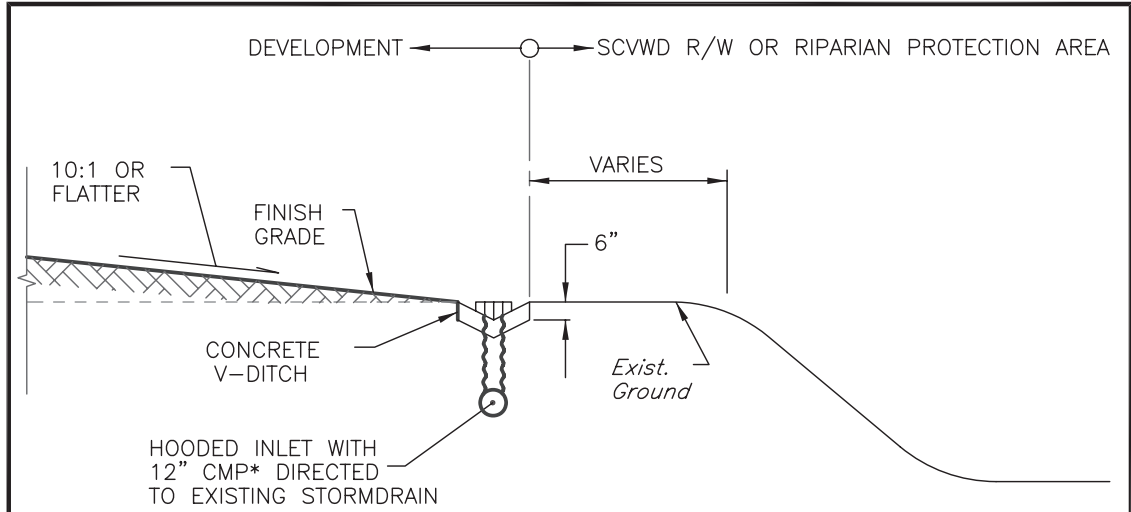
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**GRADING ADJACENT  
TO STREAMS**

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## GRADING OPTIONS NEXT TO STREAMS

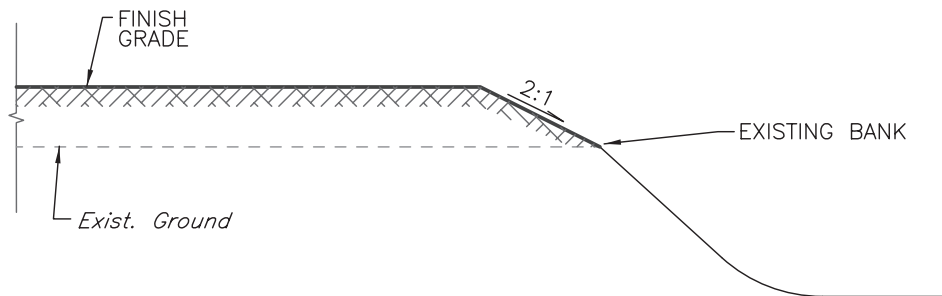
Option 5 is not the preferred option because placement of fill in riparian areas can damage stream side resources. If fill must be used in riparian areas, the type of fill used must support riparian vegetation and the area should be revegetated.



**14/5** DETAIL  
**OPTION 4**

\* CORRUGATED ALUMINUM OR STEEL PIPE

USE ONLY WHERE THERE IS NO RIPARIAN CORRIDOR



**14/4** DETAIL  
**OPTION 5**

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### GRADING ADJACENT TO STREAMS

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## GRADING AND DRAINAGE

### Use of Vegetated Swales or Buffer Strips

#### INTRODUCTION

The Guidelines and Standards Section V on Grading and Section VI on Outfalls and Site Drainage refer to the use of vegetated swales or buffer strips. A vegetated swale (a.k.a. grassed channel, dry swale, wet swale or biofilter) is a broad, shallow channel with a dense stand of vegetation designed to trap particulate pollutants (suspended solids and trace metals). Vegetated swales are fairly straight forward to design and can be easily incorporated into a project's site drainage plan. For all major redevelopment and new development, vegetated swales may be included in the stormwater permit; however, they are also a good practice for single family homeowners to consider incorporating in landscaping and design plans.

The benefits of using vegetated swales or buffer strips next to streams are that they:

1. Improve the quality of stormwater runoff and reduce or slow the velocity of runoff from hardened or paved areas
2. Allow for infiltration
3. Provide an opportunity for sediment and pollutants to be filtered and removed from the runoff.

The swales can be located within landscaped or turf areas and can collect runoff from patios, driveways, roof drains, parking lots. Discharge from the swale should be to a storm drain system, which will ultimately discharge to a stream.

#### DESIGN ELEMENTS

- Gentle side slopes: 3 horizontal to 1 vertical slope maximum
- Minimal longitudinal slope: 1% to 2% recommended. If greater, install check dams to reduce velocity. Do not use swales on slopes greater than 6%
- Flowpath length: Minimum of 10 feet
- Bottom width: 2 to 8 feet. Consider access with mowing equipment if turf grasses are used.

#### RECOMMENDED TYPES OF VEGETATION TO USE

There is a variety of vegetation, including trees, shrubs, groundcover and grasses that are suitable for periodic inundation. One goal is to select plants that will thrive at the site. Near streams, native plants and wetland vegetation are preferred to turf grasses as swale liners because they offer higher resistance to flow and provide a better environment for filtering and trapping pollutants from stormwater. However, turf grass, allowed to remain slightly high, can provide some benefits as well.

#### MAINTENANCE

Turf maintenance consists of mowing and removal of grass clippings. Swales should be cleaned of any sediment accumulation and monitored for erosion with subsequent reseeding or replanting as necessary. Fertilizers should be applied before the rainy season to minimize conveyance of pollutants to the stream.

## DESIGN GUIDE 10

### GUIDELINES AND STANDARDS V.B.2

#### PLANT SPECIES FOR VEGETATED BUFFERS AND SWALES

The following trees and shrubs tolerate wet soil and periodic inundation, and may be suitable for planting in basins and biofilters depending on regional hardiness and other factors. This list is not all-inclusive, and draws from both native and exotic species.

##### TREES

###### Box Elder (N)

*Acer negundo*

###### Red Maple (H)

*Acer rubrum*

###### Silver Maple (H)

*Acer saccharinum*

###### Alder (N)

*Alnus spp.*

###### Birch

*Betula spp.*

###### Pecan

*Carya illinoensis*

###### Buttonbush

*Carya ovata*

###### She-Oak

*Casuarina spp.*

###### Lily of the Valley

*Clethra arborea*

###### Redtwig Dogwood (N)

*Cornus stolonifera*

###### Persimmon

*Diospyros virginiana*

###### Oregon Ash (N)

*Fraxinus latifolia*

###### Honey Locust

*Gleditsia triacanthos*

###### Liquidambar

*Liquidambar styraciflua*

###### Tulip Tree

*Liriodendron tulipifera*

###### Southern Magnolia

*Magnolia grandiflora*

###### Sweet Bay

*M. virginiana*

###### Cajeput Tree

*Melaleuca  
quinquenervia*

###### Tupelo

*Nyssa sylvatica*

###### Sitka Spruce

*Picea sitchensis*

###### Sycamore (H)

*Platanus occidentalis*

###### California

###### Sycamore (N)

*P. racemosa*

###### Fremont

###### Cottonwood (N)

*Populus fremontii*

###### Wingnut

*Pterocarya stenocarpus*

###### Bur Oak (H)

*Quercus macrocarpa*

###### Pin Oak (H)

*Q. palustris*

###### Willow (N)

*Salix spp.*

###### Bald Cypress

*Taxodium distichum*

###### Arborvitae

*Thuja occidentalis*

##### SHRUBS

###### Salal (N)

*Gaultheria shallon*

###### Horsetail (N)

*Equisetum hyemale*

###### Fern (N)

*Ferns (many spp.)*

###### Iris (N)

*Iris (many spp.)*

###### Myoporum

*Myoporum parvifolium*  
'putan creek'

###### Pacific Wax

###### Flower (N)

*Myrica*

###### Willow (N)

*Salix spp.*

###### Huckleberry (N)

*Vaccinium*

##### GROUND COVER

###### Acorus

*Acorus gramineus*

###### Sedge (N)

*Carex spp.*

###### Tufted Hairgrass (N)

*Deschampsia caespitosa*

###### Sierra Laurel

*Leucothoe davisiae*

###### Bulrush

*Scirpus spp.*

###### Rush (N)

*Juncus spp.*

###### Spiderwort

*Tradescantia virginiana*

###### Common Cattail (N)

*Typha latifolia*

##### SUITABLE TURF GRASS

###### Bentgrass (N)

*Agrostis exarata*

###### California Brome (N)

*Bromus carinatus*

###### Creeping wildrye (N)

*Elymus triticoides*

###### Idaho Fescue, (N)

*Festuca idahoensis*

###### Blue Bunchgrass

*Festuca idahoensis*

###### Molate/Red

###### Fescue (N)

*Festuca rubra*

###### Meadow Barley (N)

*Hordeum  
brachyantherum*

###### Meadow Barley

*Hordeum  
brachyantherum salt*

###### Rushes (N)

*Juncus spp.*

**N** = Use plants grown from propagules collected locally

**H** = This species has a potential to hybridize with natives. Delete if native plants of the same genus exist nearby.

Table excerpted from BASMAA's *Start at the Source Guide* (2003) and adapted from Harris (1992), *Sunset Western Garden Book* (1998) and ABAG (1995b).

"Start at the Source" is available at [http://www.scvurppp-w2k.com/basmaa\\_satsm.htm](http://www.scvurppp-w2k.com/basmaa_satsm.htm).  
Other design guidance for pollution prevention is available at [www.scvurppp.org](http://www.scvurppp.org)

## SPECIFICATIONS FOR PLACEMENT OF STRUCTURAL FILL ON SCVWD LEVELS

### INTRODUCTION

This specification for structural fill is to be used where fill is placed on a levee in conjunction with projects that construct levees, raise levee heights or include cuts into levees for placement of outfalls or utilities.

### FILL MATERIAL

Fill material for trench backfill of levees and for levee embankment may be either imported backfill material or suitable material from trench excavation blended with imported earthfill material. The fill material is to be free of debris, organic or deleterious material and not contain rocks or lumps over 4 inches in greatest dimension; no more than 15% of the rocks or lumps should be larger than 2 ½ ". The fill material shall contain at least 75% finer than the #4 U.S. Standard Sieve and 50% finer than the #200 Sieve. The liquid limit shall be less than 40 and the plasticity index shall be between 10 and 20. Levee fill material should be relatively impervious (permeability less than 10 to the minus 6cm/sec).

### ADDITIONAL GUIDELINES

Surfaces exposed by stripping or excavation shall be scarified to a minimum depth of 6 inches and compacted to a relative compaction of not less than 95% based on (American Society of Testing Materials) ASTM D 1557 standard. The loose thickness of each layer of embankment material before compaction shall not exceed 8 inches, and each lift shall be compacted to at least 90% relative compaction based on ASTM D1557 standard. The field density and moisture content of compacted fill will be determined according to ASTM D 1556, D2922 and D3017 standard procedures. Any backfilled area not meeting the minimum test requirements shall be removed and recompacted until tests meet the minimum requirements. Jetting or ponding is not permitted

No thin, sliver fills will be accepted. Where compacted channel embankment is required or where replacement in over excavated areas must be accomplished, the new embankment must be placed in thin, maximum 8 inch thick horizontal layers with a minimum width of 6 feet. This specified width may be any combination of new fill plus cut into existing slope, except that a minimum cut of 2 feet into existing slope per layer of fill must be made. Slopes shall be trimmed to conform to existing section after placement of fill has been completed.

## OUTFALL STANDARDS

### INTRODUCTION

The details in this Design Guide are intended to provide clarification to G&S IV.B.1-3, which calls for slope protection for outfalls to be designed to meet SCVWD minimum engineering standards using softer slope protection methods wherever possible. This Design Guide also includes a plan view to show how the outfall would intersect with a natural channel so as to not impede surface flows or create a barrier to fish passage. The diagrams depicted are models and should be used by the local permitting agency staff unless otherwise determined by agreement between the agency and SCVWD or unless stream conditions dictate otherwise. For placement of outfalls into streams with levees, floodwalls or structural linings, however, SCVWD will need to be consulted as they typically have ownership or easements on these areas of the stream.

### GENERAL GUIDELINES

1. Outfalls should not overhang the streambank or streambed as this can lead to excessive channel erosion.
2. Outfalls, bridge abutments and other structures should be placed within the first half of the straight section after the bend (page 4.24) in order to minimize erosion, prevent turbulence and prevent redirection of flow.
3. Outfalls should be aligned downstream in the direction of the flow, at an angle no greater than 30 degrees. **In natural streams where possible, a narrow channel should be created** for the outfall so that the discharge merges into the streams in order to minimize erosion, prevent turbulence and prevent redirection of flow.
4. Any outfall pipe should be cut off flush with the face of slope protection.
5. Outfalls with flap gates require dormers or similar designs to isolate the flap gate and keep them out of flow area. (See Detail #18/1 and 28/1).

**TYPICAL MATERIALS TO USE**

Where the pipe must be cut flush with the side slope (typically in engineering channels and on steep slopes where hard slope protection measures are needed, use corrugated metal or appropriate plastic pipes for outfalls. For outfalls, with rock slope protection, or where pipe is constructed into a concrete headwall, reinforced concrete pipe may be used.

**TYPES OF OUTFALLS AND WHEN TO USE THEM**

The selection of an outfall is dependent on the condition of the stream bank into which the outfall is directed. Below is a table that

describes when certain outfalls would be most appropriate.

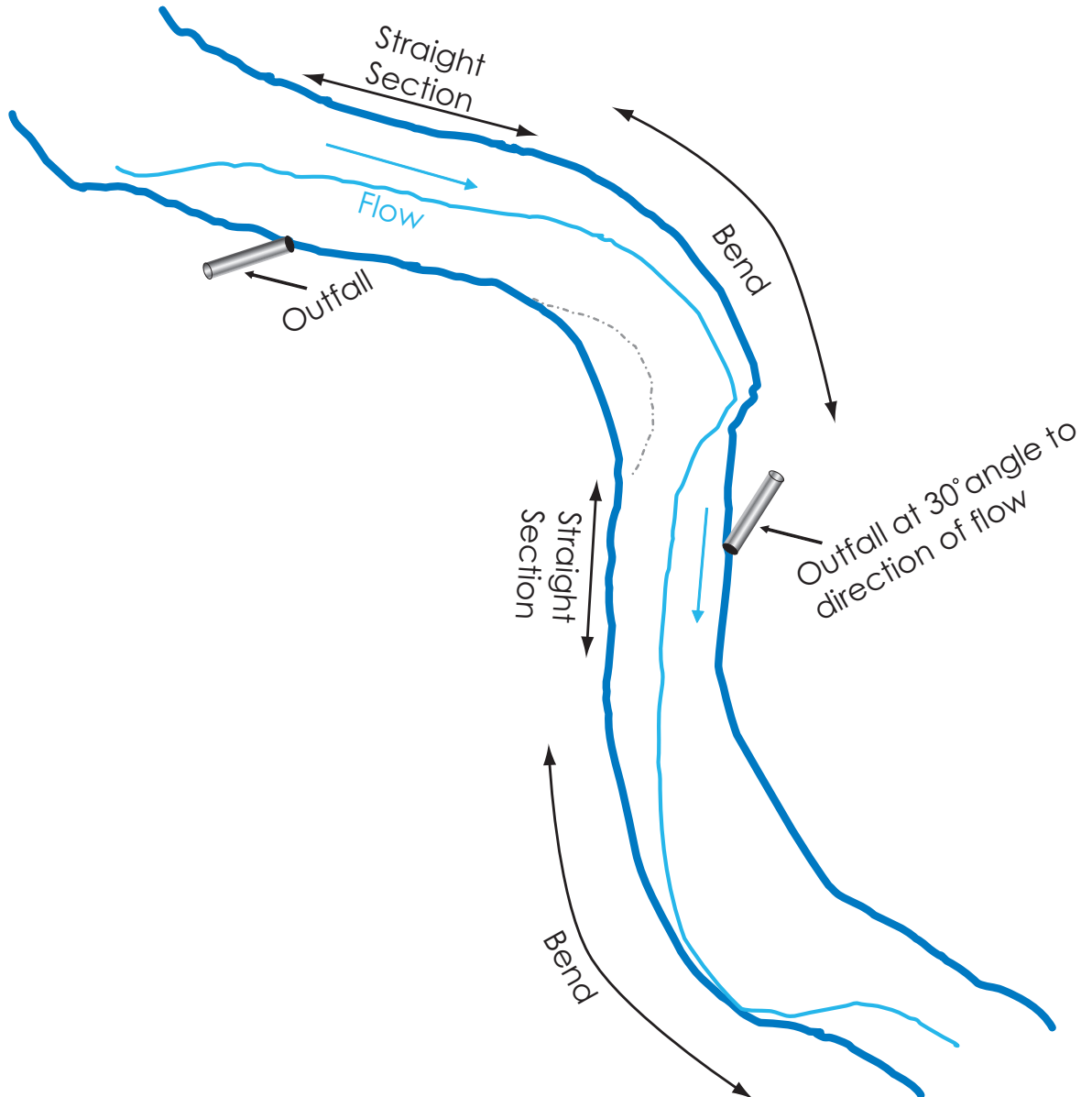
In addition to these measures, SCVWD has also developed model details for outfalls into mattress and stepped gabions, an emergency overflow into a stream, and an outfall into a deep ravine. These will be available on the District’s web site. Other soft methods of slope protection that incorporate vegetation are shown in the Bank Protection section. An outfall may also be incorporated into a vegetated bank design provided there is sufficient slope protection to prevent bank erosion.

Type of Outfall	Detail Number	When to Use	Benefits/Limitations
<b>Outfalls with rock slope protection</b>	6-1, 6-2, 6-3	For unlined streams where slopes are flatter than 1.5:1 and where an incision into the bank is not possible.	Preferred option because vegetation can be re-established and rocks are more resilient to movement and stream degradation.
<b>Outfall with a drainage swale</b>	27-1	For natural streams where a bank incision can be made	Reduced potential for erosion from outfall but an incorrect placement in channel can increase turbulence and erosion
<b>Outfall into RCB Wall with one or two steel curtains</b>	1-1,1-2,1-3 2-1, 2-2	If the stream is contained in a Reinforced Concrete Box. The detail used will depend on the steel rebar configuration in the box	Reduced need for additional bank protection. Size of pipe is limited: larger pipes can impact hydraulics.
<b>Pipe to Pipe Outfall</b>	3-1	If the stream is contained in a reinforced Concrete or corrugated metal pipe	Outfall pipe is limited to ¼ the size of the stream pipe
<b>Pipe Outfall into Channel Lining</b>	4-1, 4-2	If the stream is contained in a concrete lined channel	
<b>Pipe Outfall with Sacked Concrete Rip Rap</b>	5-1, 5-2, 5-3, 5-4, 5-5, 5-6	For steep slopes 1.25:1 or greater where other measures will not be structurally sound	This treatment is not preferred ite it deflects flow, is not resilient in degrading channel

## OUTFALL STANDARDS

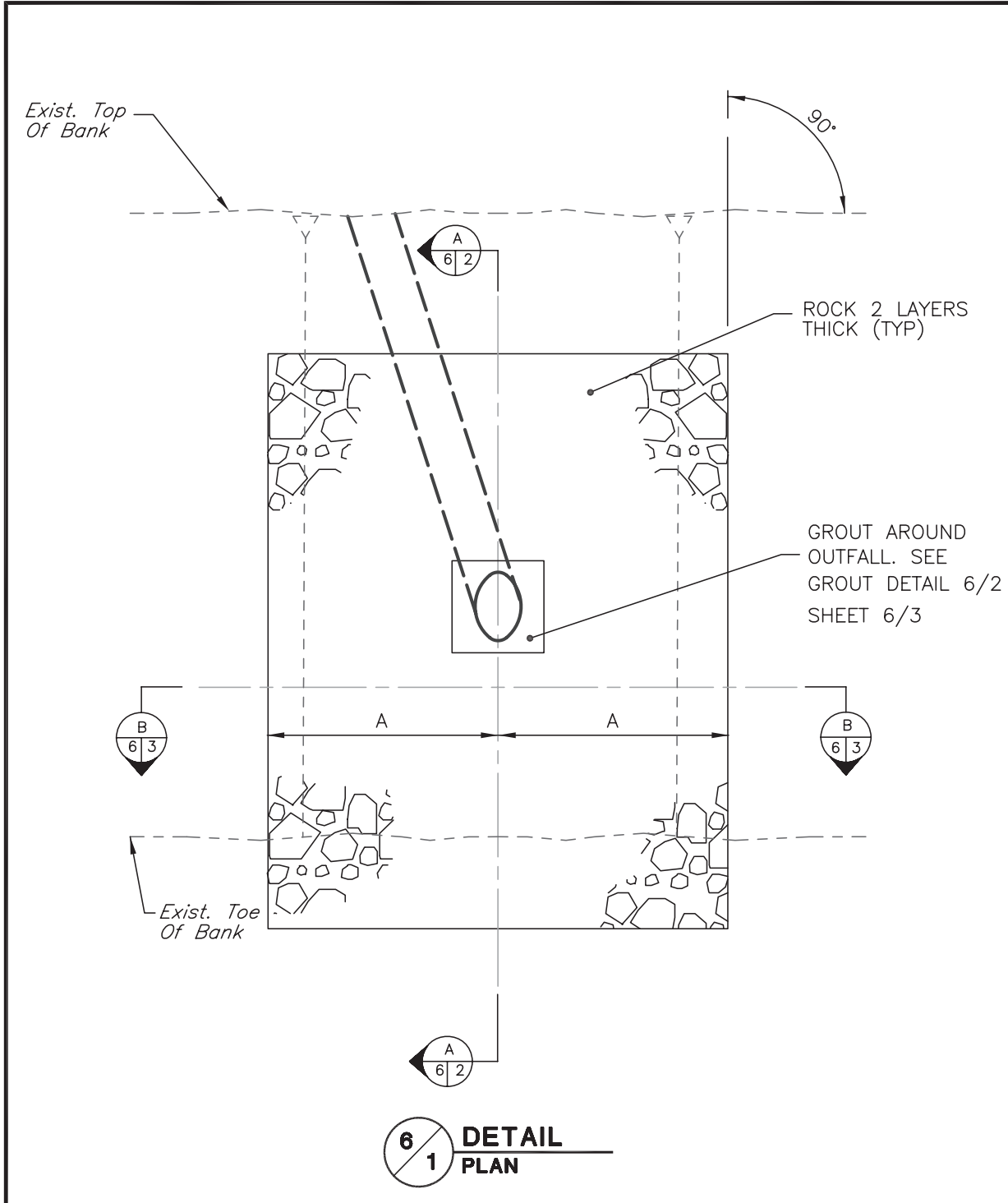
Outfalls, bridge abutments and other structures should be placed within the first half of the straight section after the bend.

