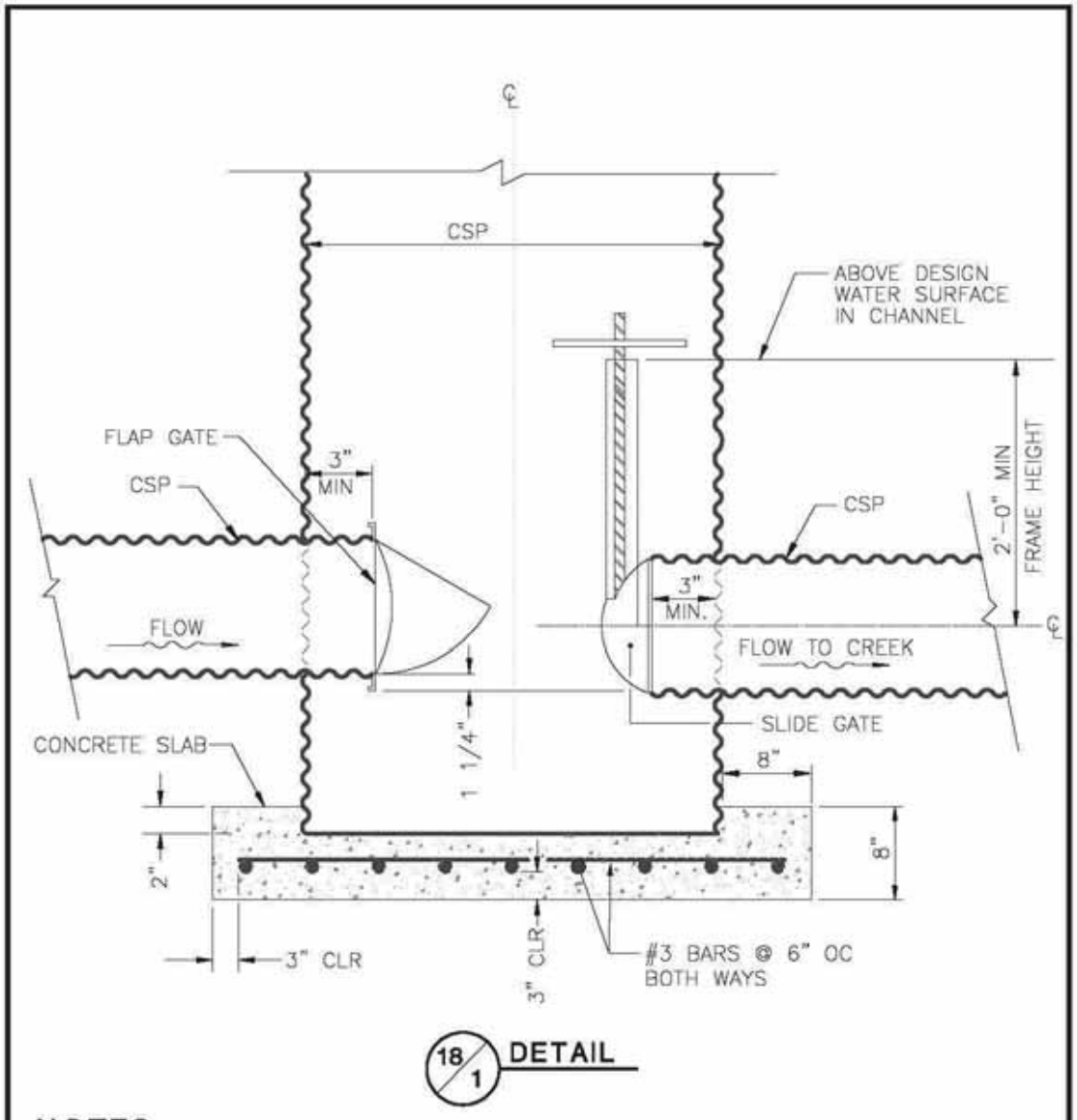
FLAP GATE STRUCTURE

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.



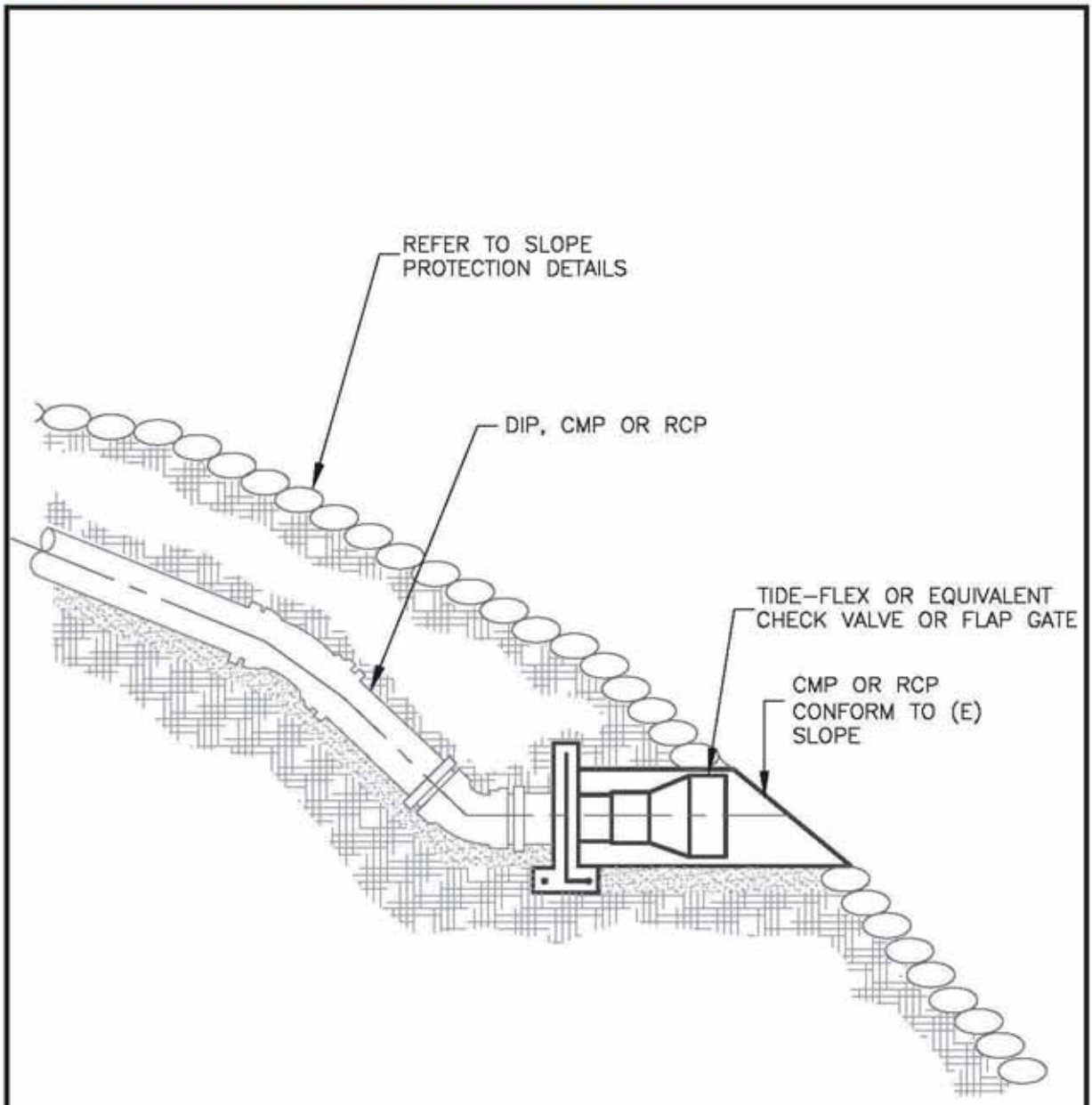
18/1 DETAIL

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.

Santa Clara Valley Water District 5750 Almaden Expressway, San Jose 95118 Phone (408)265-2600 SCALE: N.T.S. 9/4/2001 REVISED Sheet44.dwg	FLAP GATE STRUCTURE	GUIDE 18/1 SHEET 42

FLAP GATE IN DORMER PIPE



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7/11/2005 REVISED

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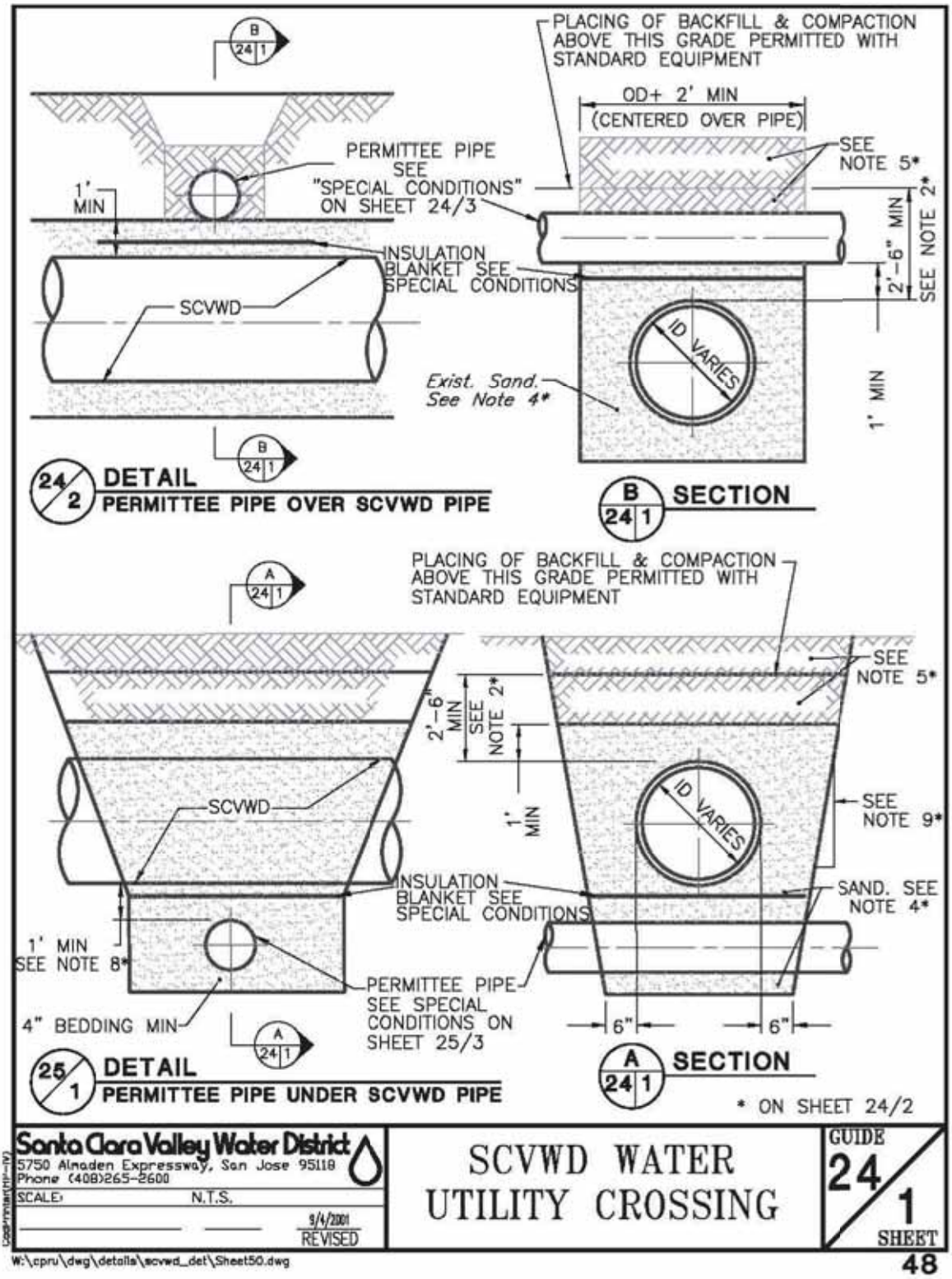
FLAP GATE

GUIDE 28/1 SHEET 54

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.