Outfalls should be aligned downstream in the direction of the flow, at an angle of less than 30 degrees.





# OUTFALL WITH ROCK SLOPE PROTECTION

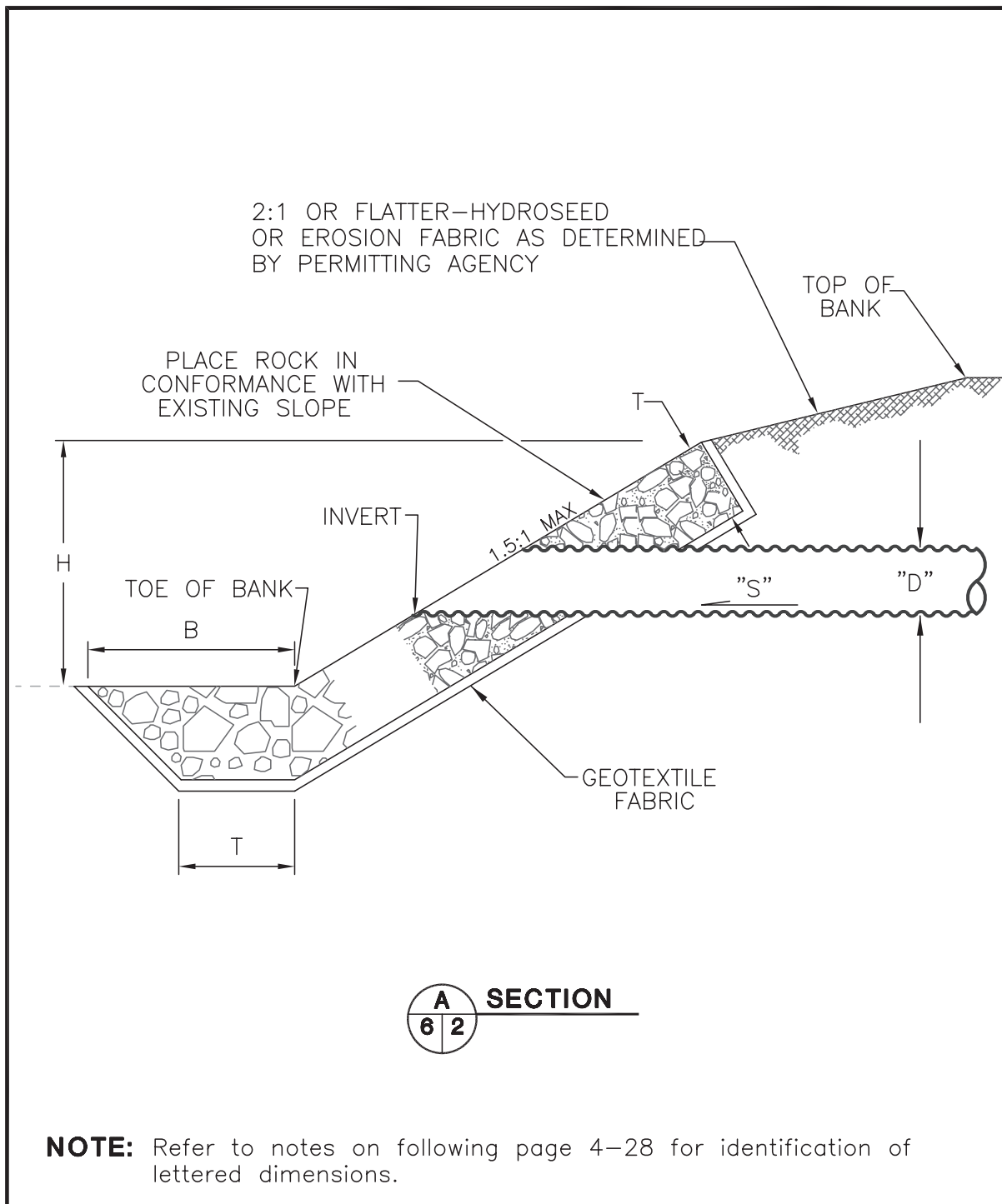


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**OUTFALL WITH ROCK  
SLOPE PROTECTION**

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# OUTFALL WITH ROCK SLOPE PROTECTION



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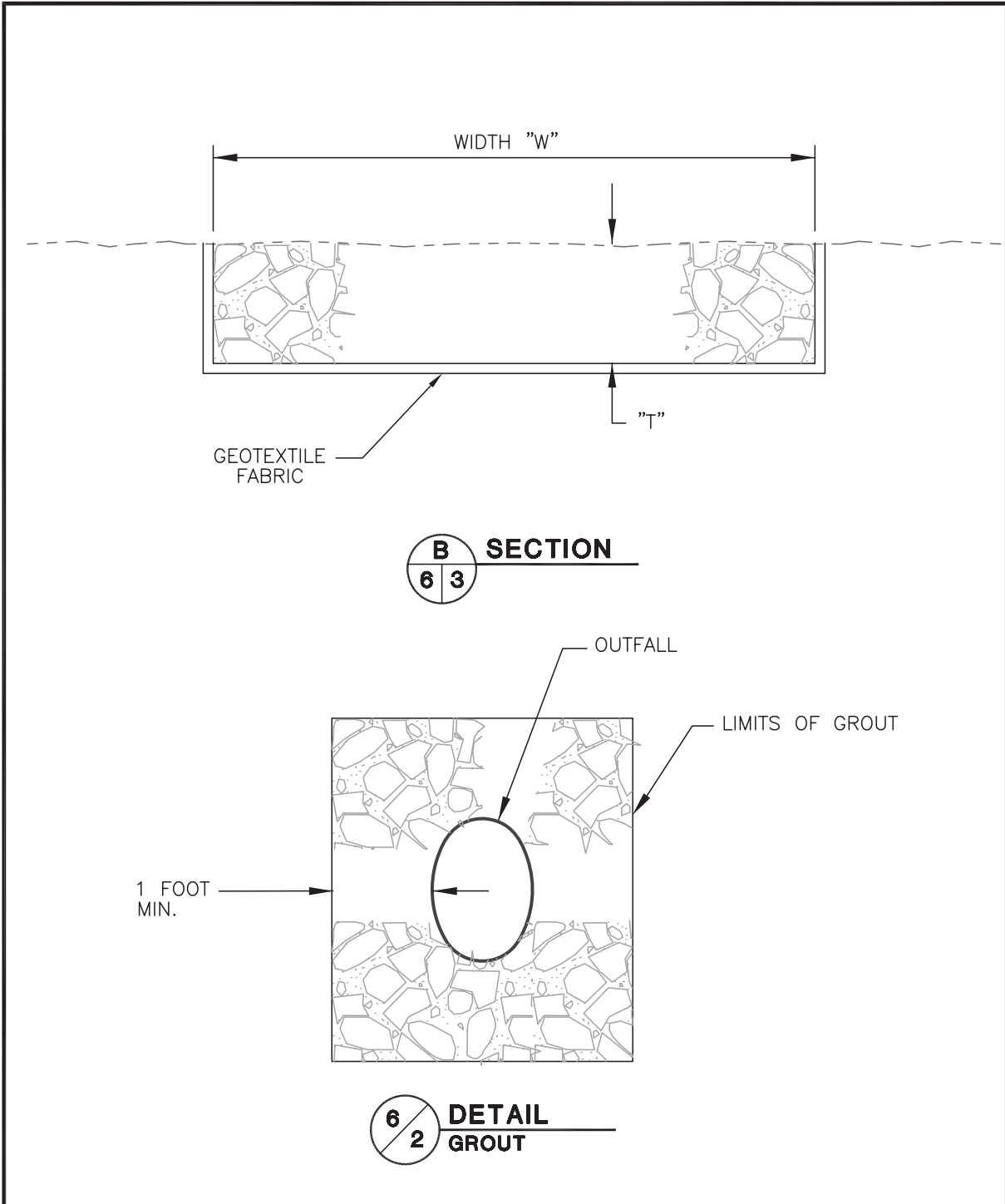
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**OUTFALL WITH ROCK SLOPE PROTECTION**

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# OUTFALL WITH ROCK SLOPE PROTECTION



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OUTFALL WITH ROCK  
SLOPE PROTECTION

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# DESIGN GUIDE 12

## GUIDELINES AND STANDARDS VI.B.3

### NOTES FOR CONSTRUCTION OF OUTFALL

1. IT IS MANDATORY THAT THE SCVWD INSPECTOR BE NOTIFIED AT LEAST 48 HOURS PRIOR TO THE COMMENCEMENT OF CONSTRUCTION. COMPLETE REMOVAL OF PORTIONS OF THE WORK INSTALLED WITHOUT INSPECTION MAY BE REQUIRED IF THIS REQUIREMENT IS NOT MET.
2. ALL WORK IS TO BE IN ACCORDANCE WITH THE STATE STANDARD SPECIFICATIONS SECTION 72-2. NO WHITE ROCK MAY BE USED. METHOD B PLACEMENT SHALL BE USED. GROUT TO BE IN CONFORMANCE WITH PARAGRAPH 65-1.06 FOR CEMENT MORTAR.
3. THE OUTFALL PIPE IS TO BE CUT OFF FLUSH WITH THE SLOPE PROTECTION.
4. ANY BACKFILL NECESSARY FOR THE INSTALLATION OF THE OUTFALL SHOULD BE COMPACTED TO 90 PERCENT RELATIVE COMPACTION IN CONFORMANCE WITH ASTM STANDARD TEST METHOD D1557.
5. ANY EXCESS SOIL FROM EXCAVATION SHALL BE DEPOSITED OFF OF DISTRICT RIGHT OF WAY UNLESS APPROVED BY THE DISTRICT'S INSPECTOR.

### CRITERIA TO BE USED FOR DESIGN OF OUTFALL

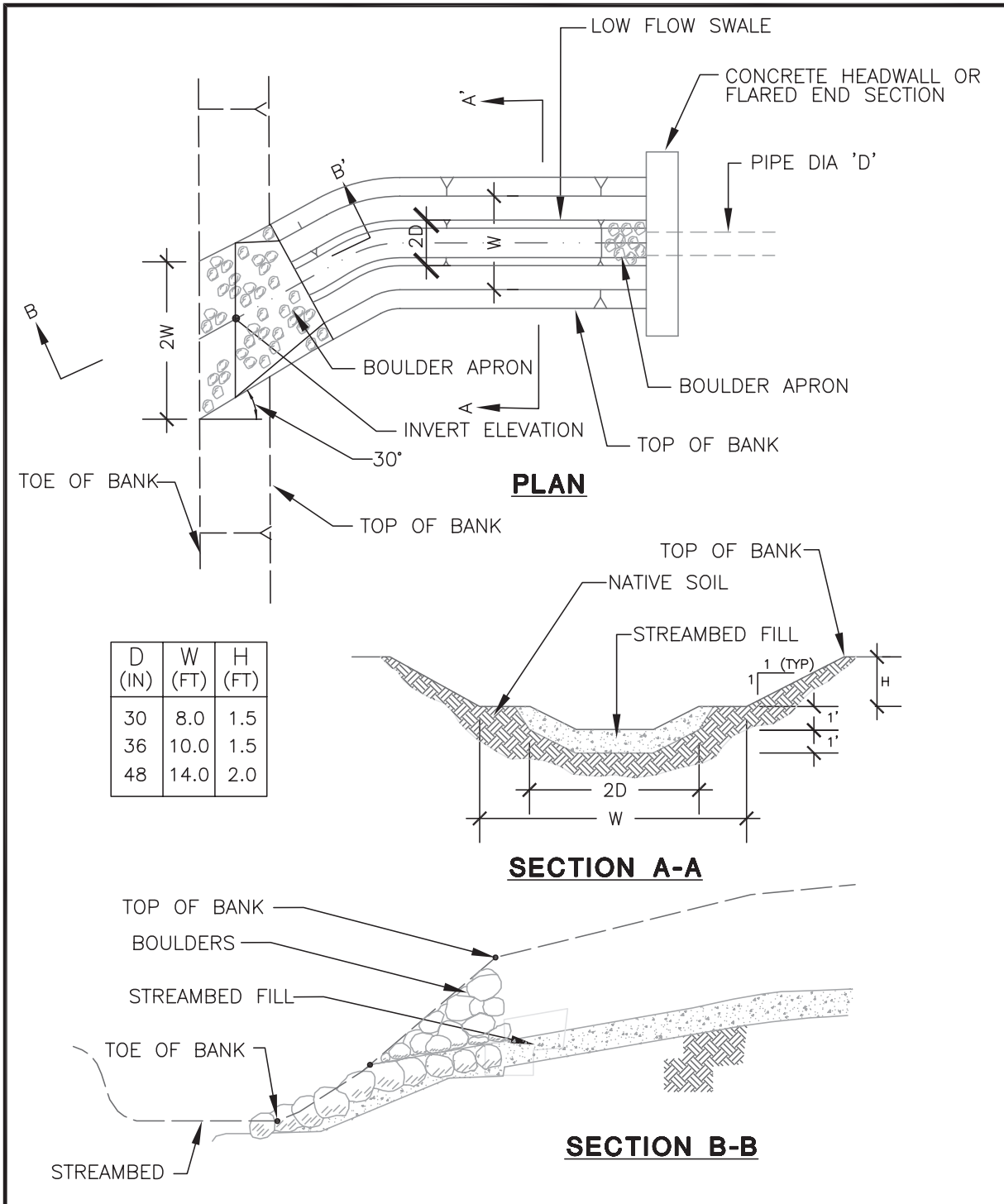
1. ROCK SLOPE PROTECTION FOR OUTFALLS MAY NOT BE USED FOR SLOPES STEEPER THAN 1.5:1.
2. THE PLAN VIEW, SECTION A 6/2 AND SECTION B 6/3 ARE TO BE DRAWN TO SCALE ON THE PLANS WITH SCALE PROVIDED AND SHOULD REFLECT EXISTING CONFIGURATION OF THE CHANNEL WHERE THE OUTFALL IS PROPOSED.
3. PLANS SHOULD SPECIFY THE FOLLOWING DIMENSIONS/ELEVATIONS:

PIPE DIAMETER "D"	TOP OF BANK ELEVATION
1/2 SLOPE PROTECTION WIDTH "A"	TOE OF BANK ELEVATION
ROCK THICKNESS "T"	PIPE INVERT ELEVATION
CHANNEL BOTTOM ROCK WIDTH "B"	PIPE OUTFALL SLOPE "S"
SLOPE PROTECTION WIDTH "W"	
HEIGHT OF ROCK "H"	
4. ROCK THICKNESS "T", HEIGHT OF ROCK PROTECTION "H" AND ROCK CLASS (gradation) ARE TO BE DETERMINED BY SCVWD BASED ON LOCATION OF OUTFALL AND FIELD CONDITIONS. ONE-HALF SLOPE PROTECTION WIDTH "A" IS TO BE THE GREATER OF TWICE THE PIPE DIAMETER "D" OR 2 FEET. CHANNEL BOTTOM ROCK WIDTH "B" IS TO BE 2 TIMES THE ROCK THICKNESS "T".
5. THE OUTFALL PIPE IS TO HAVE THE FOLLOWING CHARACTERISTICS:

MATERIAL:	CORRUGATED METAL PIPE
DIAMETER:	12-INCH MINIMUM
THICKNESS AND SLOPE:	SEE TABLE 5/1 ON SHEET 5/3

REINFORCED CONCRETE PIPE MAY BE USED IN ROCK SLOPE PROTECTION.
6. GEOTEXTILE FABRIC SHALL BE MIRAFI 700X OR EQUAL.
7. ROCK SLOPE PROTECTION MAY BE COVERED WITH SOIL AND PLANTED.
8. THE OUTFALL PIPE SHOULD POINT DOWNSTREAM.

**OUTFALL WITH DRAINAGE SWALE**



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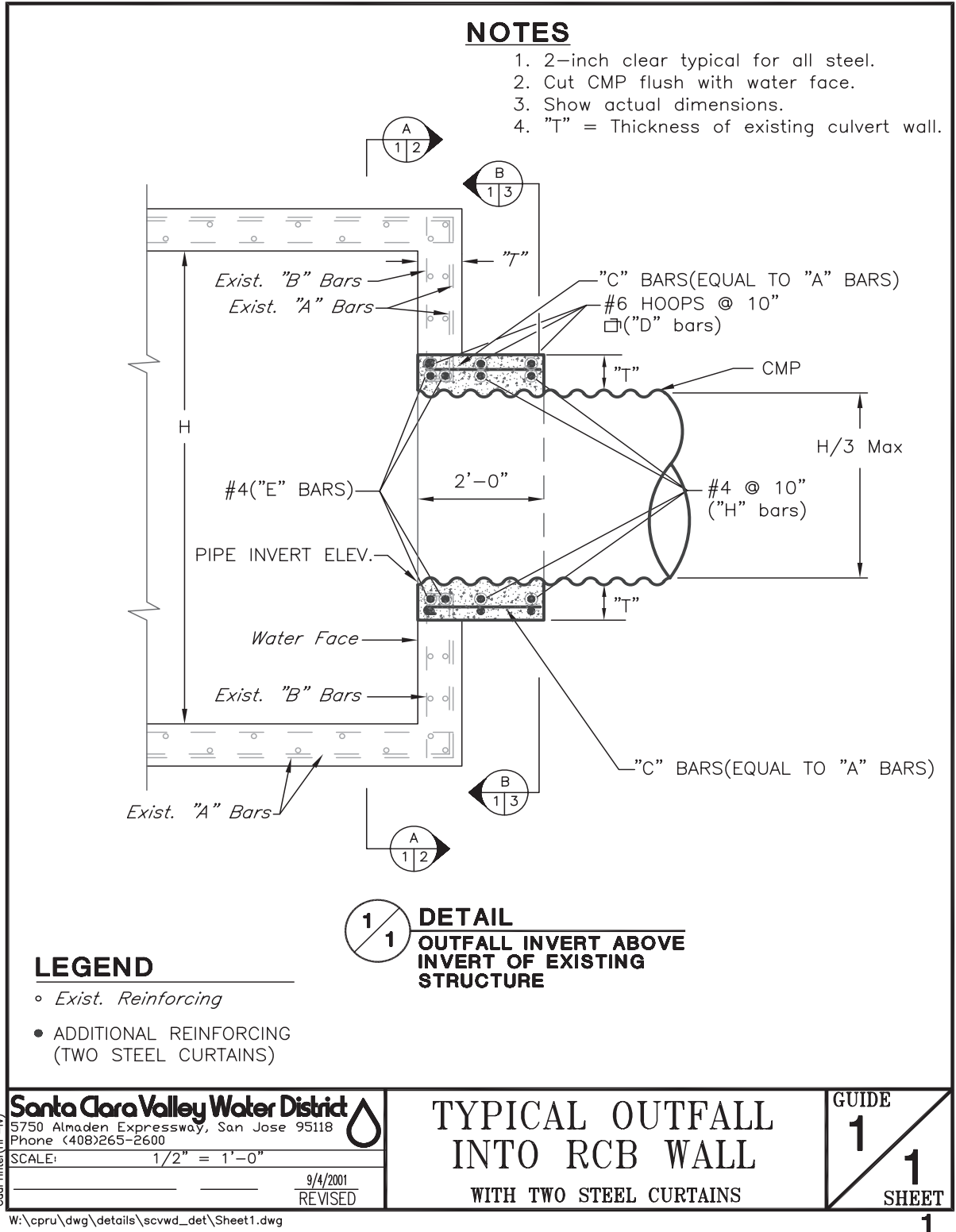
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**OUTFALL WITH DRAINAGE SWALE**