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:

SIEVE SIZE	PERCENT PASSING
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 EXTRANEOUS 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 UTILITY CROSSING

GUIDE 24/2 SHEET

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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 PERMITTE 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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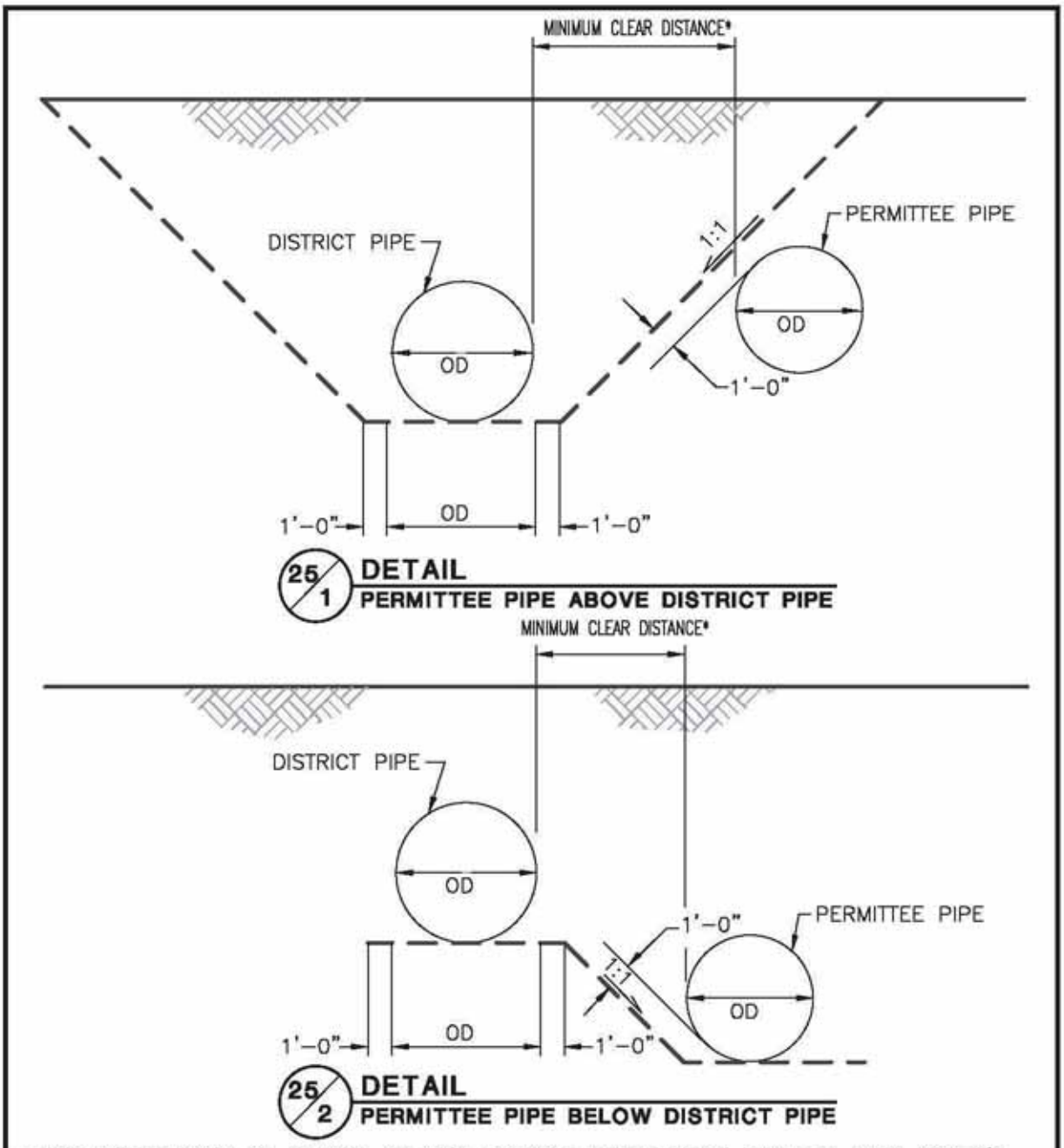
PIPELINE PARALLEL TO SCVWD WATER PIPELINE



* 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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SCALE: N.T.S.