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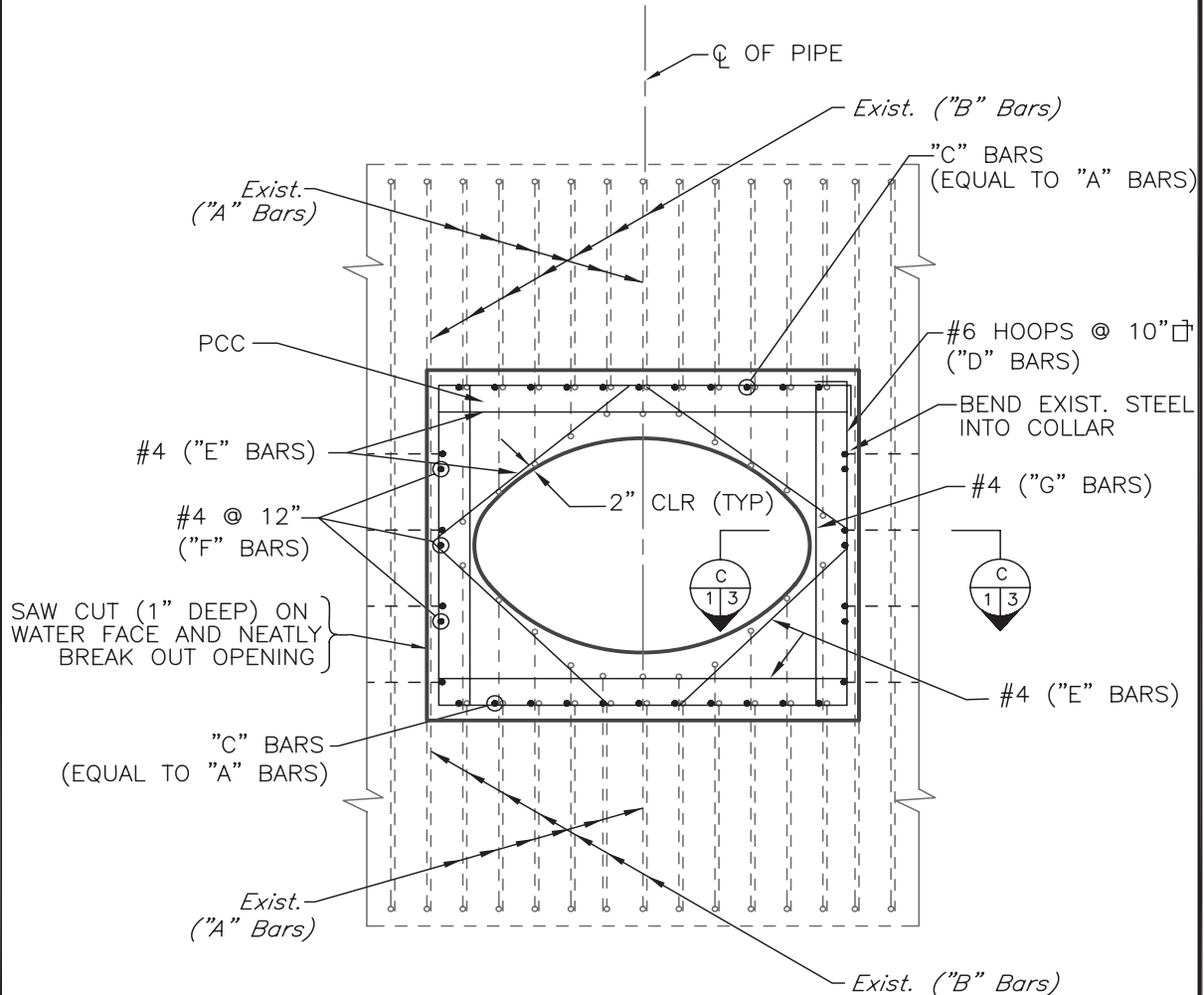
**TYPICAL OUTFALL INTO REINFORCED CONCRETE BOX WALL**  
 with two steel curtains



**TYPICAL OUTFALL INTO REINFORCED  
CONCRETE BOX WALL**  
with two steel curtains

**NOTES**

1. Reinf. symmetrical about  $\text{C}$  of pipe.



**A SECTION**

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**TYPICAL OUTFALL INTO  
RCB WALL  
WITH TWO STEEL CURTAINS**

GUIDE

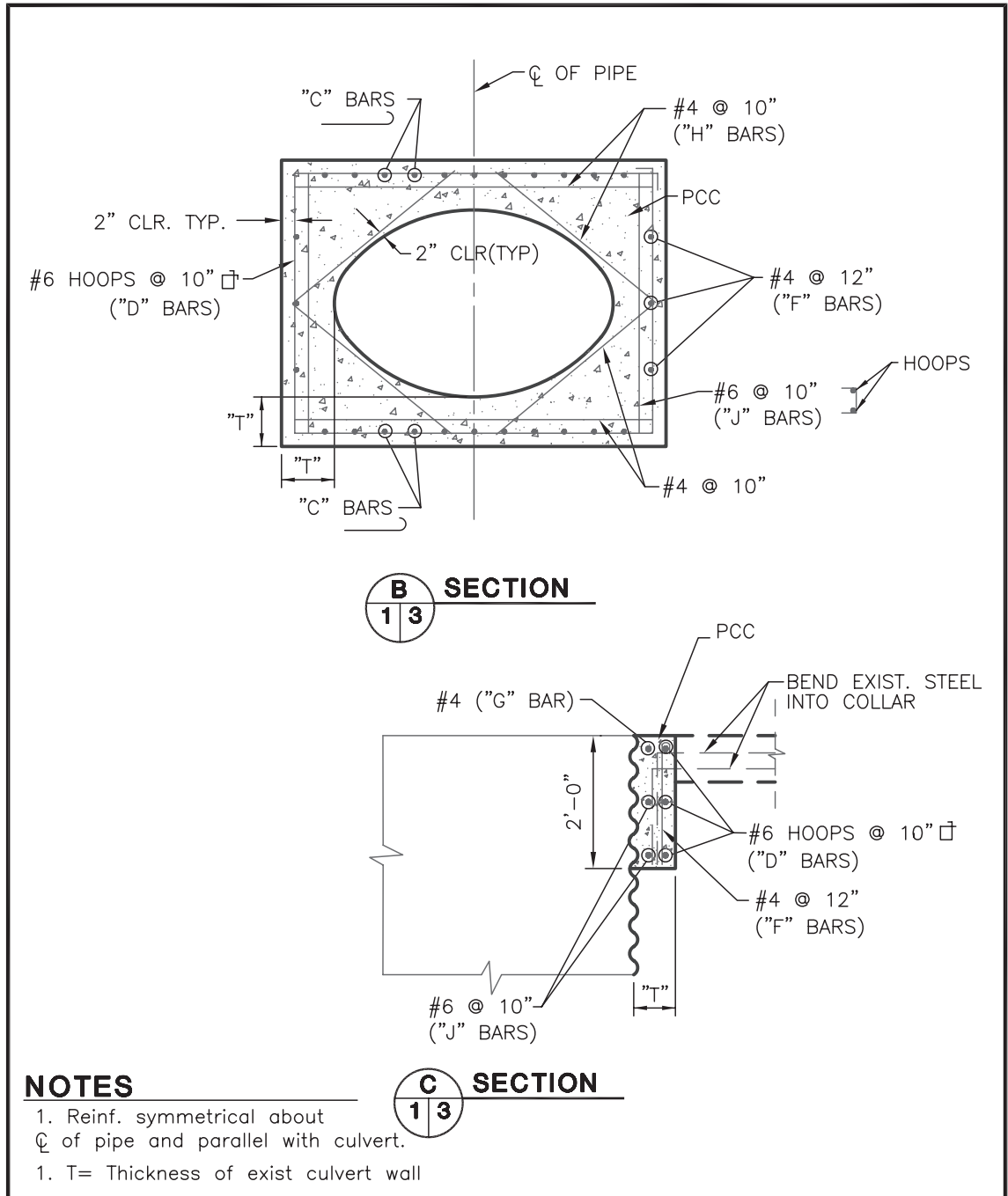
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**TYPICAL OUTFALL INTO REINFORCED CONCRETE BOX WALL**  
 with two steel curtains



**NOTES**

1. Reinf. symmetrical about  $\text{CL}$  of pipe and parallel with culvert.
1. T= Thickness of exist culvert wall

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**TYPICAL OUTFALL INTO RCB WALL**  
 WITH TWO STEEL CURTAINS

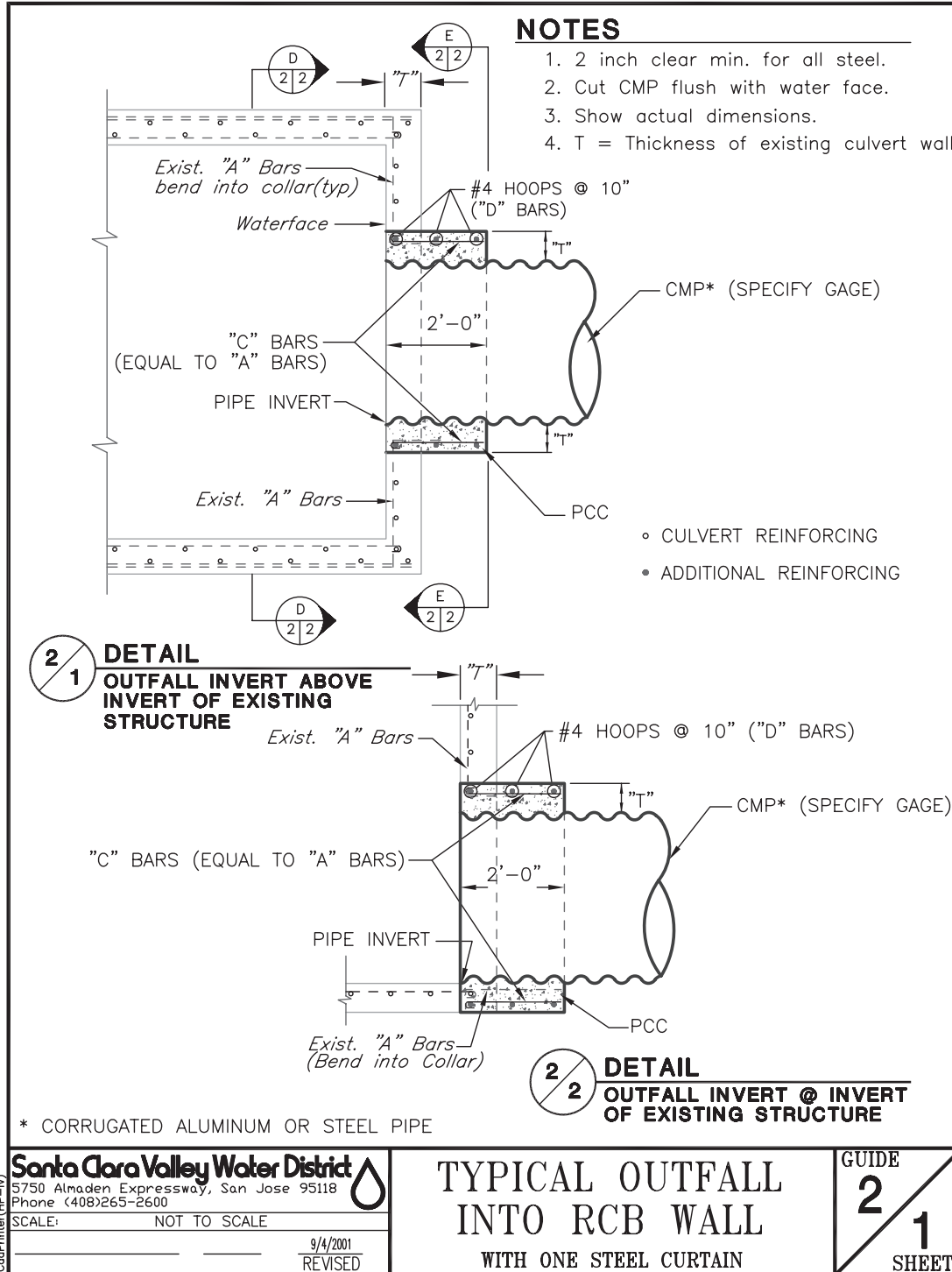
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# TYPICAL OUTFALL INTO REINFORCED CONCRETE BOX WALL

with one steel curtains



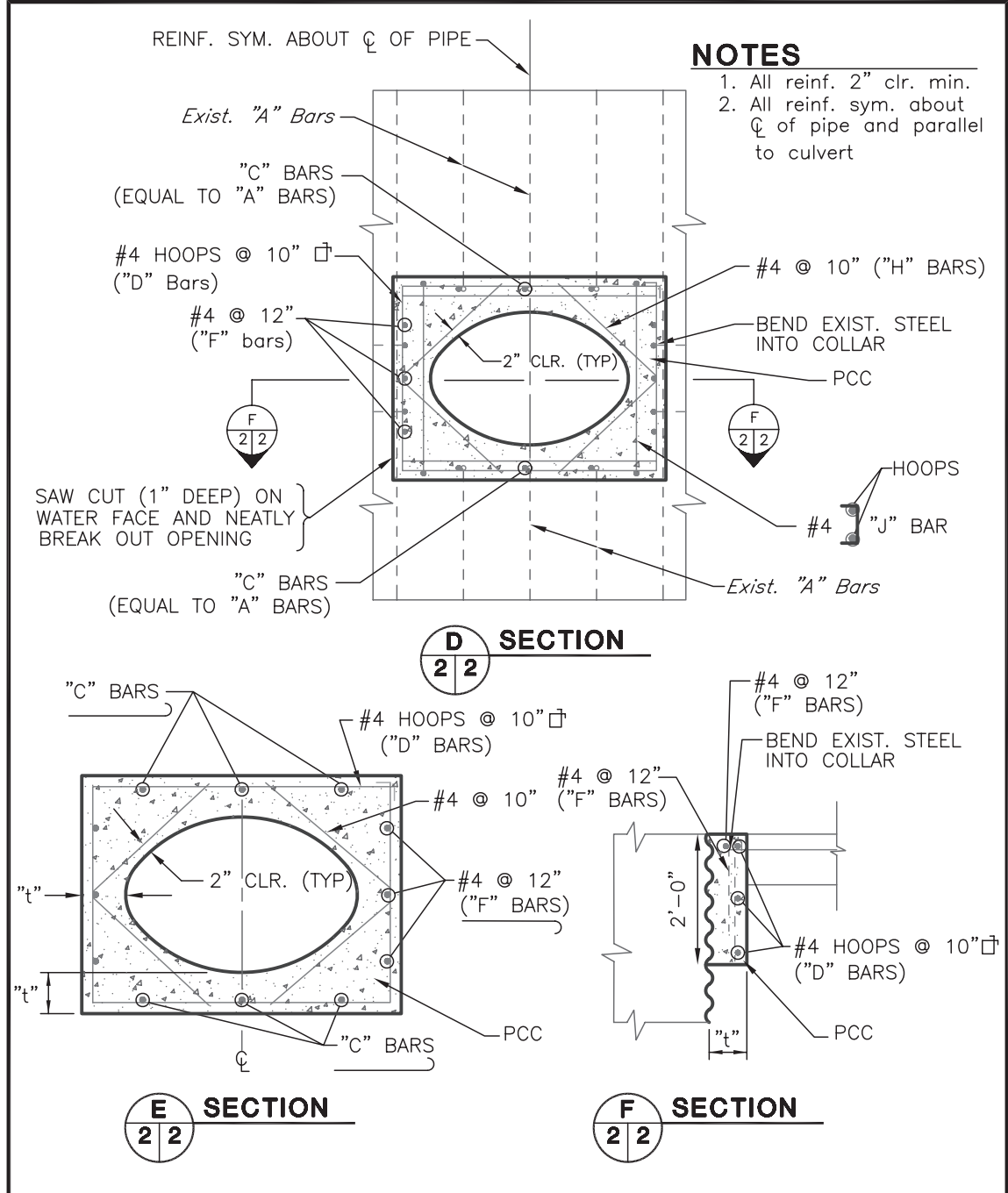
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**TYPICAL OUTFALL INTO RCB WALL WITH ONE STEEL CURTAIN**

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# TYPICAL OUTFALL INTO REINFORCED CONCRETE BOX WALL

with one steel curtain



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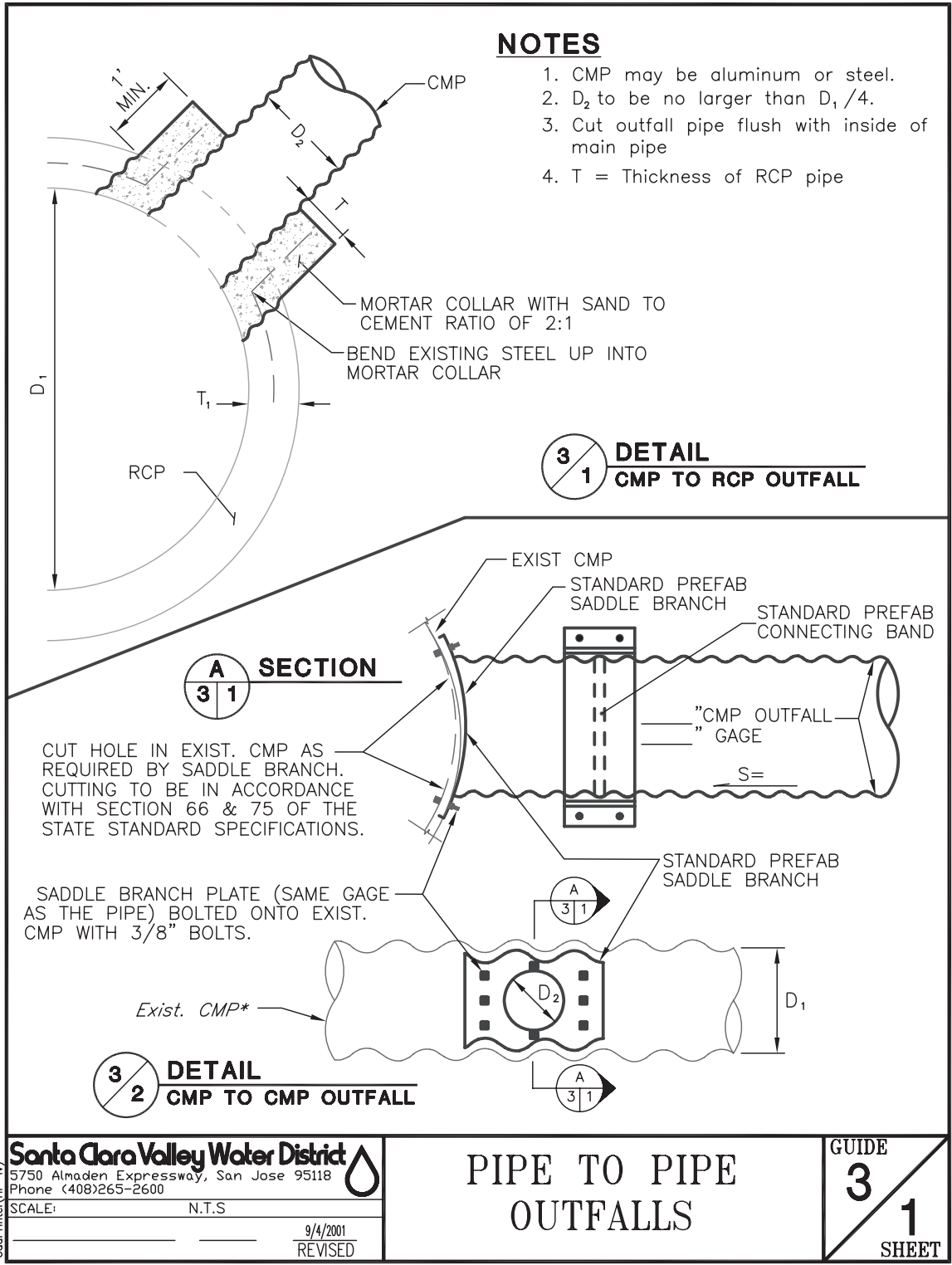
**TYPICAL OUTFALL INTO RCB WALL**  
 WITH ONE STEEL CURTAIN

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**2**  
 SHEET

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# PIPE TO PIPE OUTFALLS

The size of the pipe is limited to 1/4 the diameter of the receiving pipe.



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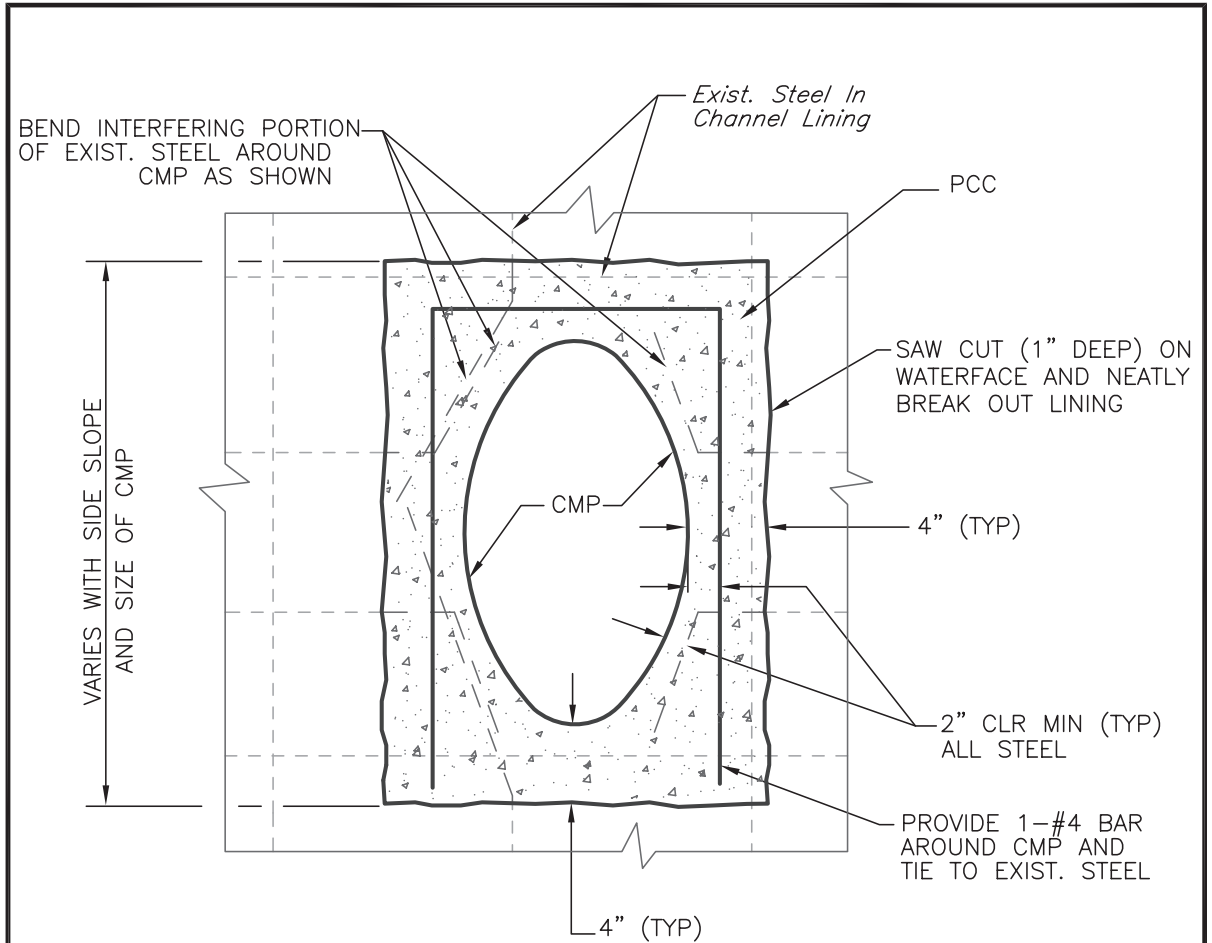
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## PIPE TO PIPE OUTFALLS

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## PIPE OUTFALL INTO CHANNEL LINING



4  
1
**DETAIL**  
**CHANNEL SIDESLOPE 1:1 OR FLATTER**

**NOTES**

1. Cut CMP flush with water face of lining.
2. CMP may be aluminum or steel.
3. This Detail is typical for both curtains of exist. steel.

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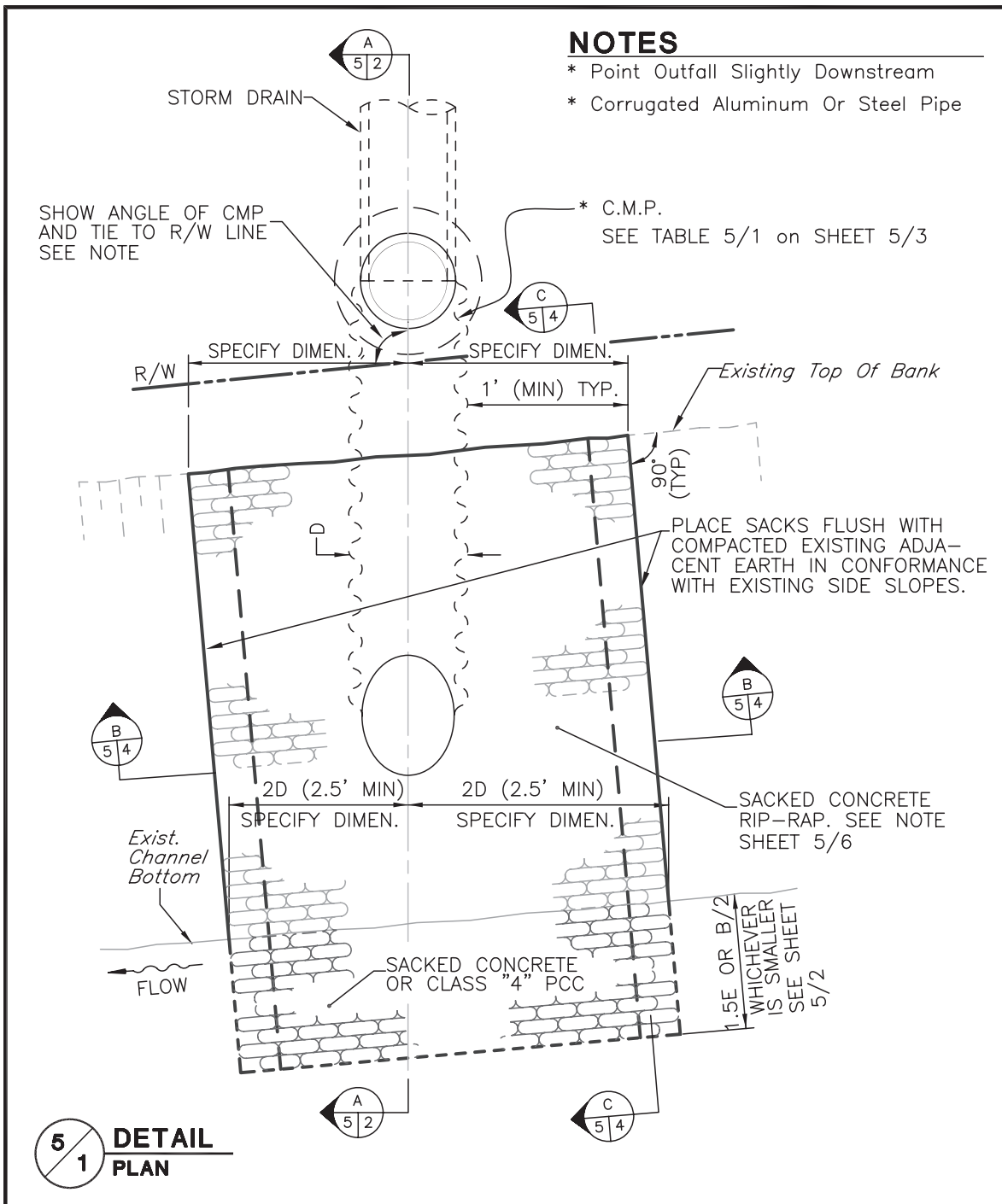
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# PIPE OUTFALL INTO CHANNEL LINING

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# PIPE OUTFALL WITH SACKED CONCRETE RIP RAP



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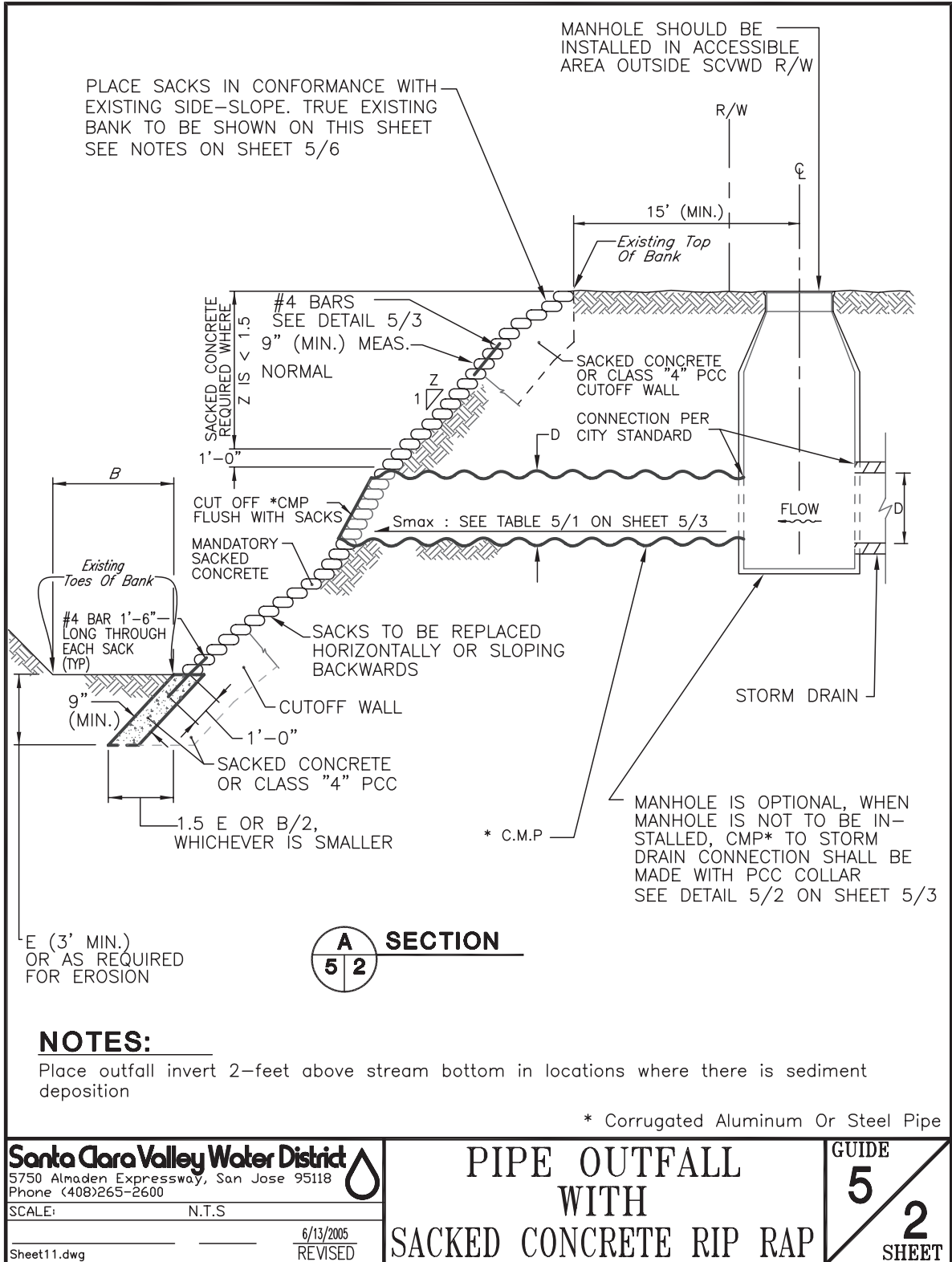
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PIPE OUTFALL  
WITH  
SACKED CONCRETE RIP RAP

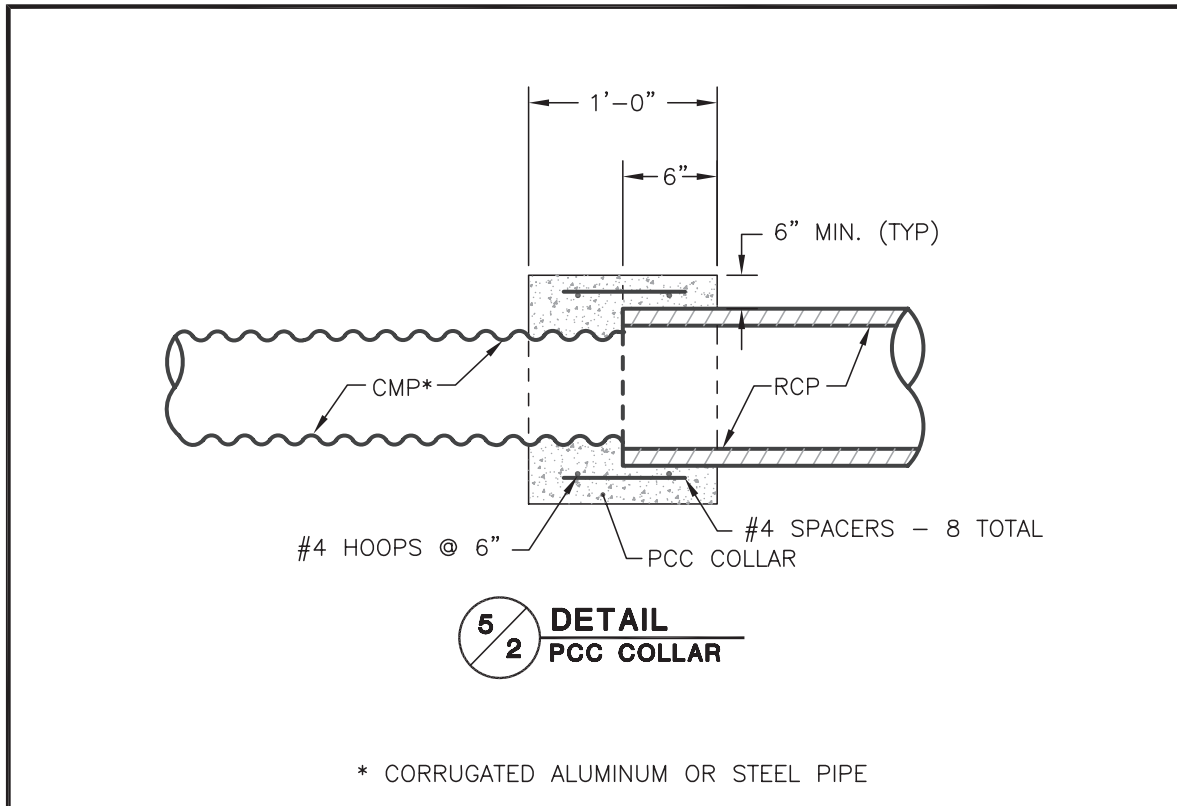
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# PIPE OUTFALL WITH SACKED CONCRETE RIP RAP



# PIPE OUTFALL WITH SACKED CONCRETE RIP RAP



CMP	GAGE	Smax.*
12"	16	.0778
18"	16	.0659
24"	14	.0580
30"	14	.0530
36"	12	.0491

CMP	GAGE	Smax.*
42"	12	.0459
48"	12	.0432
54"	12	.0411
60"	10	.0394
66"	10	.0379

CMP	GAGE	Smax.*
72"	10	.0365
78"	8	.0354
84"	8	.0343

5  
1 **TABLE**

$$S_{max} = \frac{112 n^2}{D^{1/3}} \text{ (MEASURED. IN FT.)}$$

## REQUIRED PIPE GAGE AND MAXIMUM ALLOWABLE SLOPES \* FOR CMP OUTFALLS

\* THE ABOVE SLOPES ARE BASED ON CMP WITH STANDARD CORRUGATIONS.

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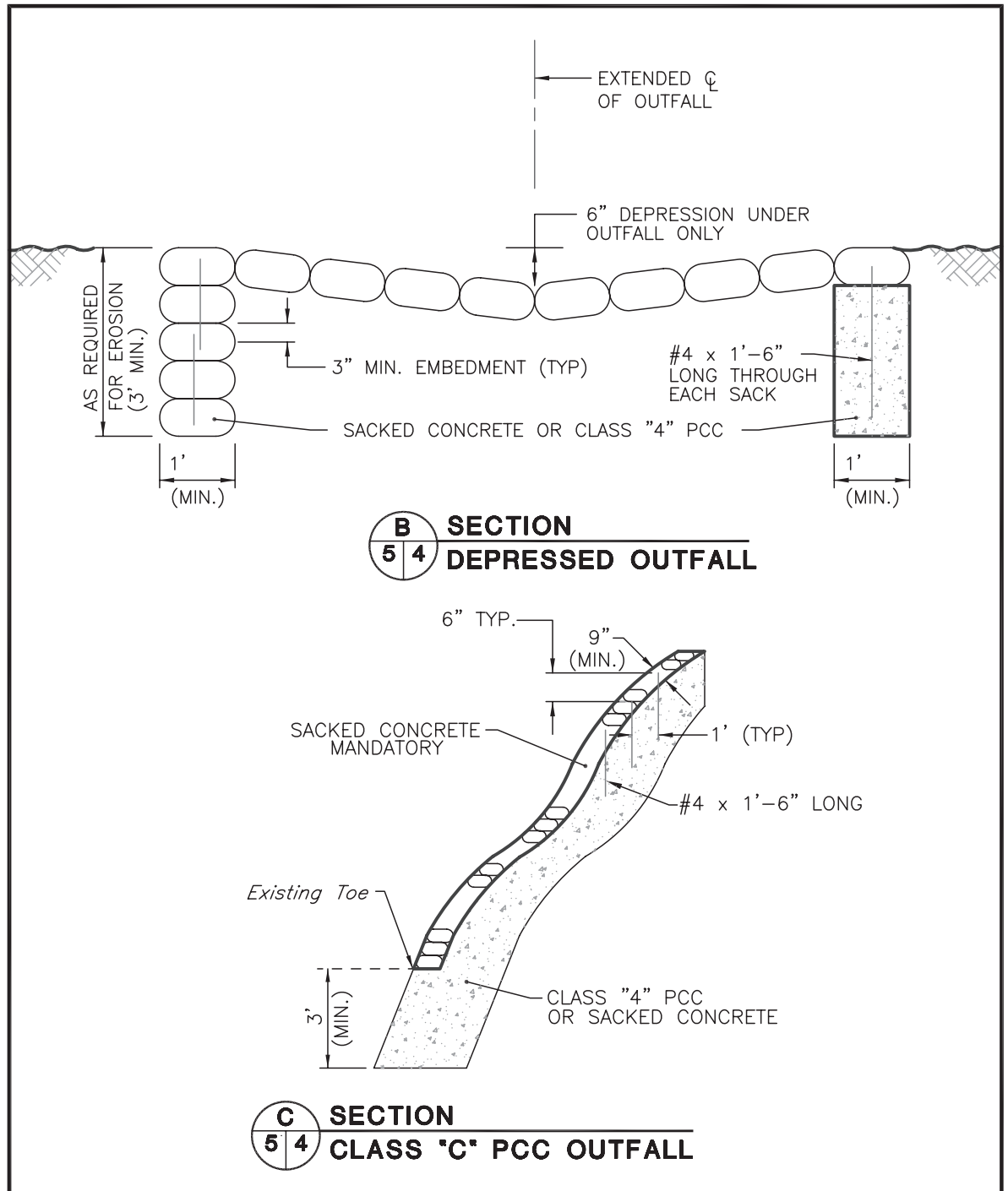
## PIPE OUTFALL WITH SACKED CONCRETE RIP RAP

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# PIPE OUTFALL WITH SACKED CONCRETE RIP RAP



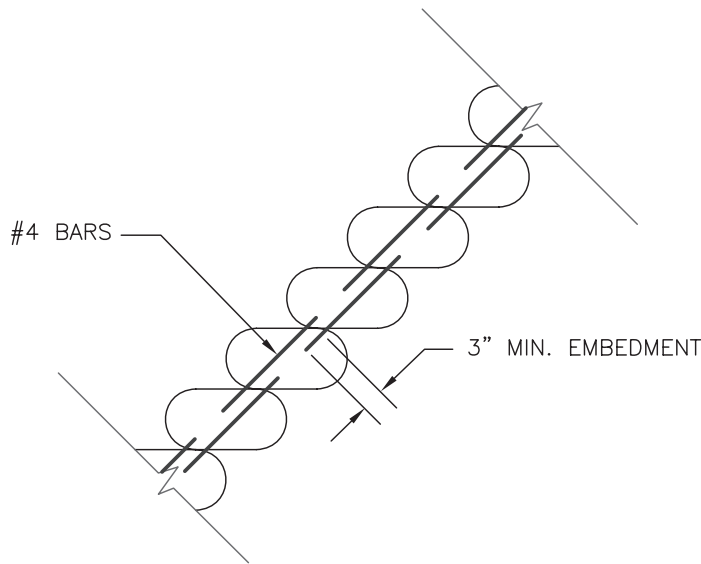
<p><b>Santa Clara Valley Water District</b>                  5750 Almaden Expressway, San Jose 95118                  Phone (408)265-2600</p> <p>SCALE: _____ N.T.S.</p> <p>9/4/2001                  REVISED</p>	<p><b>PIPE OUTFALL                  WITH                  SACKED CONCRETE RIP RAP</b></p>	<p>GUIDE  <b>5</b>  <b>4</b>                  SHEET</p>
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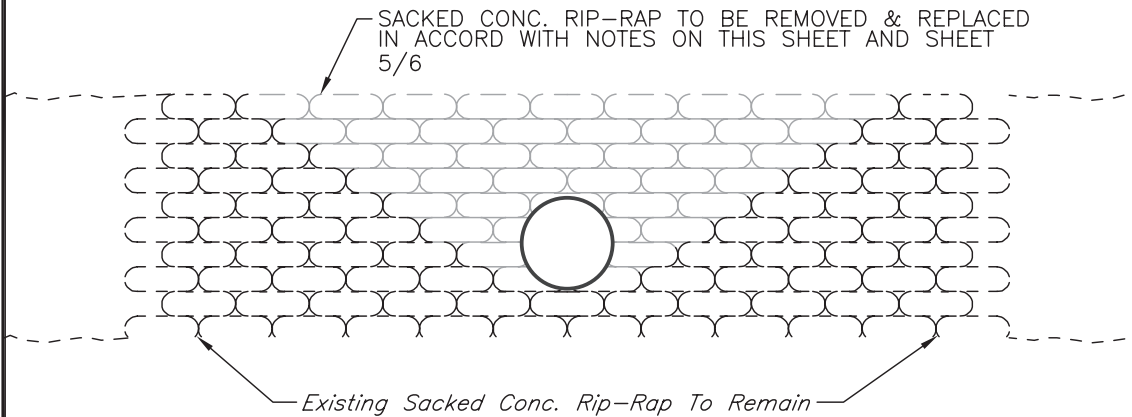
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# PIPE OUTFALL WITH SACKED CONCRETE RIP RAP