9/4/2001 REVISED

CLEARANCE FOR PIPELINES PARALLEL TO WATER UTILITY PIPE

GUIDE 25/1 SHEET

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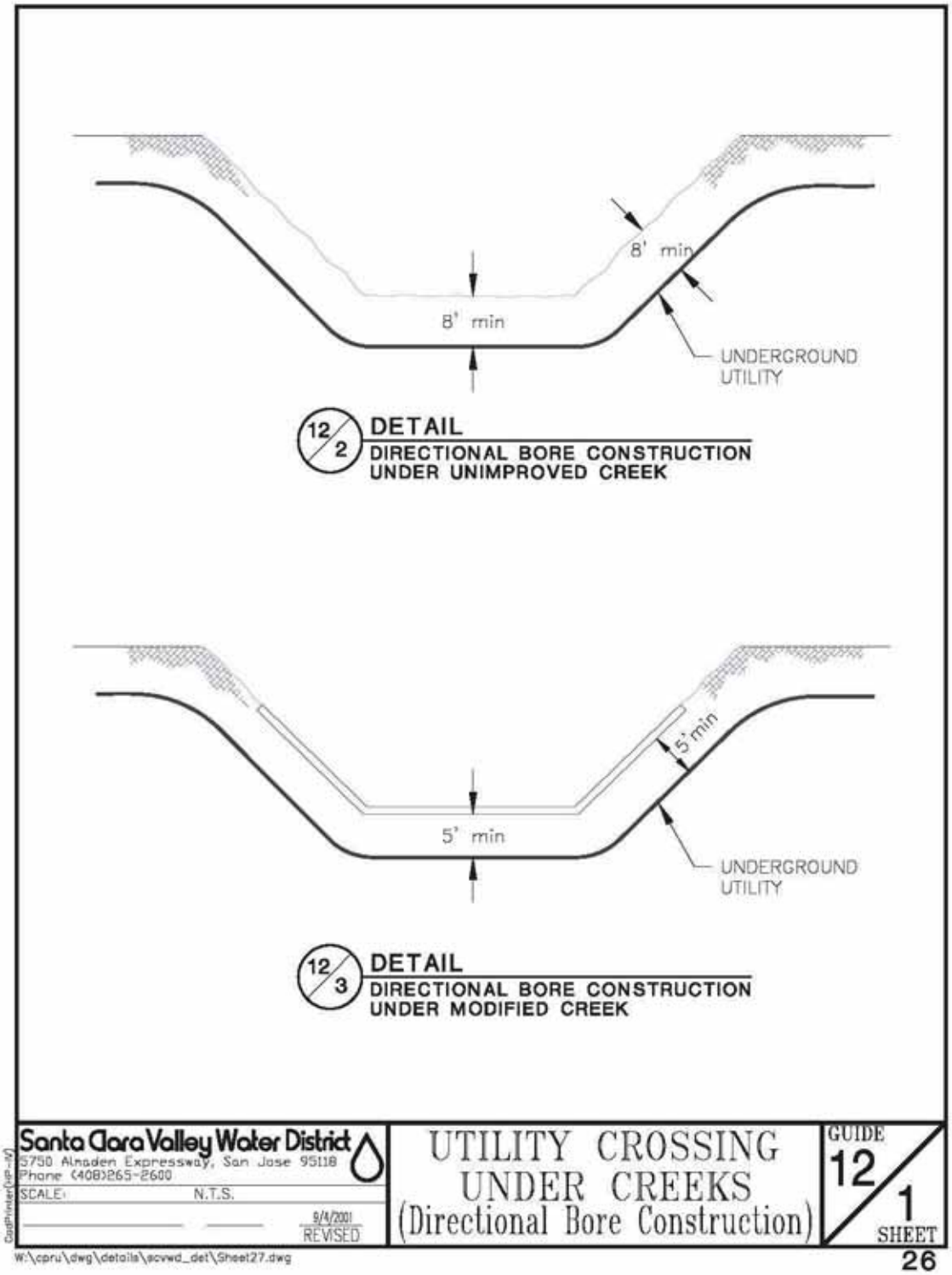
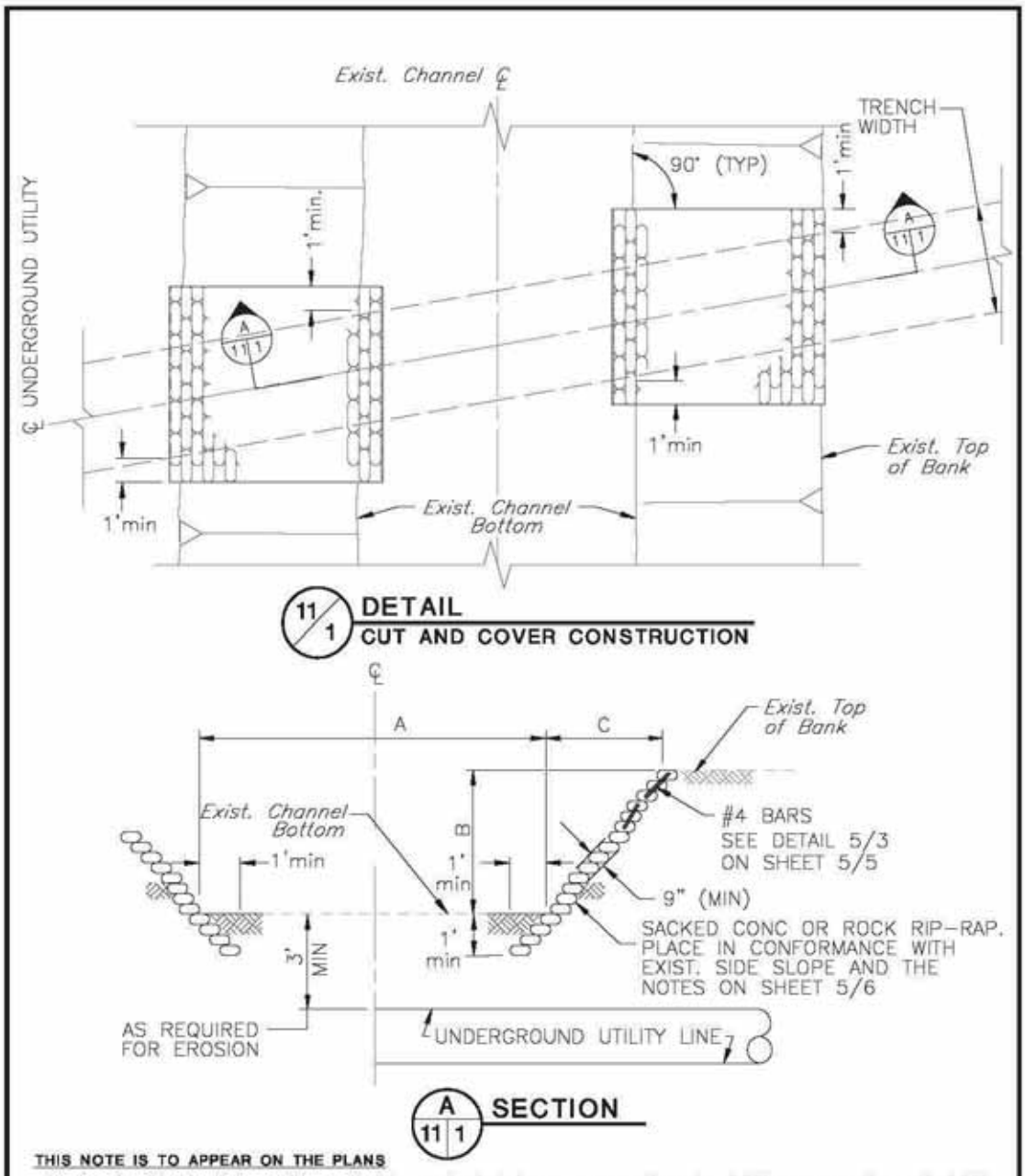
UTILITY CROSSING UNDER CREEKS

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.



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.



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 mitigat 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)

- 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.