**5/3** **DETAIL**  
**SACK REINFORCING**



**5/4** **DETAIL**  
**PIPE INSTALLATION IN EXIST. SACKED CONCRETE RIP-RAP**

**NOTES**

1. The removal of only a portion of a sack is not allowed.

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PIPE OUTFALL WITH  
SACKED CONCRETE  
RIP-RAP

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## PIPE OUTFALL WITH SACKED CONCRETE RIP RAP

NOTES FOR SACKED CONCRETE RIP - RAP

THESE NOTES ARE TO APPEAR ON PLANS

1. SACKS FOR SLOPE PROTECTION SHALL BE 10oz. BURLAP MEASURING 19 1/2" BY 36" INSIDE THE SEAMS WHEN LAID FLAT. CONCRETE SHALL BE CLASS 4 IN ACCORDANCE WITH THE CURRENT STATE STANDARD SPECIFICATION. THE AMOUNT OF WATER ADDED AT THE TIME OF MIXING SHALL BE SUCH TO PRODUCE A MIXTURE WITH A MAXIMUM SLUMP OF 4 INCHES. SACKED DRY MIXES ARE NOT PERMITTED. THE VOLUME OF CONCRETE PLACED IN EACH SACK IS TO BE CONTROLLED BY A CHUTE MEASURING DEVICE AND SHALL BE APPROXIMATELY 1/2 CUBIC FOOT OF PLASTIC CONCRETE LOOSELY PLACED SO AS TO LEAVE ROOM FOR FOLDING AT THE TOP.
2. FACE OF RIPRAP TO BE COINCIDENT WITH EXISTING SIDE SLOPE OF CHANNEL. DO NOT PACK UNTIL SMOOTH; LEAVE AS ROUGH AS POSSIBLE.
3. EXTEND RIPRAP UP TO THE TOP OF BANK, UNLESS OTHERWISE SPECIFIED ON PLAN.
4. INSTALL CUTOFF WALL (3-FOOT MINIMUM DEPTH) AT UPSTREAM AND DOWNSTREAM ENDS. CUTOFF WALLS TO EXTEND UP SIDES OF CHANNEL.
5. DRIVE ONE #4 REINFORCING BAR THROUGH EACH SACK. MINIMUM LENGTH OF BARS TO BE 18 INCHES. DO NOT LEAVE ENDS OF BARS EXPOSED, NOR DRIVE INTO DIRT OR JOINT BETWEEN ENDS OF SACKS - SEE DETAIL 5/3
6. ALL BACKFILL SHALL BE WITH SUITABLE MATERIAL FROM EXCAVATION AND SHALL BE COMPACTED TO 90 PERCENT RELATIVE COMPACTION IN ACCORDANCE WITH ASTM TEST METHOD D1557
7. SACKS SHALL BE PLACED SO THAT THEY ARE HORIZONTAL OR SLOPING TOWARDS BANK. SACKS SLOPING AWAY FROM BANK WILL NOT BE ACCEPTED.
8. IT IS MANDATORY THAT SCVWD INSPECTOR BE NOTIFIED AT LEAST 48 HOURS BEFORE CONSTRUCTION BEGINS. COMPLETE REMOVAL MAY RESULT IF THIS REQUIREMENT IS NOT MET.

THE FOLLOWING NOTES ARE TO BE ADHERED TO BUT ARE NOT TO APPEAR ON THE PLANS

- A. OBTAIN CONSTRUCTION/ENCROACHMENT PERMIT FROM THE SCVWD FOR ALL STORM OUTFALL BY SUBMITTING IMPROVEMENT PLANS BEFORE CONTRACT IS OUT TO BID.
- B. ON PLAN SUBMITTALS SHOW SUFFICIENT INFORMATION SO THAT THE CROSS SECTION OF EXISTING CREEK AT THE OUTFALL AND FOR A MINIMUM DISTANCE OF 20 FEET BOTH UPSTREAM AND DOWNSTREAM OF OUTFALL CAN BE DETERMINED. ADDITIONAL CROSS SECTION INFORMATION MAY BE REQUESTED BY SCVWD.
- C. SHOW ALL INFORMATION REQUIRED ON SHEET 5/1 & 5/2 AND INDICATE THE SIZE AND LOCATION OF TREES NEAR THE OUTFALL.
- D. PLAN SUBMITTALS NOT SHOWING THE INFORMATION REQUIRED BY NOTES B AND C WILL NOT BE PROCESSED.
- E. USE SAME HORIZONTAL AND VERTICAL SCALE FOR SECTION OF EXISTING CREEK AT OUTFALL.

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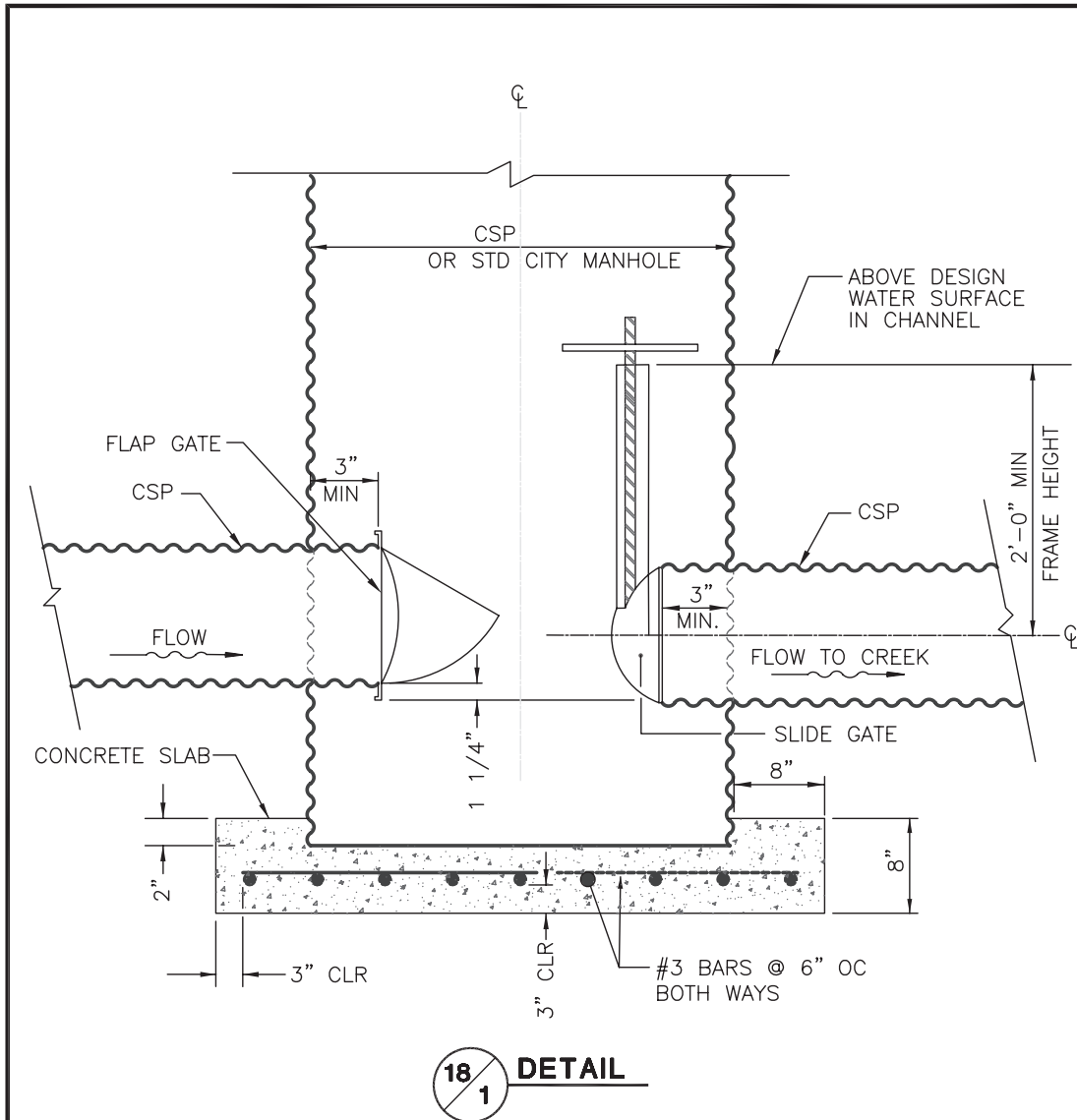
PIPE OUTFALL WITH  
 SACKED CONCRETE  
 RIP-RAP

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**6**  
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## FLAP GATE STRUCTURE

Flap gates are needed on outfalls where the adjacent ground is below the high water level (usually 100 year water surface elevation). The flap gates will prevent the back flow of water from the stream on to the adjacent land. Where adjacent land at the stormdrain pipe inlet is higher in elevation than the high water level, a flap gate is not needed. Two options for the placement of a flap gate are shown.



### NOTES

1. Structure to be installed outside SCVWD R/W in area that is easily accessible during rainy periods.
2. Specifications and details of design for the structure are subject to the standards of the local agency that will maintain the structure.

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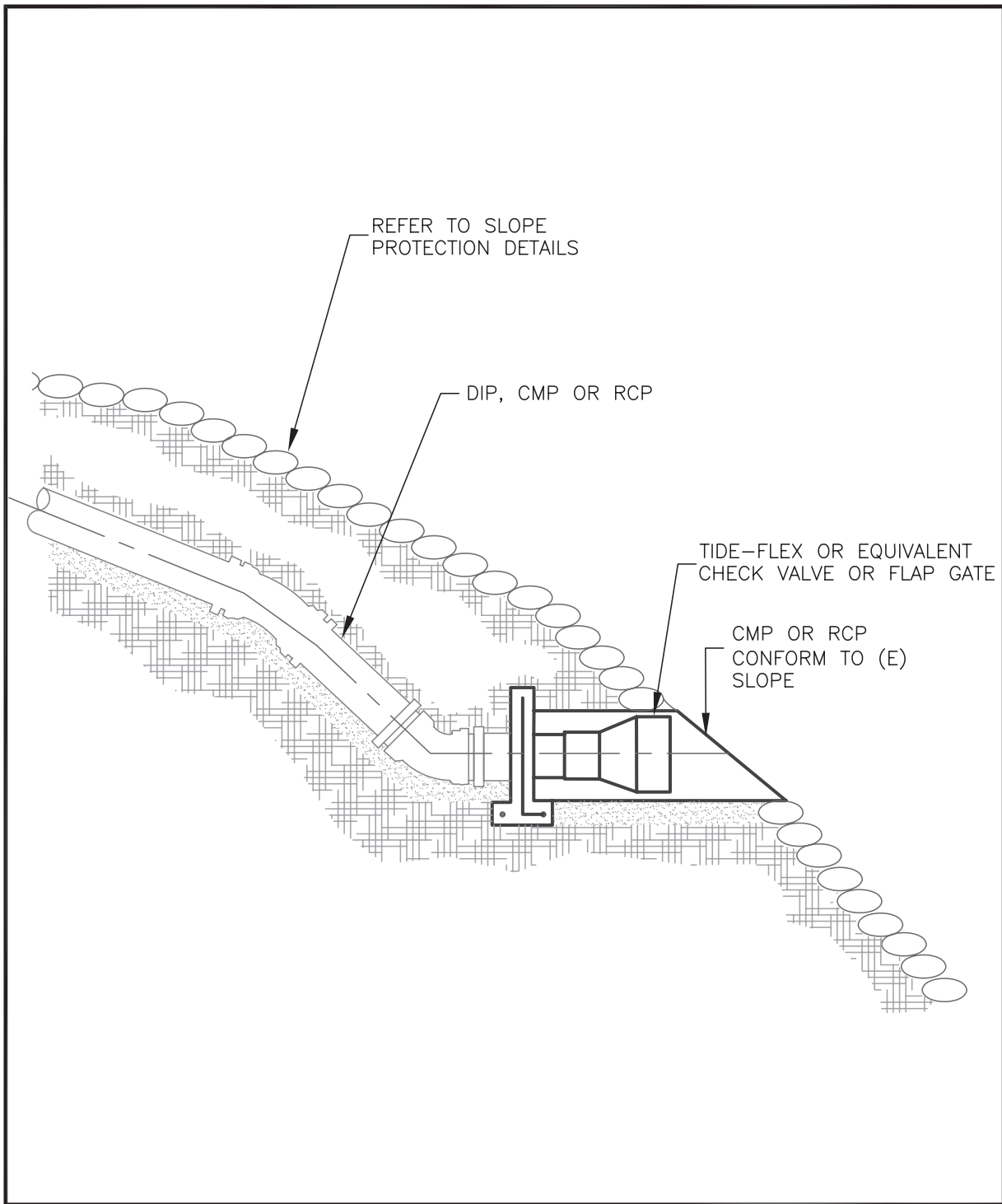
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## FLAP GATE STRUCTURE

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## FLAP GATE IN DORMER PIPE



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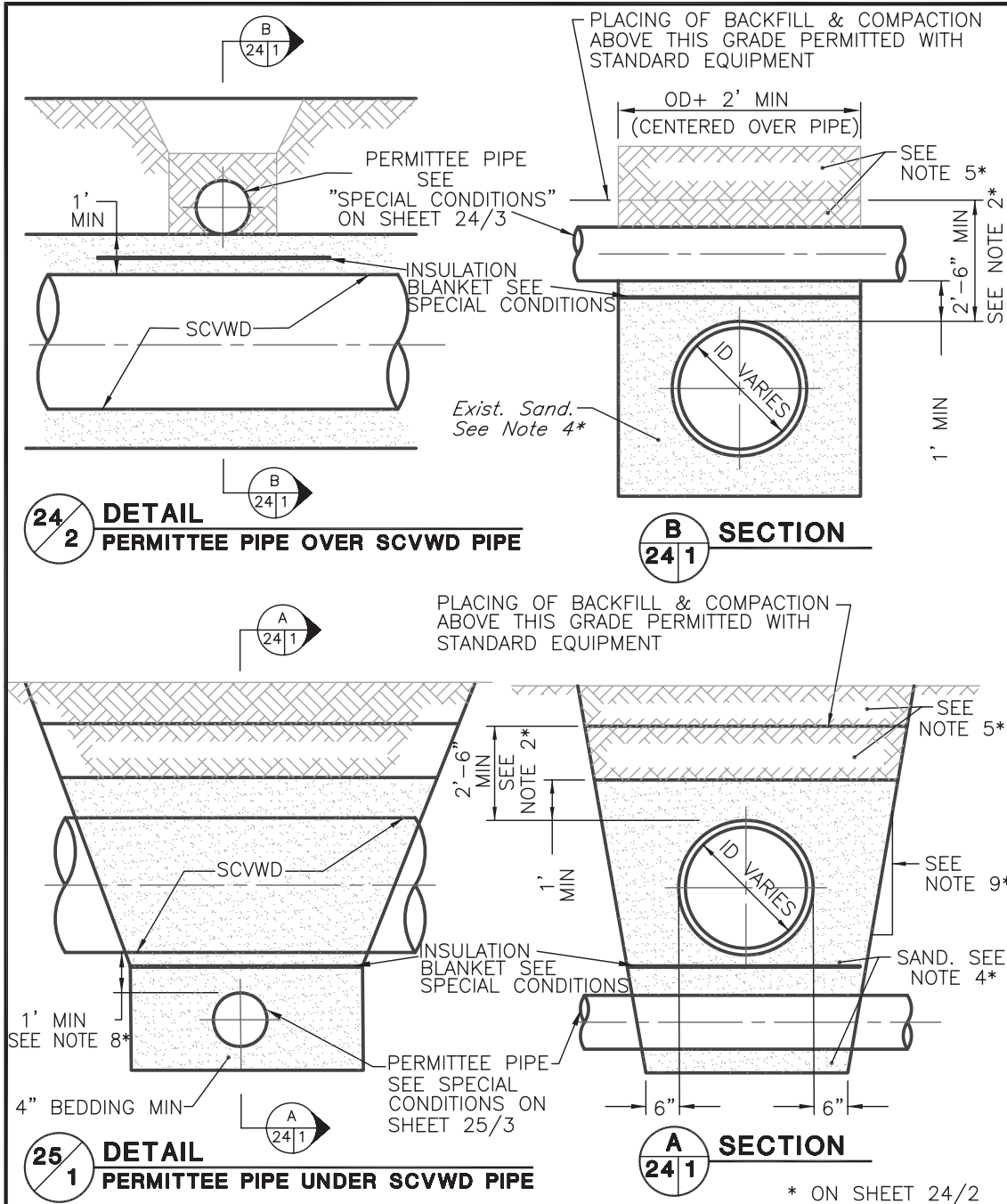
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FLAP GATE

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**1**  
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# SCVWD WATER PIPELINE CROSSING

The following pipeline crossing design guides are for water, sewer and other utilities that may cross SCVWD raw (untreated) or treated water pipelines. These are generally large diameter high pressure water mains that supply drinking water to Santa Clara County residents. There may be variations to this guideline if pipeline is located under city/county streets.



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SCVWD WATER  
UTILITY CROSSING

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## SCVWD WATER PIPELINE CROSSING

THESE NOTES ARE TO APPEAR ON PLANS

1. THE CONTRACTOR SHALL COMPLY WITH THE RULES AND REGULATIONS OF "CAL OSHA" CALIFORNIA LABOR CODE SECTION 6300 AND FOLLOWING.
2. COMPACTION EQUIPMENT SHALL BE EITHER VIBRATORY COMPACTORS OR PNEUMATIC TAMPERS. JETTING MAY BE ALLOWED. STANDARD EXCAVATION AND COMPACTION EQUIPMENT IS NOT PERMISSIBLE WITHIN 30 INCHES OF DISTRICT PIPE. IF, IN THE OPINION OF THE DISTRICT, THE COMPACTION EQUIPMENT USED IS IMPROPER OR IMPROPERLY USED AND HAS DAMAGED THE PIPE, THE PIPE SHALL BE EXPOSED FOR INSPECTION AT THE CONTRACTOR'S EXPENSE. THE CONTRACTOR SHALL THEN REPAIR DAMAGE, IF ANY, AND PROCEED WITH THE BACKFILLING WITH EQUIPMENT APPROVED BY THE DISTRICT. IN GENERAL, HAND-OPERATED POWER EQUIPMENT WILL BE CONSIDERED SATISFACTORY FOR USE WITHIN 30 INCHES OF THE DISTRICT'S PIPE.
3. PIPE TRENCH EXCAVATION AND BACKFILL SHALL CONFORM TO THE PROVISIONS OF SECTION 19 OF THE STATE STANDARD SPECIFICATIONS EXCEPT AS HEREIN MODIFIED.
4. COMPACTED SAND BACKFILL MATERIAL SHALL BE CLEAN, HARD, SOUND AND DURABLE. IT SHALL HAVE A SAND EQUIVALENT VALUE OF NOT LESS THAN 30. THE PERCENTAGE COMPOSITION BY WEIGHT SHALL CONFORM TO THE FOLLOWING GRADATION:

<u>SIEVE SIZE</u>	<u>PERCENT PASSING</u>
3/4 Inch	100
3/8 Inch	75 TO 100
#4	60 TO 100
#20	0 TO 40
#200	0 TO 5

THE MATERIAL SHALL BE FREE FROM DELETERIOUS COATINGS, CLAY BALLS, ROOTS, BARK, STICKS, RAGS AND OTHER EXTRANEIOUS MATERIAL. SAND BACKFILL SHALL BE COMPACTED BY APPROVED METHODS TO A DENSITY OF AT LEAST 90 PERCENT OF MAXIMUM DRY DENSITY.

5. BACKFILL AND COMPACTION REQUIREMENTS ABOVE THE NOTED LIMITS SHALL BE TO THE SPECIFICATIONS OF AGENCY HAVING JURISDICTION.
6. ALL EXCAVATION WITHIN 12 INCHES OF DISTRICT'S PIPE IS TO BE BY HAND METHODS.
7. CONTACT SANTA CLARA VALLEY WATER DISTRICT TWO WORKING DAYS PRIOR OF ANY WORK WITHIN \_\_\_\_\_ FEET OF CENTER LINE OF THE DISTRICT PIPE. PHONE 265-2600, CONSTRUCTION ADMINISTRATION UNIT.
8. FOR UNDERCROSSING, SANTA CLARA VALLEY WATER DISTRICT PIPE SHALL BE SUPPORTED DURING TRENCHING OPERATIONS IF DEEMED NECESSARY BY THE DISTRICT INSPECTOR. ANY TYPE OF PIPE COULD BE USED IF CLEARANCE TO DISTRICT PIPE BOTTOM IS AT LEAST 2 FEET. BACKFILL AND COMPACTION OF PERMITTEE'S PIPE TO BE COMPLETED BEFORE BACKFILLING SCVWD PIPE.
9. SLOPES SHOWN ARE NOT TO SCALE AND ARE INTENDED TO INDICATE NATURAL ANGLE OF REPOSE OF BACKFILL MATERIAL.

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## SCVWD WATER PIPELINE CROSSING

**SPECIAL CONDITIONS FOR PIPE CROSSINGS OF DISTRICT UNDERGROUND FACILITIES**

**A. PIPELINES**

1. WITHIN \_\_\_\_\_ FEET OF CENTER LINE OF SCVWD PIPELINE, PERMITTEE IS TO INSTALL RIGID STEEL, CAST IRON, OR REINFORCED PLASTIC MORTAR PIPE WITH WELDED, FLANGED, OR MECHANICAL JOINTS AND ENCLOSE ALL CABLES (TELEPHONE, ELECTRIC, etc.) IN RIGID STEEL CONDUIT. BY ELECTING TO DO OTHERWISE, PERMITTEE THEREBY AGREES THAT THE SCVWD HAS NO RESPONSIBILITY FOR DAMAGE OF ANY KIND TO THE CROSSING, INCLUDING THAT WHICH MAY OCCUR DURING FUTURE MAINTENANCE, REPAIR OR REPLACEMENT OF DISTRICT'S FACILITY. FOR EXCEPTION, SEE NOTE 8 ON SHEET 24/2.
2. WHEN THE PERMITTEE PIPE CROSSING OVER A SCVWD TREATED WATER PIPELINE IS A SEWAGE PIPE OR UNDER WITH A SEWAGE FORCE MAIN, THE SEWAGE PIPE MUST BE ENCLOSED IN A CONTINUOUS SLEEVE FOR A DISTANCE OF 10', MEASURED HORIZONTALLY AND PERPENDICULAR FROM SCVWD'S TREATED WATER PIPELINE (BOTH SIDE). THE SLEEVE SHALL BE STEEL WITH A MINIMUM WALL THICKNESS OF 1/4".
3. IF THE SEWAGE PIPE IS 24" IN DIAMETER OR GRATER, THE INSTALLATION SHOULD BE REVIEWED AND APPROVED BE THE STATE DEPARTMENT OF HEALTH SERVICES PRIOR TO CONSTRUCTION.

**B. CORROSION CONTROL – CATHODIC PROTECTION:**

1. PERMITTEE HEREBY WAIVES ALL CLAIMS FOR DAMAGES TO FACILITIES BEING INSTALLED UNDER THIS PERMIT, FROM ELECTRICAL INTERFERENCE OR SIMILAR ACTION, RESULTING FROM OR CONNECTED WITH THE SCVWD OPERATION OF ANY EXISTING OR FUTURE CATHODIC PROTECTION SYSTEM ON OR IN VICINITY OF EASEMENTS OWNED BY THE DISTRICT.
2. BY EXERCISE OF THIS PERMIT, PERMITTEE AGREES TO BE RESPONSIBLE FOR ANY DAMAGE TO THE SCVWD FACILITIES WHICH MAY OCCUR AS THE RESULT OF THE INSTALLATION OF THE PERMITTEE'S CATHODIC PROTECTION FACILITIES.
3. PERMITTEE HEREBY AGREES TO REMOVE BY ELECTRICAL DRAINAGE OR OTHER METHOD APPROVED BY SCVWD, AT NO COST TO THE DISTRICT, CATHODIC INTERFERENCE OCCURING ON THE SCVWD FACILITIES WHICH, IN THE OPINION OF THE DISTRICT, RESULTS IN DAMAGE TO ITS STRUCTURES AND WHICH OCCURS AS A RESULT OF THE HEREIN PERMITTED INSTALLATION OF UNDERGROUND STRUCTURES OR CATHODIC PROTECTION DEVICES. THE AMOUNT OF ELECTRICAL DRAINAGE REQUIRED TO REMOVE SAID CATHODIC INTERFERENCE SHALL BE DETERMINED BY FIELD TESTS MUTUALLY CONDUCTED BY SCVWD AND PERMITTEE.
4. WHEN THE CLEARANCE SEPARATING METALLIC PIPELINES IS 24" OR LESS, AN INSULATING BLANKET IS TO BE INSTALLED. THE BLANKET SHALL BE SQUARE AND 2' LARGER THAN THE DIAMETER OF THE LARGER PIPE. THE BLANKET SHALL BE 1/4" THICK AND SHALL BE NEOPRENE, BUTYL RUBBER, PVC OR MICARTA INSULATING BLANKET.
5. BLANKET SHALL BE INSTALLED ON SOIL BACK FILL AND CENTERED BETWEEN PIPES.

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**SCVWD WATER UTILITY  
CROSSING**

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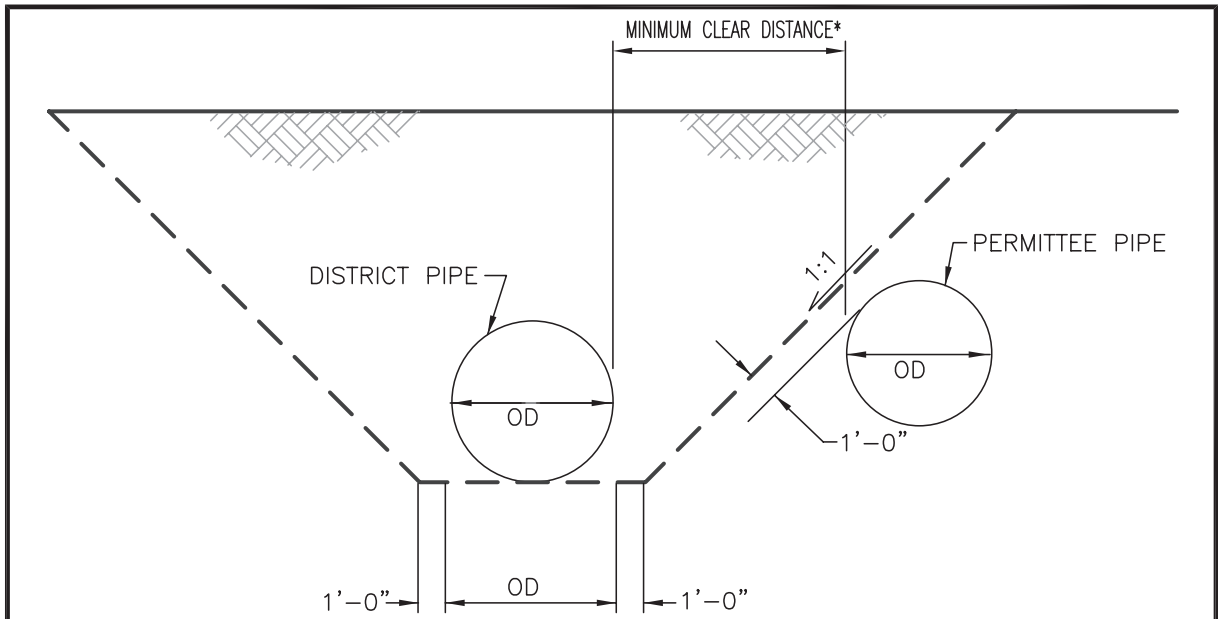
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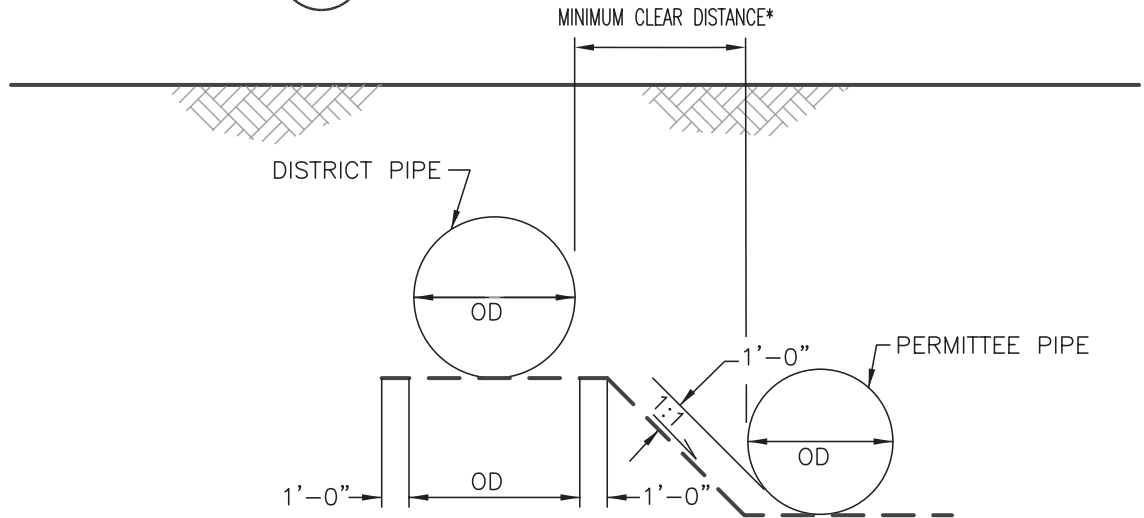
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**GUIDELINES AND STANDARDS VIII.B.6**

**PIPELINE PARALLEL TO SCVWD WATER PIPELINE**



**25/1** **DETAIL**  
**PERMITTEE PIPE ABOVE DISTRICT PIPE**



**25/2** **DETAIL**  
**PERMITTEE PIPE BELOW DISTRICT PIPE**

\* FOR INSTALLATION OF SEWAGE OR NON-POTABLE WATER PIPES PARALLEL WITH SCVWD'S TREATED WATER LINES, THE MINIMUM CLEAR DISTANCE IS 10 FEET. INSTALLATIONS WITH PROPOSED CLEAR DISTANCES LESS THAN 10 FEET MUST BE REVIEWED AND APPROVED BY THE DEPARTMENT OF HEALTH SERVICES. SEWAGE AND NON POTABLE WATER PIPES SHOULD BE INSTALLED BELOW SCVWD'S TREATED WATER LINE.

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**CLEARANCE FOR PIPELINES  
PARALLEL TO WATER  
UTILITY PIPE**

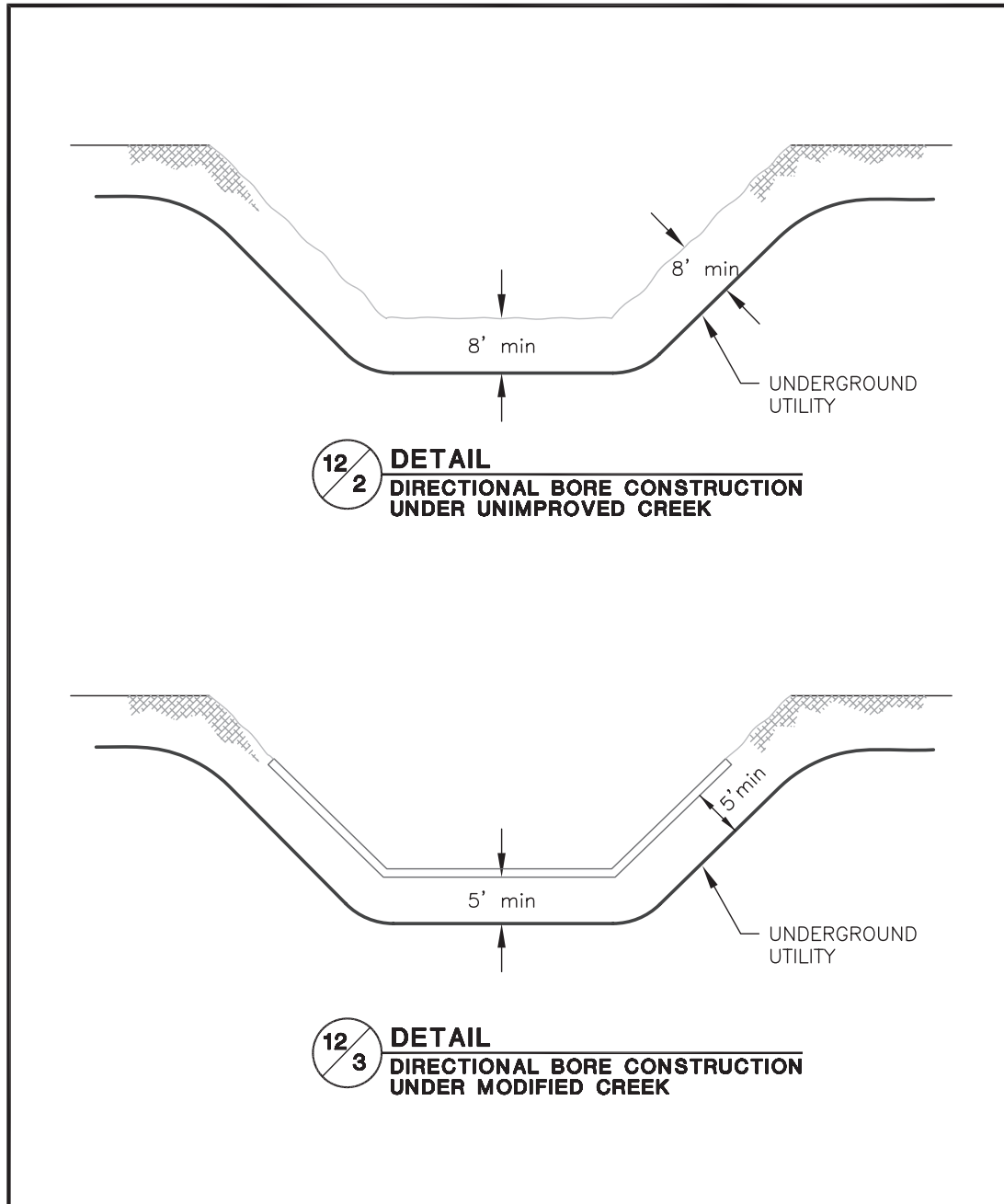
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# UTILITY CROSSING UNDER CREEKS

Place utilities on the downstream face of bridge and culvert crossings. Downstream face is preferred so as to not be damaged during debris removal activities. Exposed sanitary sewer, gas lines and treated water lines should be sleeved or otherwise protected to prevent breakage. Utilities may not be placed within the waterway, opening of the bridge or culvert. Utility crossings using direction bore or jack and bore methods are the preferred methods for under stream crossing.



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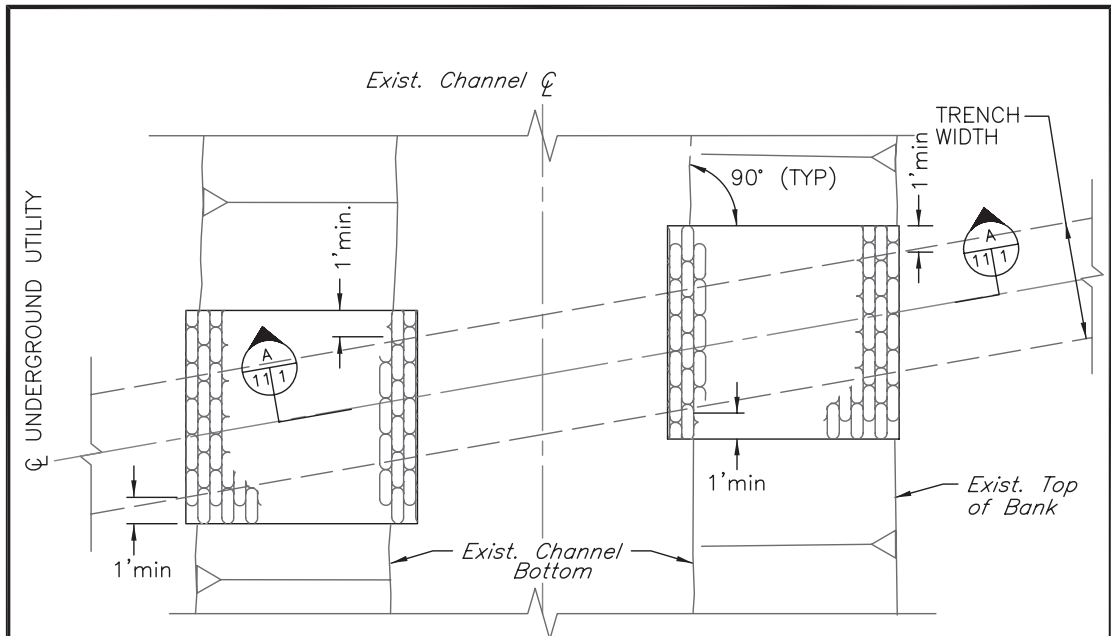
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UTILITY CROSSING  
UNDER CREEKS  
(Directional Bore Construction)

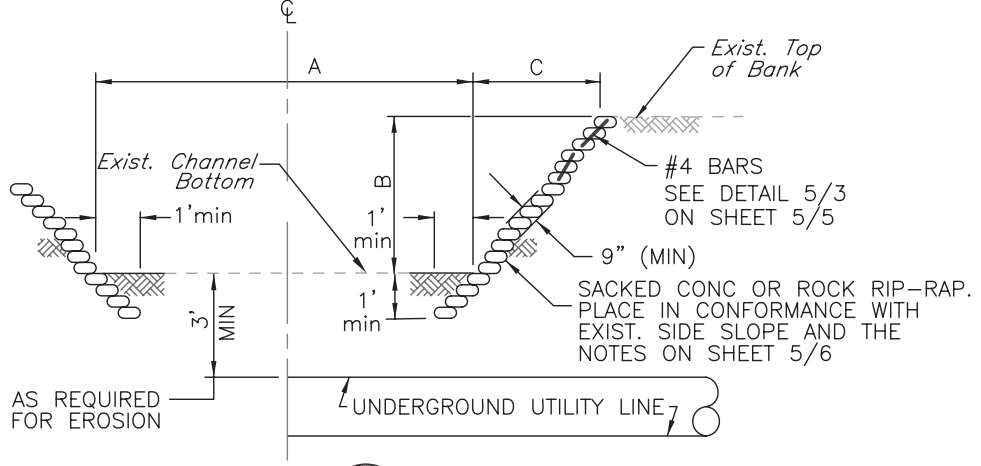
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## UTILITY CROSSING UNDER CREEKS

This type of utility crossing under a creek is not preferred because of the damage it can cause to riparian areas, bank soil structure and impacts to water quality. Permits are needed from resource agencies. This option may be permissible only in rare cases for small, rural streams.



**11/1** **DETAIL**  
**CUT AND COVER CONSTRUCTION**



**A** **SECTION**  
**11/1**

**THIS NOTE IS TO APPEAR ON THE PLANS**  
 All back fill shall be with suitable material from excavation to 90% compaction. If 90% compaction is not attained, placement of sacked concrete slope protection is required.

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## GUIDANCE FOR TRAIL DESIGN

For Trails next to Streams and Streamside Resources

### INTRODUCTION

The guidelines and details in this Design Guide are intended to provide clarification to G&S IX.A and IX.A.2, which discuss design and construction of trails next to streams and riparian areas. Most of the guidelines and details, which are specifically related to streams, grading and riparian resources, have been excerpted from the document, Uniform Interjurisdictional Trail Design, Use and Management Guidelines (UD) (April 15, 1999), which was prepared by the Santa Clara County Parks and Recreation Department.

### GENERAL GUIDELINES FOR PROTECTION OF RIPARIAN HABITAT

While trails are often located near natural and streamside areas for recreation and enjoyment purposes, it is important that the construction, design and use of the trail not negatively impact the nearby stream and stream resources that users of the trail want to enjoy. A biological resource assessment will be required for trail routes along streams or creeks. While there is no standard setback, the general guideline is to locate the trail adjacent to - not within - the riparian corridor.

In designing the trail, **the goal is to remove the minimum amount of vegetation as necessary** to accommodate the trail clearing width and to mitigate and restore riparian habitat. Consideration should be given to acquiring additional land rights, where feasible, to place the trail outside of the riparian corridor. In addition, the following guidelines should be followed:

- To control trail use and prevent environmental damage, the design should include barriers such as fences, vegetation, stiles and fallen trees. (UD – 1.3.1.3)
- To the maximum extent feasible, trail alignment should avoid impacts to

known special status plants and animal habitats. In special status species areas, trail use may be limited as appropriate to ensure protection of these resources. (UD – 1.3.2.1)

- Revegetation or enhancement will be undertaken where any sensitive habitat or special status species habitat will be disturbed by construction. The design of an appropriate revegetation program shall fully compensate for the lost habitat and shall be designed by a qualified biologist. Riparian and wetland habitat will typically be mitigated at a 3:1 ratio for high quality habitat areas and at a lower ratio where lower habitat quality justifies a lower ratio. Locally native plants will be utilized in all mitigation work. (UD – 1.3.3.6)
- Any cut or fill slopes adjacent to the trail shall be immediately reseeded or replanted. Vegetation will vary by location and surrounding landscape context.

### FOR MORE INFORMATION

Refer to sections in this Design Guide for protection riparian vegetation and planting guidelines.