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)
- 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 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)

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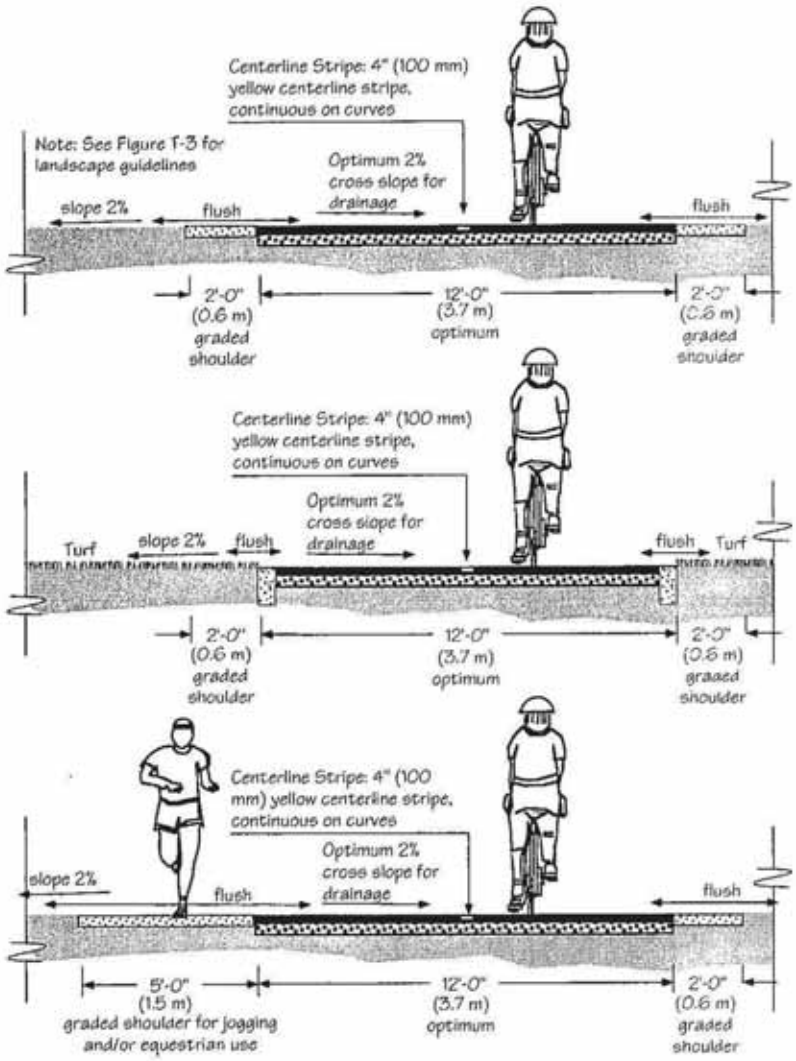
DESIGN OF URBAN SHARED-USE TRAILS

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.

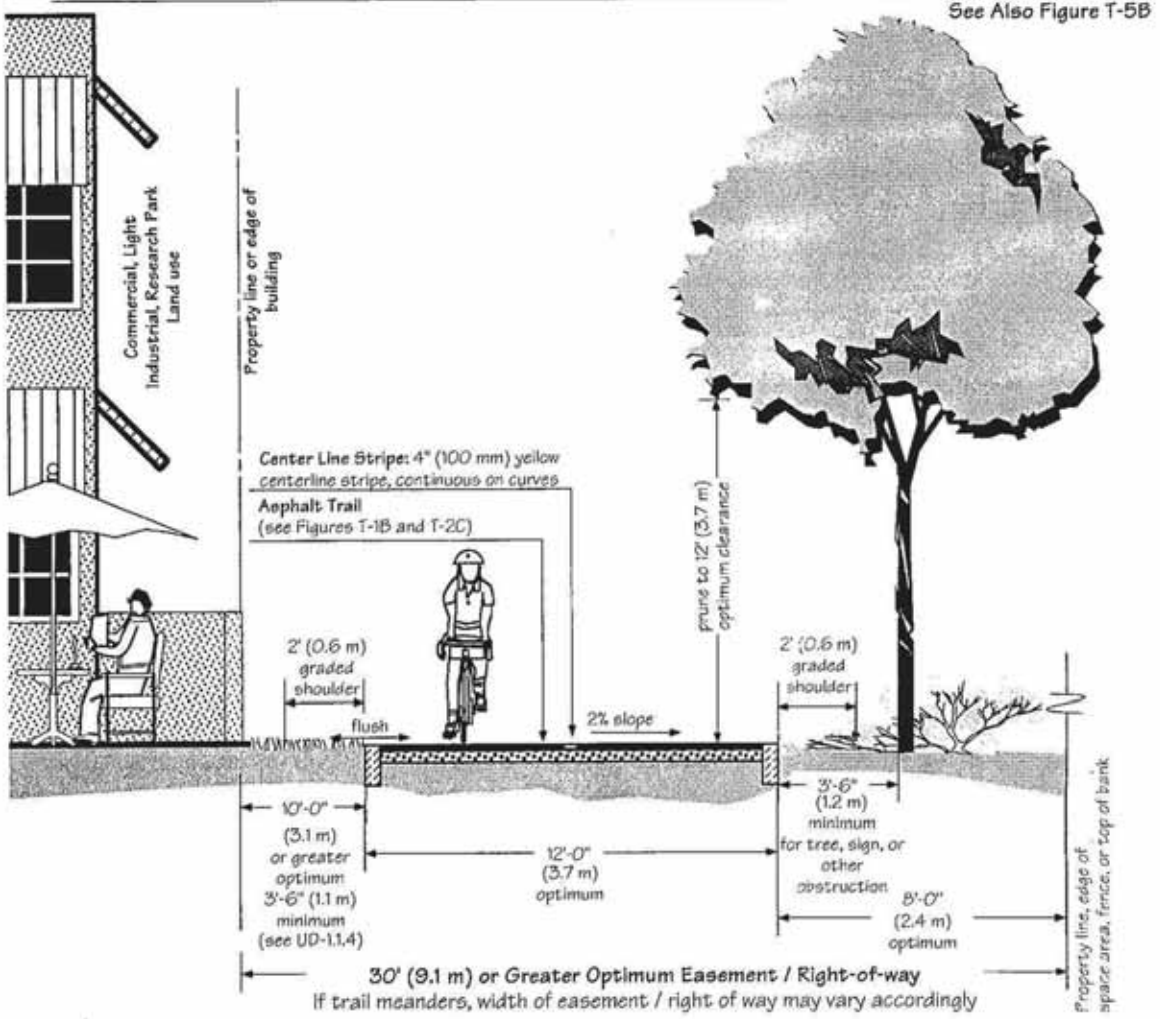
Final: April 15, 1999

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:

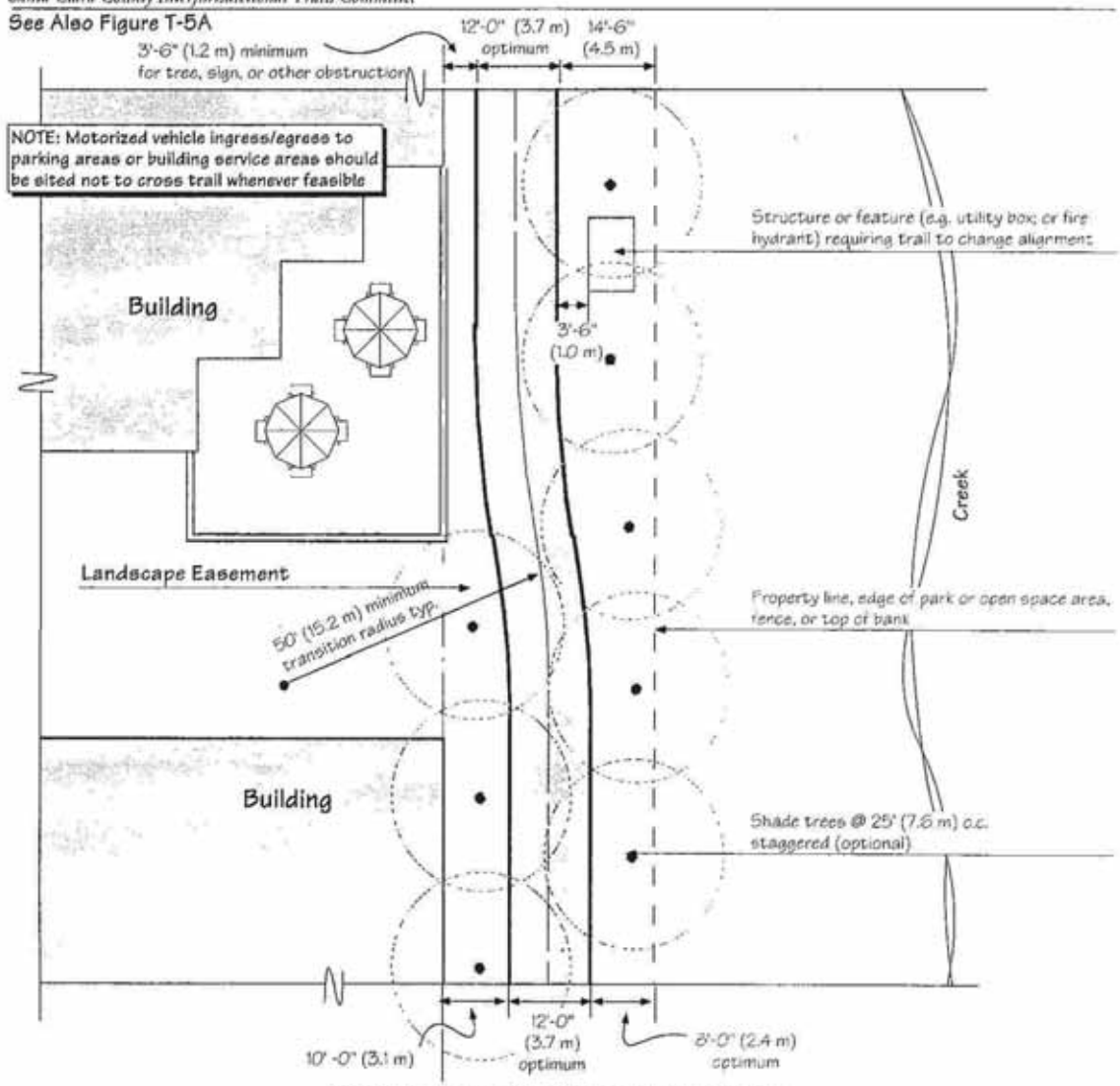
- Maximum grade of 5% is optimum; 8.33% maximum for short sections.
- Trail shoulders: 2' (0.6 m) graded shoulder / 2' (0.6 m) minimum vegetation clearance; prune all brush over 12" (0.3 m) in height and 1/2" (12 mm) dia. that extends into trailway.
- Centerline stripes should be used along trails. Solid 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.
- "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: TRAIL AJACENT TO CREEK, PARK OR OPENSPACE