### GENERAL GUIDELINES FOR SITING OF TRAILS NEXT TO STREAMS/STREAM CROSSINGS

The objective is to set trails back from the top of bank to avoid erosion over time and protect the existing riparian area.

- Use existing maintenance trails, access route and levees wherever possible to minimize impacts of new construction in riparian zones (UD – 1.3.2.3)
- When parallel to a stream or riparian zone and not located on a levee, new trails should be located behind the top of bank or at the back or outside edge of the riparian zone – except where topographic, resource management, or other constraints make this infeasible or undesirable. (UD – 1.3.3.1)

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### GUIDELINES AND STANDARDS IX

- Trails in areas of moderate or difficult terrain and adjacent to a riparian zone shall be composed of natural materials or shall be designed to minimize disturbance, and the need for drainage structures. (UD – 1.3.3.2)
- Trail crossings of streams and drainages shall be designed to minimize disturbance through the use of bridges or culverts, whichever is least environmentally damaging. Bridges and culverts should be designed so that they visually and functionally blend with the environment. (UD – 1.3.3.3)
- New native riparian vegetation should be planted in the setback zone, where practical, to complement existing vegetation (UD – 1.3.3.4)
- Trails will avoid wetlands, including seasonal wetlands, wherever possible. Trails adjacent to wetlands will be constructed so that trail fills avoid wetland impacts. (UD – 1.3.3.5)
- Locate trail alignment and crossings under bridges above the 100 year or 1% flood water surface elevation.
- Trail alignment will be limited to one side of the stream to minimize impacts to habitat.
- Trail use will generally be limited to the hours between dawn and dusk to minimize impacts to wildlife.
- Lighting of trails should be avoided. Exceptions include security lighting in downtown commercial and entertainment areas where lighting should be minimized.
- Use limited terracing or building steps to avoid large-scale grading. Reinforce steps with stone or wood. (UD – 3.5.3)
- Surface water shall be diverted from trails by cross sloping the trail tread between 2 and 3%. (UD – 3.5.4)
- Where there is potential for significant soil erosion, require a specific erosion control plan. (UD – 3.5.5)
- Do not locate irrigation systems within 2 feet of the edge of the trail. Irrigation for turf areas around a trail should use only a pop-up variety of irrigation head. To avoid erosion and undercutting of the trail, the irrigation system should be controlled so that only incidental spray might reach the trail surface and edge. (UD – 3.5.6)
- Select plants for streamside areas that do not require irrigation beyond an establishment period.
- Use permeable pavements where possible.
- Where overland direction of drainage away from the creek is constrained, provide positive drainage.

### GENERAL GUIDELINES FOR GRADING AND DRAINAGE

- No significant grading as defined by local ordinances will be used for trail construction unless in conjunction with an approved development project. (UD – 3.5.1)
- The degree of cut allowed on a slope depends on the soil type, hardness and surrounding natural resources. Cuts should be contoured to blend with the natural slopes. Berms of earth, rocks or wood may be necessary. (UD – 3.5.2)

### GENERAL DESIGN AND AESTHETIC PLANS AND SECTIONS

In addition to the excerpted guidelines above, this section also includes 7 plans and/or sections to help guide the design and placement of trails taken from the Santa Clara County Parks Departments Uniform Interjurisdictional Trail Design manual.

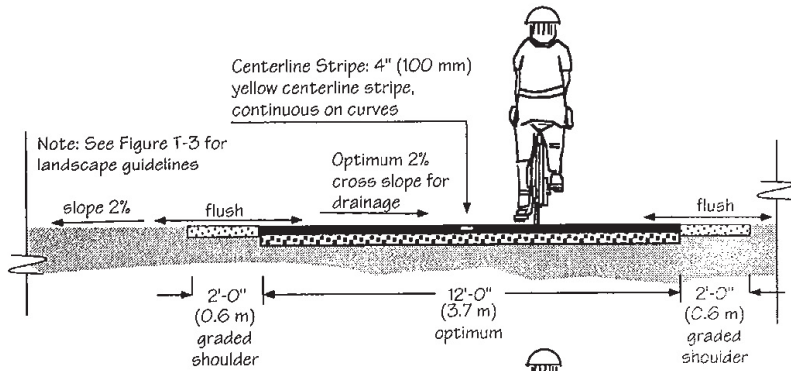
- Design of Urban Shared-Use Trails (T-1)
- Section: Trail Adjacent to Creek, Park, or Open Space (T-5A)
- Plan: Trail Adjacent to Creek, Park or Open Space (T-5B)
- Plan: Design of a Trail on a Levee (T-15)
- Plan and Section: Levee Trail Undercrossing (T-16)
- Creek Crossings and Water Quality (T-17)
- Trail Placement Adjacent to Streams (T-18)

[www.parkhere.org](http://www.parkhere.org)

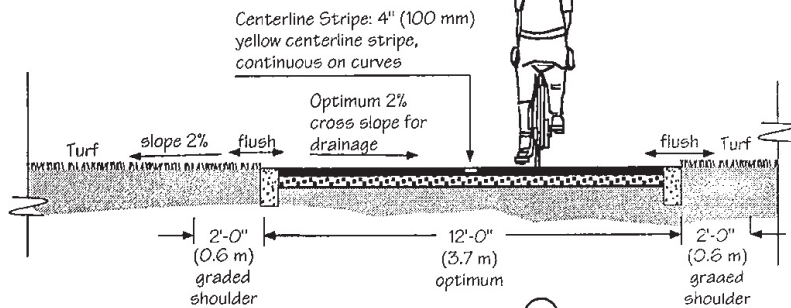
# DESIGN OF URBAN SHARED-USE TRAILS

## Urban Shared-Use Trail Sections T-1

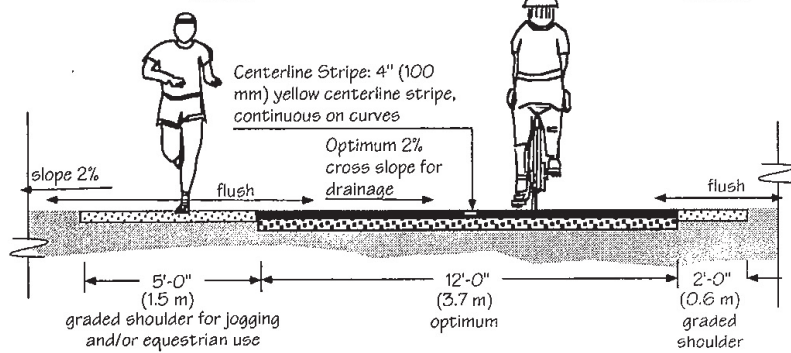
Uniform Interjurisdictional Trail Design, Use, and Management Guidelines  
Santa Clara County Interjurisdictional Trails Committee



Paved Trail  
(See Figure T-2, A and B)  
**Section A**



Paved Trail in Turf Area  
(See Figure T-2, C)  
**Section B**



Combination Paved Trail and Unpaved Jogging Trail  
(See Figure T-2, A and B)  
**Section C**

Related Policies: UD-2.2.2; UD-3.5.4; UD-4.11.1; UM-3.4

**Notes:**

- For natural-surfaced trail cross-sections and urban Shared-Use Trails that include an equestrian shoulder, refer to the 1995 Countywide Trails Master Plan, Figures G-2 and G-3.
- Trail shoulders: 2' (0.6 m) graded shoulder; 2' (0.6 m) minimum vegetation clearance; prune all brush over 12" (0.3 m) in height and 1/2" (12 mm) dia. that extends into trailway.
- Centerline stripes should be used along trails. Solid centerline stripes should be used where there is heavy use, on curves greater than 100 feet long (30.5 m) with restricted sight distances, and where the path is unlighted and nighttime riding is expected. Dashed stripes should be used where there is heavy use but only where sight distances permit.
- "Optimum": The best or most favorable condition for a particular trail situation from the perspective of responsible management.
- Reference Also: Highway Design Manual, Chapter 1000 Bikeway Planning and Design; Topic 1003 - Design Criteria; and Topic 1004 - Uniform Signs. California State Department of Transportation.

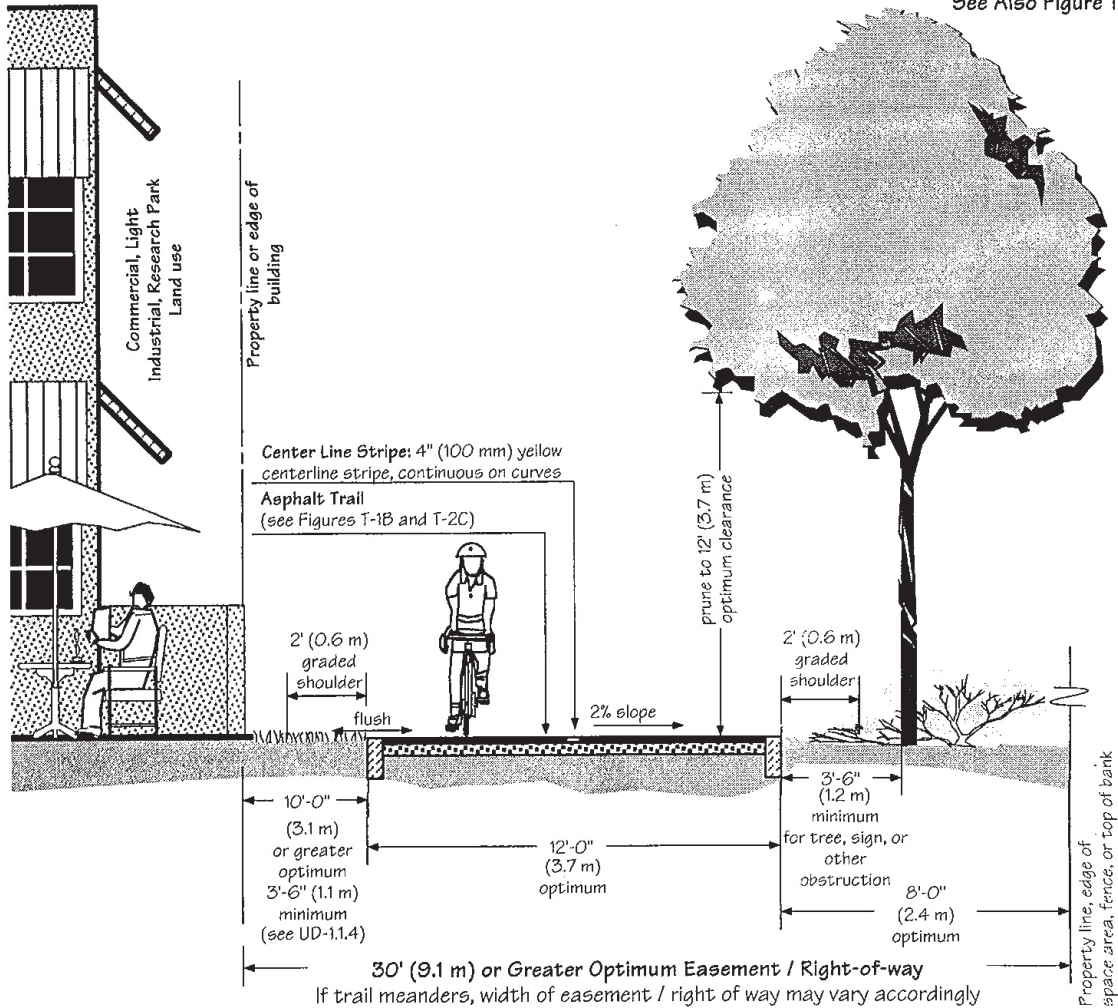
Final: April 15, 1999

# SECTION: TRAIL ADJACENT TO CREEK, PARK OR OPEN SPACE

## Trail Adjacent to Creek, Park, or Open Space T-5A

Uniform Interjurisdictional Trail Design, Use, and Management Guidelines  
Santa Clara County Interjurisdictional Trails Committee

See Also Figure T-5B



Related Policies: UD-1.1.1; UD-1.1.4; UD-2.2.2; UD-3.5.6; UD-4.11.1; UM-3.4

**Notes:**

- Maximum grade of 5% is optimum; 8.33% maximum for short sections.
- Trail shoulders: 2' (0.6 m) graded shoulder / 2' (0.6 m) minimum vegetation clearance; prune all brush over 12" (0.3 m) in height and 1/2" (12 mm) dia. that extends into trailway.
- Centerline stripes should be used along trails. Solid centerline stripes should be used where there is heavy use, on curves greater than 100 feet long (30.5 m) with restricted sight distances, and where the path is unlighted and nighttime riding is expected. Dashed stripes should be used where there is heavy use but only where sight distances permit.
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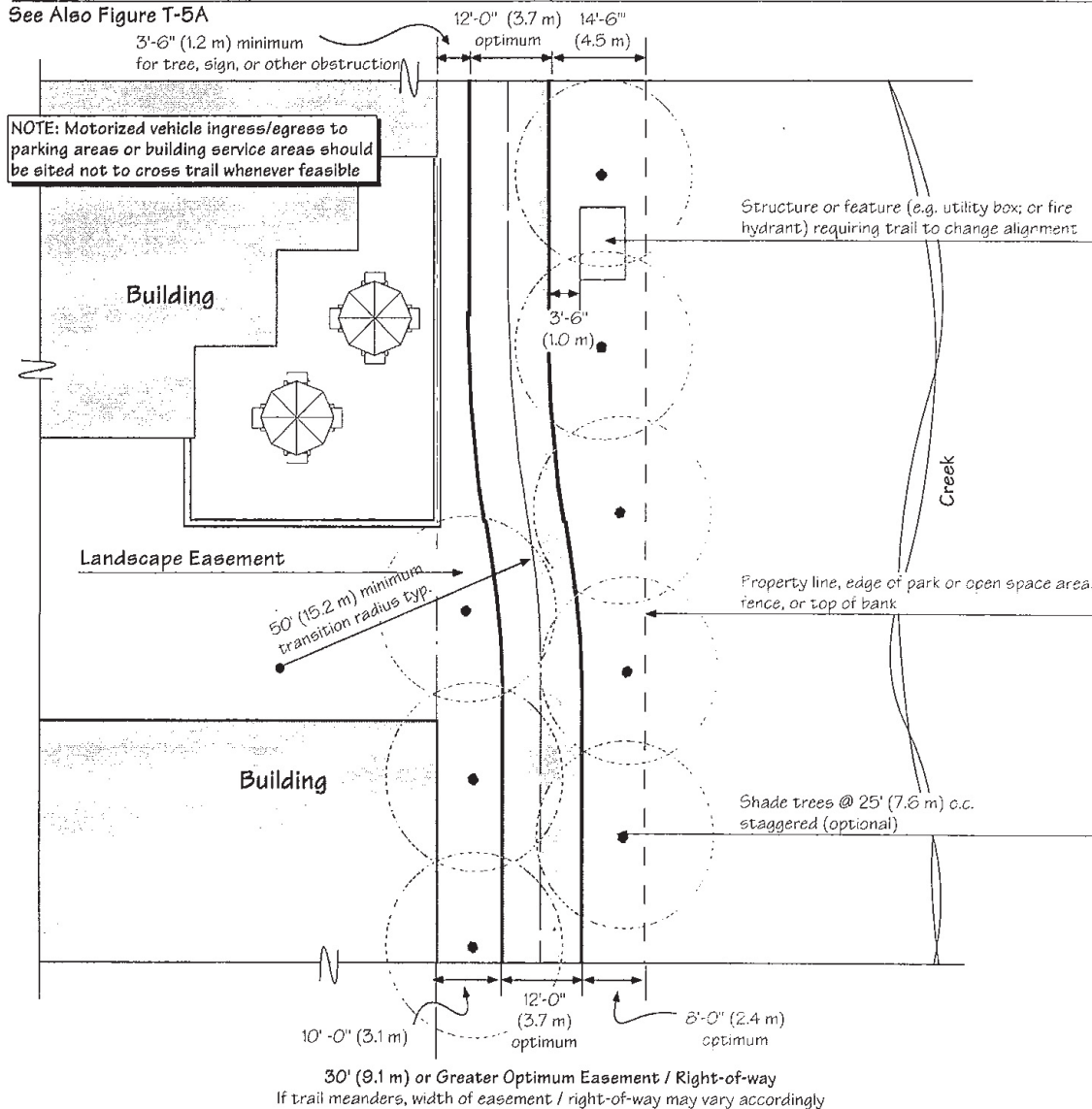
Final: April 15, 1999

# PLAN: TRAIL ADJACENT TO CREEK, PARK OR OPENSOURCE

## T-5B Plan: Trail Adjacent to Creek, Park, or Open Space

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 Santa Clara County Interjurisdictional Trails Committee

See Also Figure T-5A



Related Policies: UD-1.1.1; UD-1.1.4; UD 2.2.2; UD-4.11.1

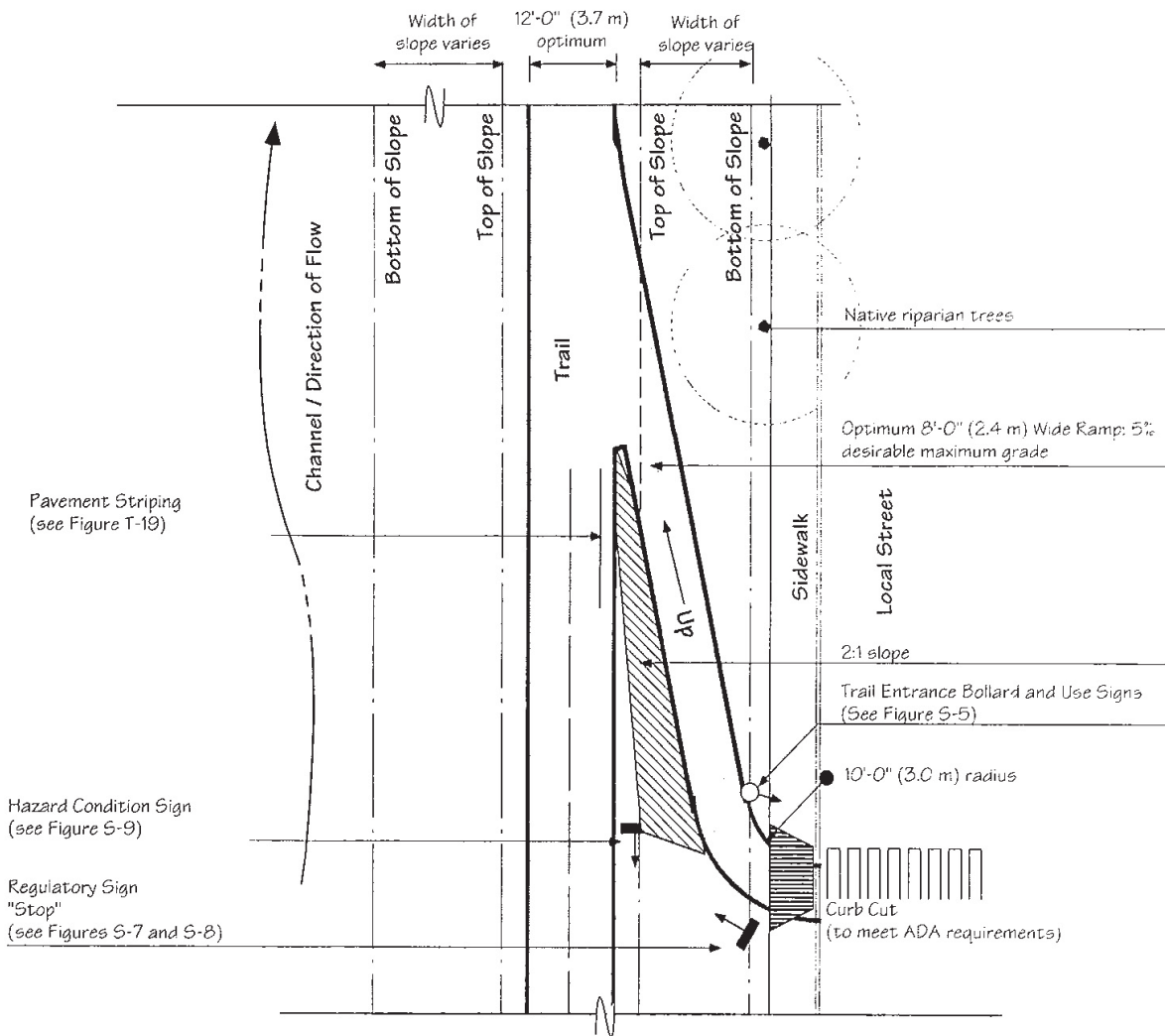
- "Optimum": The best or most favorable condition for a particular trail situation from the perspective of responsible management
- Reference Also: Highway Design Manual, Chapter 1000 Bikeway Planning and Design; Topic 1003 - Design Criteria; and Topic 1004 - Uniform Signs. California State Department of Transportation.

Final: April 15, 1999

# PLAN: DESIGN OF A TRAIL ON A LEVEE

## T-15 Plan: Trail on Levee

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 Santa Clara County Interjurisdictional Trails Committee



Related Policies: UD-1.3.2.3

- "Optimum": The best or most favorable condition for a particular trail situation from the perspective of responsible management.
- Reference Also: Highway Design Manual, Chapter 1000 Bikeway Planning and Design; Topic 1003 - Design Criteria; and Topic 1004 - Uniform Signs. California State Department of Transportation.