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

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



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

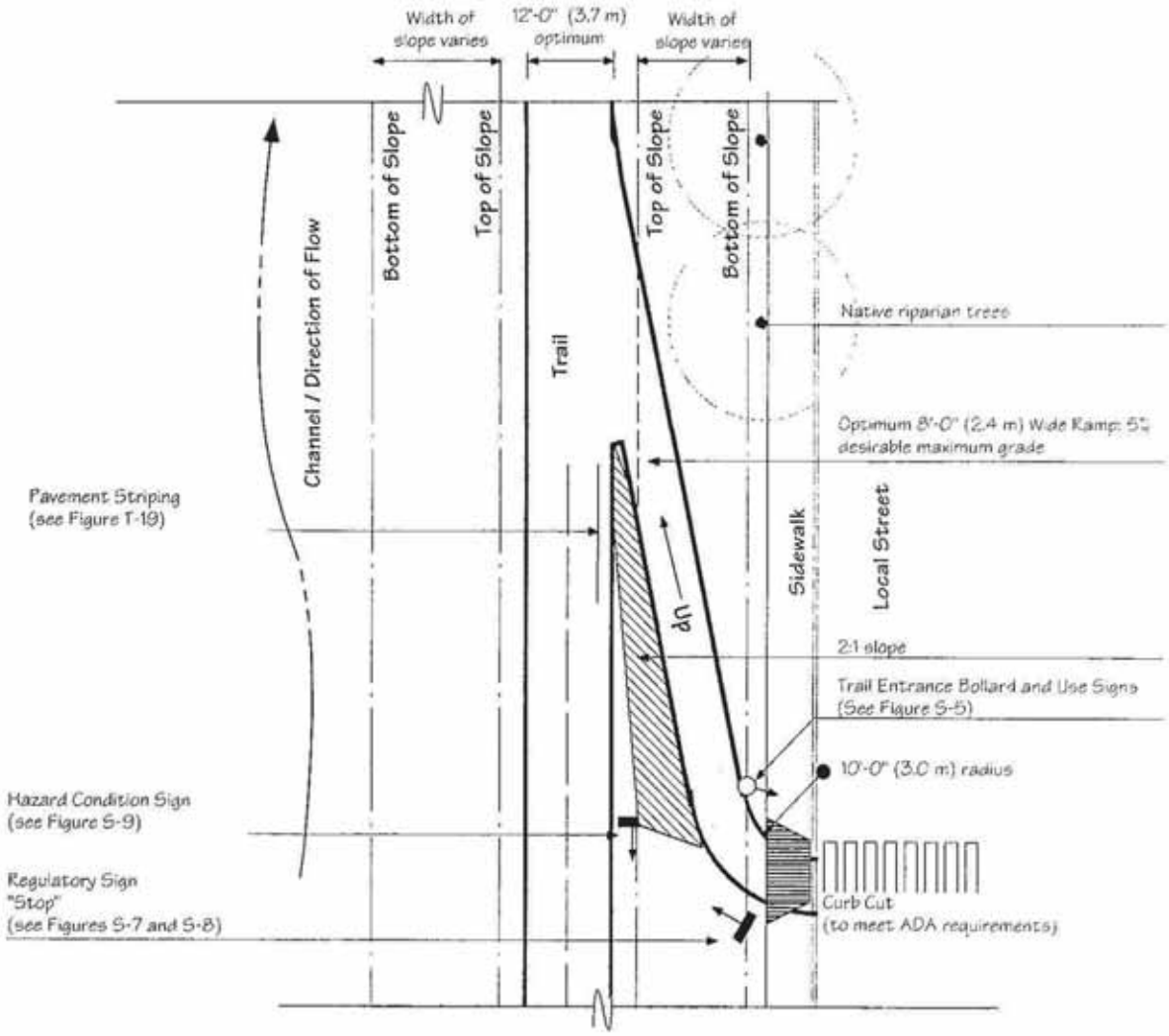
- "Optimum": The best or most favorable condition for a particular trail situation from the perspective of responsible management.
- Reference Also: *Highway Design Manual, Chapter 1000 Bikeway Planning and Design; Topic 1003 - Design Criteria; and Topic 1004 - Uniform Signs*, California State Department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

Final: April 15, 1999

PLAN: DESIGN OF A TRAIL ON A LEVEE

T-15 Plan: Trail on Levee

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



Related Policies: UD-1.3.2.3

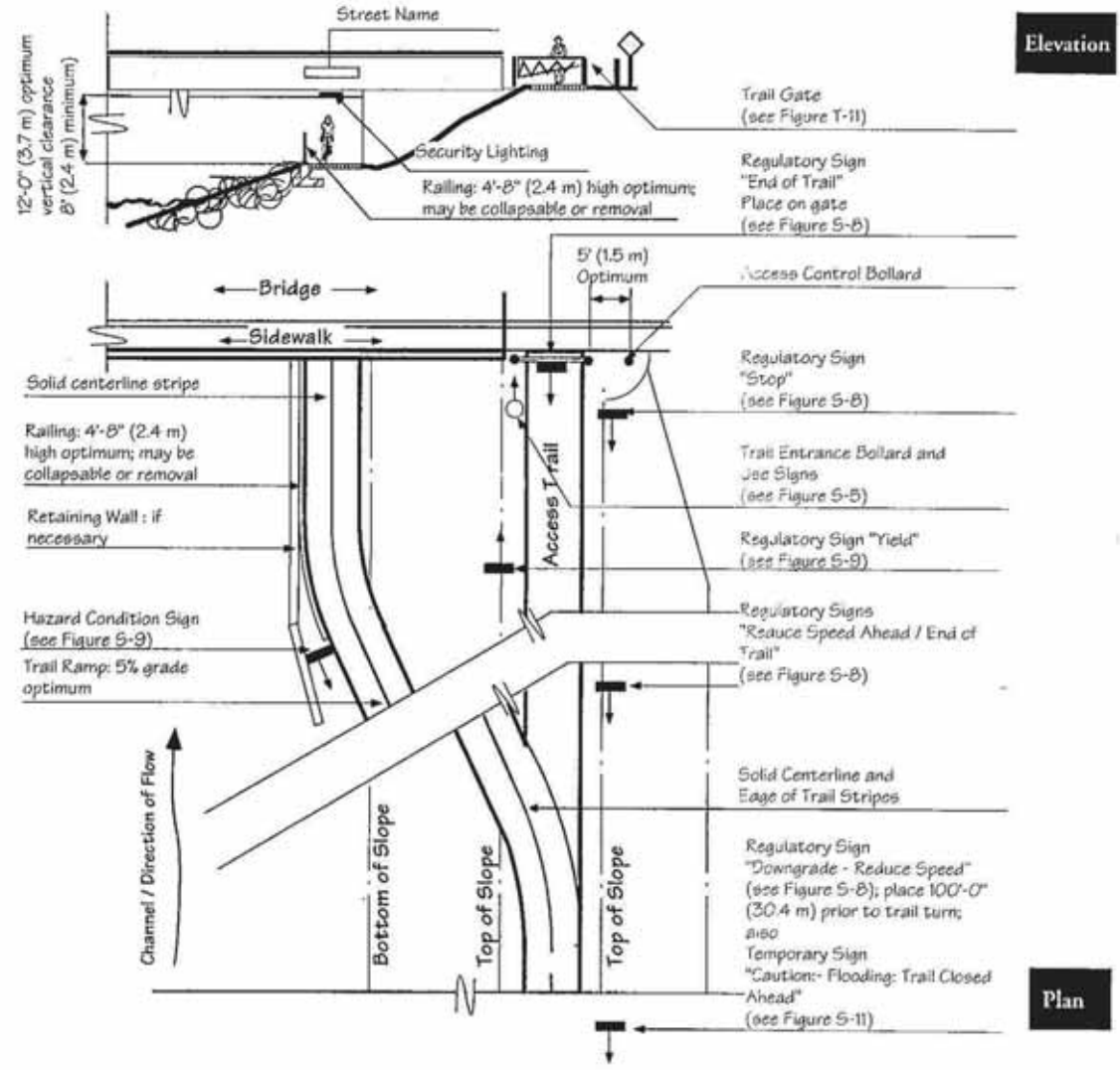
- "Optimum": The best or most favorable condition for a particular trail situation from the perspective of responsible management.
- Reference Also: *Highway Design Manual, Chapter 1000 Bikeway Planning and Design; Topic 1003 - Design Criteria; and Topic 1004 - Uniform Signs.* California State Department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

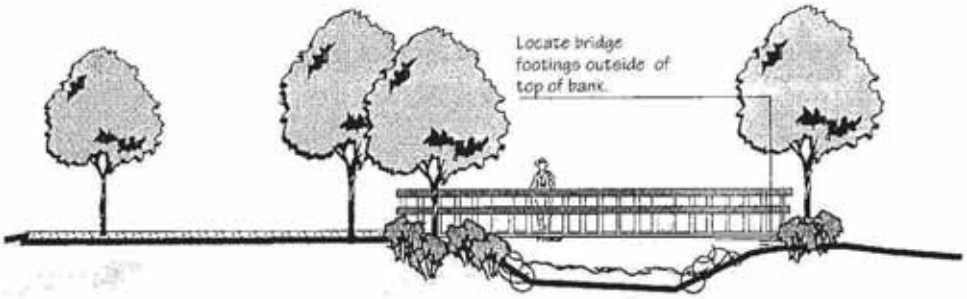
- "Optimum": The best or most favorable condition for a paticular trail situation from the perspective of responsible management.
- Reference Also: *Highway Design Manual, Chapter 1000 Bikeway Planning and Design; Topic 1003 - Design Criteria; and Topic 1004 - Uniform Signs.* California State Department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

Final: April 15, 1999

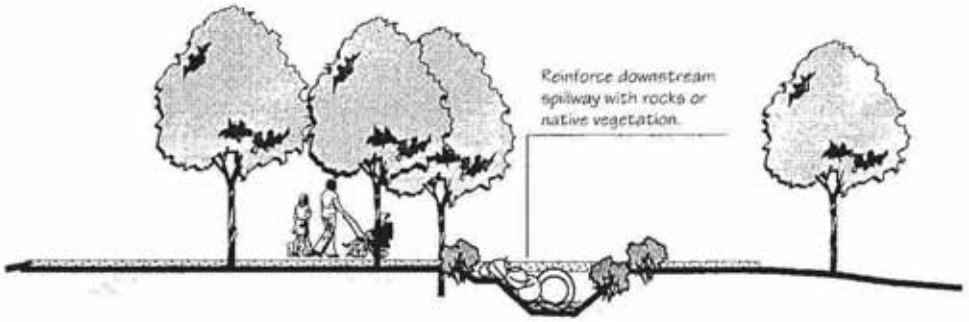
CREEK CROSSINGS AND WATER QUALITY

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 paticular 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.

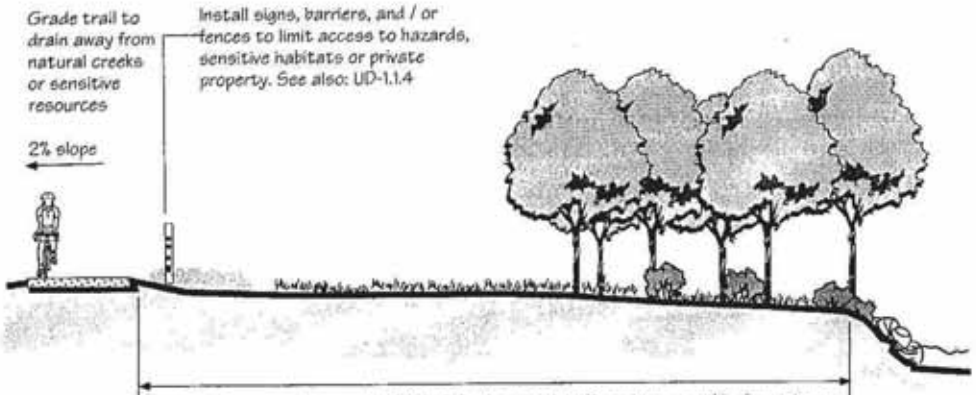
Final: April 15, 1989

TRAIL PLACEMENT ADJACENT TO STREAMS

Trail Placement Adjacent to Streams T-18

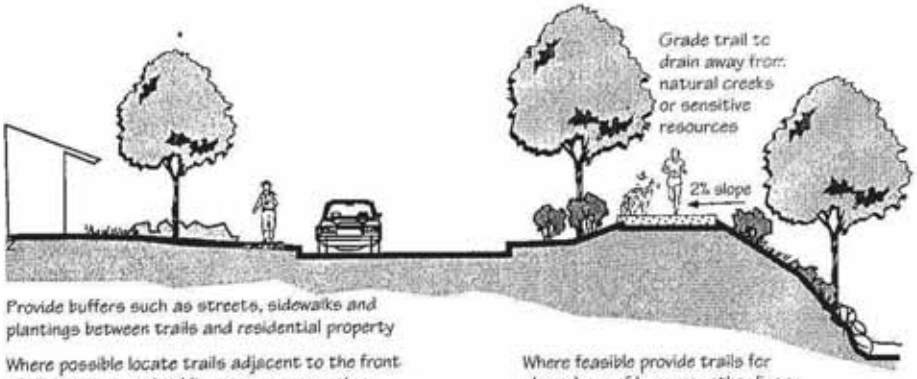
Uniform Interjurisdictional Trail Design, Use, and Management Guidelines
Santa Clara County Interjurisdictional Trails Committee

Relationship to property lines, environmentally sensitive areas & residences



For shared-use trails, provide 150' (46.0 m) setback buffer, where possible, from the top of bank (where the stream is predominantly in its natural state) or 100' (30.4 m) from the outside edge of the riparian zone where there are no opportunities for shared use of levees or existing roadways.
See also: Design Guideline UD 1.3.3.1.

A



Provide buffers such as streets, sidewalks and plantings between trails and residential property

Where possible locate trails adjacent to the front yards, streets and public open spaces, rather than adjacent to private backyards, storage areas, or utility areas.

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

Where feasible provide trails for shared use of levees or other linear open spaces.
See also: Figures T-15 and T-16.

B

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

- "Optimum": The best or most favorable condition for a paticular 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 District 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 District for review. Groundwater assessment before a project starts will help the District 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 Drinking Water Source Assesment and Protection Program 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.

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 beyond the riparian corridor. 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).

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.