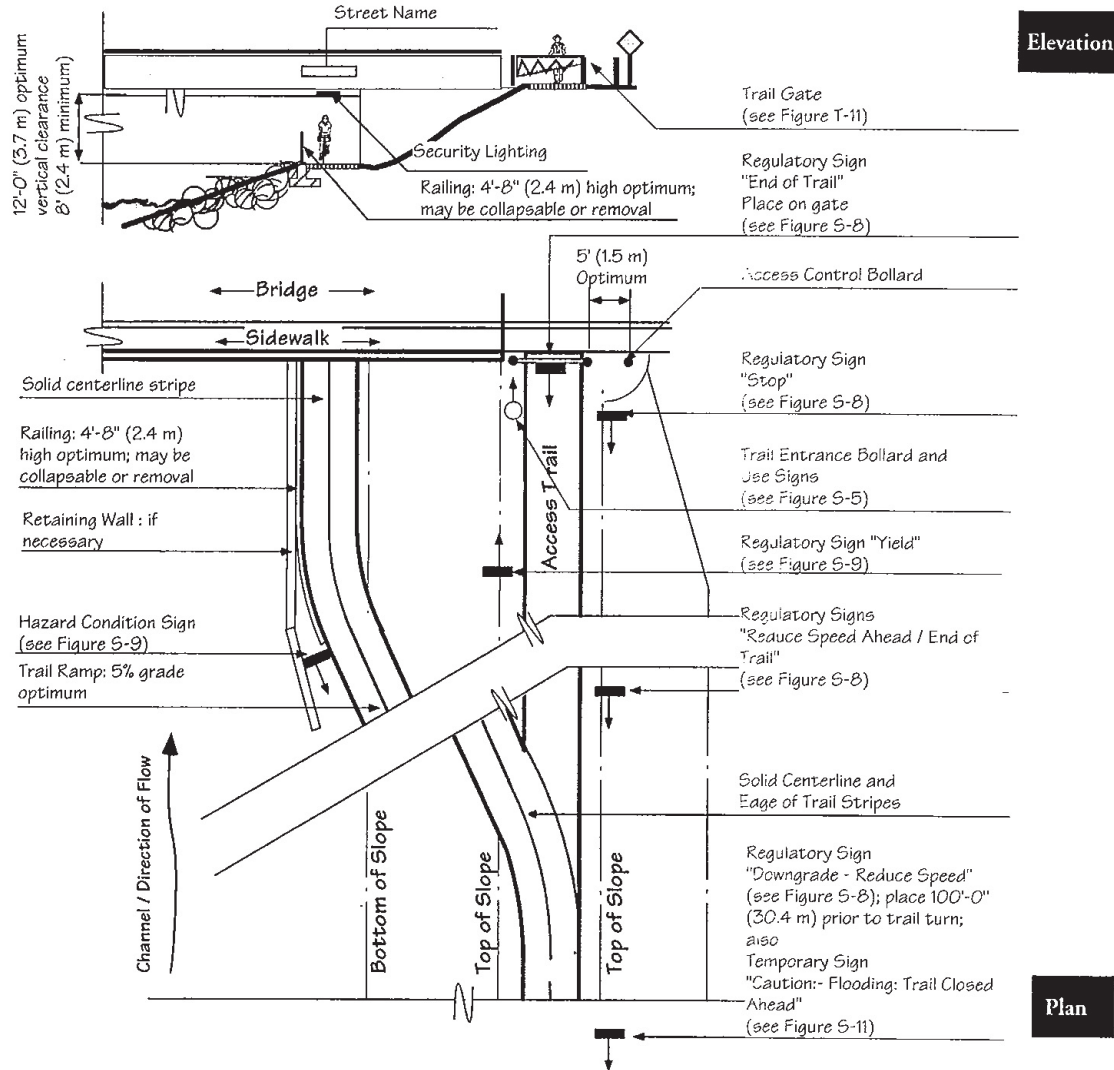
Final: April 15, 1999



# PLAN AND SECTION: LEVEE TRAIL UNDERCROSSING

## Plan and Section: Levee Trail Undercrossing T-16

Uniform Interjurisdictional Trail Design, Use, and Management Guidelines  
Santa Clara County Interjurisdictional Trails Committee



Related Policies: UD-2.6; UD 4.1.5

### Notes

- Trail connections will likely occur on both sides of road bridge

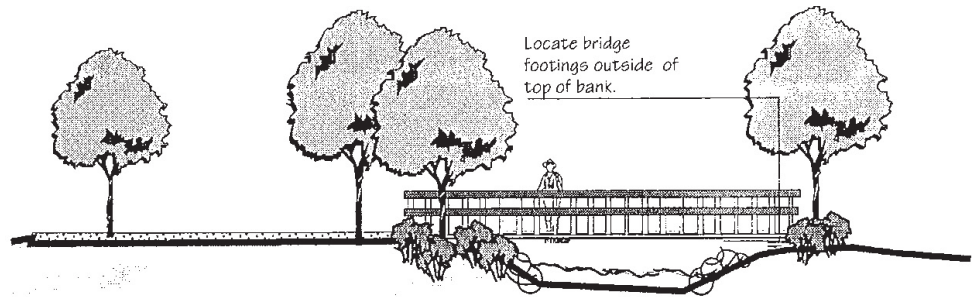
- "Optimum": The best or most favorable condition for a particular trail situation from the perspective of responsible management
- Reference Also: Highway Design Manual, Chapter 1000 Bikeway Planning and Design; Topic 1003 - Design Criteria; and Topic 1004 - Uniform Signs. California State Department of Transportation.

Final: April 15, 1999

# CREEK CROSSINGS AND WATER QUALITY

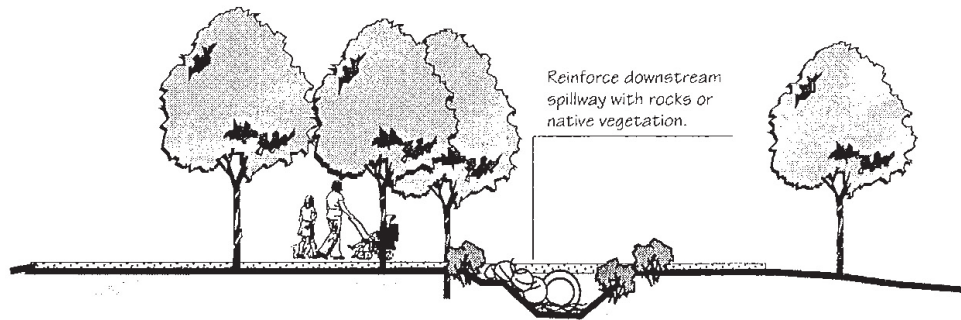
## T-17 Creek Crossings & Water Quality

*Uniform Interjurisdictional Trail Design, Use, and Management Guidelines*  
*Santa Clara County Interjurisdictional Trails Committee*



Bridge major streams and drainages

A



Culvert crossings of small streams and drainages

B

Related Policies: UD-1.3.3.14

- "Optimum": The best or most favorable condition for a particular trail situation from the perspective of responsible management
- Reference Also: *Highway Design Manual, Chapter 1000 Bikeway Planning and Design; Topic 1003 - Design Criteria; and Topic 1004 - Uniform Signs.* California State Department of Transportation.

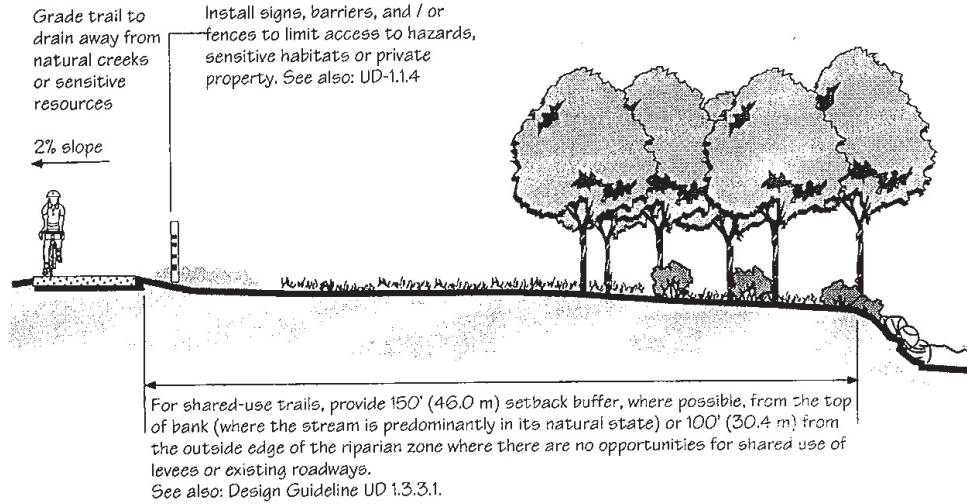
Final: April 15, 1999

# TRAIL PLACEMENT ADJACENT TO STREAMS

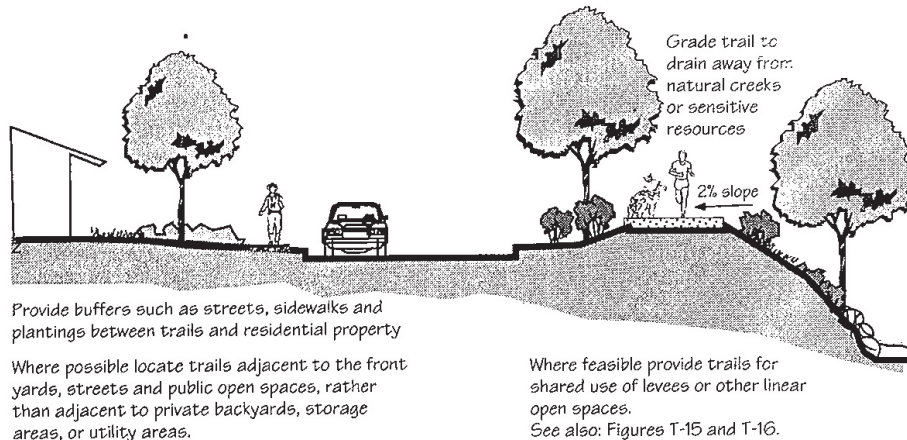
## Trail Placement Adjacent to Streams T-18

Uniform Interjurisdictional Trail Design, Use, and Management Guidelines  
Santa Clara County Interjurisdictional Trails Committee

### Relationship to property lines, environmentally sensitive areas & residences



A



B

See also: Design Guideline UD 2.1, Tables UD-1 and UD-2

Related Policies: UD-1.1.1; UD-1.3.3.14; UD 1.1.4

- "Optimum": The best or most favorable condition for a particular trail situation from the perspective of responsible management
- Reference Also: Highway Design Manual, Chapter 1000 Bikeway Planning and Design; Topic 1003 - Design Criteria; and Topic 1004 - Uniform Signs. California State Department of Transportation.

Final: April 15, 1999

# GROUNDWATER RESOURCE ASSESSMENT CRITERIA

## INTRODUCTION

Any proposed project subject to CEQA where the permitting agency finds that there is potential for groundwater quantity or quality impacts should provide a groundwater assessment that will need to be reviewed. Examples of land use decisions that could impact groundwater and may require a groundwater assessment include:

- Increases in water demand (whether that demand will be served by on-site wells or potentially change the quantity of water pumped by retail water suppliers)
- Land use changes that could impact the quantity or quality of water percolating into the groundwater resource on site such as changes in impervious surface area or the use of dry wells or other stormwater infiltration facilities
- Use of on-site wastewater treatment
- Use of underground chemical storage facilities.

## SUBMISSION OF GROUNDWATER ASSESSMENT

The groundwater assessment should be submitted to the appropriate permitting agency for review. Groundwater assessment before a project starts will help the appropriate permitting agency anticipate groundwater management impacts and ensure that groundwater resources, both quantity and quality, are sustained and protected. The required groundwater assessment should include:

### General:

- A description of the groundwater basin or basins over which the project lies;
- Identify whether the site is located in a recharge area of the groundwater basin;
- Identify any existing active or abandoned wells on site.

### Water Supply:

- Is groundwater expected to be a source of supply to meet the water demand for the project? If so, provide pumping locations and quantities for the proposed project;

- Describe potential impacts to groundwater recharge on site (due to changes in pervious and impervious surfaces for example);

- Is there currently or will the proposed project be using recycled water? For what uses?

### Water Quality:

- Are there any existing contamination sites or plumes?
- Information on the geo-hydrology of the site, including historical depth to water at the site (in different years, seasons, or different hydrologic conditions if known); is the shallowest groundwater part of the drinking water aquifer or perched water above a confining lens or confining layer?
- Identify active drinking water sources and protection zones within the proposed project limit;
  - If known, the vulnerability of the local groundwater to any possible contamination that might occur at the site (the physical barrier effectiveness to use the DWSAP terminology): what the groundwater gradient is on site, the ability of the soil materials to transmit or delay the movement of contamination to the water table;
- Identify locations and risk rankings of possible contaminating activities within the limit of the proposed project area. These include storm runoff devices, other infiltration devices (such as septic or leach fields), chemical storage tanks (for example, dry cleaners and gas stations);
- Provide the information on Best management practices (BMPs) applied within the proposed project area for protecting groundwater and surface water that are used or potentially used as sources of drinking water.

## SCVWD FLOOD PROTECTION DETENTION BASIN DESIGN CRITERIA

### SCVWD FLOOD PROTECTION DETENTION BASIN DESIGN CRITERIA

This guidance is intended to provide an overview and is to be supplemented with engineering analysis and design. Engineering professionals should refer to the SCVWD Hydrology Manual, the Santa Clara County Drainage Manual, and any design requirements made by permitting agencies.

These design criteria are recommended to be used when detention basins are required to mitigate for impacts to flood conveyance capacity. Separate criteria have been developed for implementing NPDES permit requirements for hydro-modification. There may be some instances where stormwater runoff rates need to be regulated for both flood protection and hydro-modification (HMP) purposes. In those cases, the recommended method of design needs to be as follows: (a) design the basin for the HMP requirements, (b) test the HMP basin design against the flood protection requirements outlined in this section. If the HMP design meets the flood protection requirements, the HMP design achieves both functions. If not, the HMP design would need to be modified by the engineer to accomplish both functions. This may require modifying the storage volume and the orifices/weirs of the HMP basin.

### GENERAL DESIGN CRITERIA

The frequency, lateral extent and elevation of flooding should not substantially increase under post development conditions.

The 100-year flood according to pre-development and post-development conditions shall be analyzed and routed through the pond. The 100-year outflow hydrograph shall not be more than the pre-development condition. If there is an existing flooding condition downstream, then the design should also be based on the flow rate and frequency at which flooding occurs.

In general the design of detention facilities should be based on the differential storage between the inflow and the outflow hydrographs. The peak of the outflow hydrograph for the post-design condition shall not exceed that of the pre-design condition.

### DEFINITIONS AND DESIGN IMPLICATIONS OF SOME TERMINOLOGIES

**Pre-development condition:** This is the existing land uses within the tributary watershed, which may be completely rural, and it includes pervious and impervious areas. Using appropriate procedures, the total flow peak and volume may be determined by calculating the flood hydrographs from the pervious and impervious areas and then subsequently combining these two hydrographs.

**Post-development condition:** With an increase in imperviousness, urbanization within the watershed will result in a higher runoff volume and a different peak flow rate which, again, are obtained by combining the pervious area and impervious area hydrographs from the post-development land use conditions.

**Differential peak flow rate and volume:** The differential flow values, between the pre- and post-development conditions, represent the effect of urbanization. In order to minimize impacts from flooding, no increase in flow rate or volume is allowed. Thus, mitigation measures are needed. One of the mitigation measures is to achieve peak shaving and volume reduction via a detention basin.

**Detention basin routing:** The routing (passing-through) of floodwaters through the detention basin could effectively reduce the peak flow and volume at its downstream end due to storage effects. The use of a detention basin is desired to reduce flood peaks.

## DESIGN GUIDE 18

### GUIDELINES AND STANDARDS XIV.A.3

#### OPERATION MANUAL AND RULE CURVES

For every stormwater detention facility that is designed to alleviate flood damages or other natural emergencies, guidelines must be established to assure the proper maintenance and safety of the facility. These guidelines should identify whom, when, and how the facility will be managed. The safety elements of operating the facility should be addressed, as should recommendations relating to the ingress-egress to and from the facility.

It is recommended that detention basins be designed to function as multipurpose facilities for recreation as well as for flood attenuation. For this purpose, the facility should be designed with minimum depths of water and relatively flat slopes for the sides of the pond. In the case where detention facilities are designed as multipurpose facilities for recreation, flood and pollution control, a rule curve that specifies the allowable maximum water surface elevations over time should be defined and made as a part of the final operating manual.

#### SITING OF DETENTION BASINS

- Recommend situating the detention basin closer to the middle of a watershed to provide efficient peak flow and volume reductions.
- Avoid locations near San Francisco Bay or at the lower/downstream end of a watershed.
- Utilize existing topography, such as the selection of a low depressed area to reduce the amount of excavation and the selection of a narrow necking area for outlet control or dam sites, could result in significant savings.
- Avoid locations where the seasonal ground water level may rise above the basin bottom. Ground water flow can have significant effect in the construction and operation of the basin.

- Where multiple detention facilities are on one creek, synchronize operations of these facilities so as not to expand the impact and increase the flow rather than reducing it.

#### PROTECTION OF RIPARIAN HABITAT AND GROUNDWATER Detention basins should not be located within the riparian corridor, but may be located within the riparian setback.

Geotechnical evaluation may be needed for basins in close proximity to a creek bank. To protect the groundwater from surface water contamination, it is preferable that the stormwater detention facilities be located in impervious areas. Investigations should also be made into the proximity of existing groundwater contamination. Infiltration from an unlined detention basin can exacerbate the movement of a groundwater contamination plume. Groundwater or geologic conditions may require the inclusion of a lining to ensure that the underground water is not contaminated.

#### TYPES OF ATTENUATION FACILITIES

**Off-Stream Facilities:** Off-stream basins are preferable because they are generally smaller than in stream types and, hence, more economical. In-stream basins have more restrictions due to environmental concerns. An off-stream detention basin is designed to take the excess flow above a certain prescribed threshold. Stormwater runoff from a watershed is generally collected and transported via storm drains or channels to the detention basin. The outlet of the off-stream basin should be designed to drain flow back to the main stream either by gravity or by pumping if gravity flow is not feasible.

**In-Stream Facilities:** Instream facilities are not preferred because of the impacts structural modifications may have on the stream. Flow through ponds or detention basins that intercept flow from development with a discharge outlet draining back to the creek to mitigate induced flooding can both be categorized as in-stream facilities. The modified puls or storage-indication method is frequently used as the routing method for the in-stream facility routing. Usually the in-stream facility attenuates the flows through the creek; therefore, the outlet structure should be designed to accommodate the required capacity of the creek. At times, minimum inflows are permitted to flow unimpeded through the detention facility. The design of in stream detention facilities shall be consistent with the design of the ultimate flood control project on that stream.

### **SIZING OF AN OFF-STREAM DETENTION BASIN**

The sizing of an off-stream detention basin involves an iterative design process. Flow over a preset level is diverted through a diversion and control structures such as an overflow weir discharging via either an open channel or a closed conduit into the detention basin. At the lower end of the basin, an outlet draining the flow back into the main stream may be needed. The flow conveying hydraulics for both inflow and outflow of the detention basin must be determined in order to meet the objectives of the flow attenuation in the main stream. This involves a trial and error design process of sizing the basin with its associated storage-discharge relationship to optimize the combined flow at the downstream end.

### **OUTLET STRUCTURE**

The outlet structure should be designed to evacuate the storage volume incidental to flood control (excluding the initial storage) within a short time period to allow for the next incoming storm.

### **SPILLWAY DESIGN**

Every stormwater detention facility should be designed to prevent damages from embankment failure due to overtopping or other causes. Good engineering principles should be implemented in the construction of the embankment and the spillway should be designed to prevent the possibility of over-banking from the spillway design flood.

If the pond volume is less than 15 acre-feet and the depth of water in the pond is less than 6 feet, then the spillway shall be designed for the 100-year flood. If the volume of the pond is between 15 and 50 acre-feet and the depth is between 6 and 25 feet, then the spillway design flood may be based on the 200-year flood. All other impoundments that are larger than defined above should comply with the design criteria of the State of California Division of Safety of Dams (DSOD).

## DESIGN GUIDE 18

### GUIDELINES AND STANDARDS XIV.A.3

#### **BASIN SLOPES AND LOW FLOW CHANNEL**

The recommended side slopes for flood control storage areas within a stormwater detention basin vary with the design of the basin. Earthen slopes or passive vegetated areas should be at a maximum of 3 horizontal to 1 vertical. Turf areas should be at a 4 to 1 or flatter slope to facilitate mowing. The basin floor shall be sloped towards the low flow channel with a minimum slope of 1%. The low flow channel is recommended to carry 1 to 3 percent of the 100-year peak flow.

#### **CHECKLIST FOR DETENTION BASIN DESIGN**

- Hydrology map of watershed boundaries, basin layout with contours.
- Summary tables of watershed parameters.
- Inflow hydrographs at key locations.
- Stage, storage, discharge curves.
- Outflow hydrographs after basin routing.
- Basin design drawings with inlet and outlet designs.
- Summary tables of peak flow and volume for pre- and post- conditions.