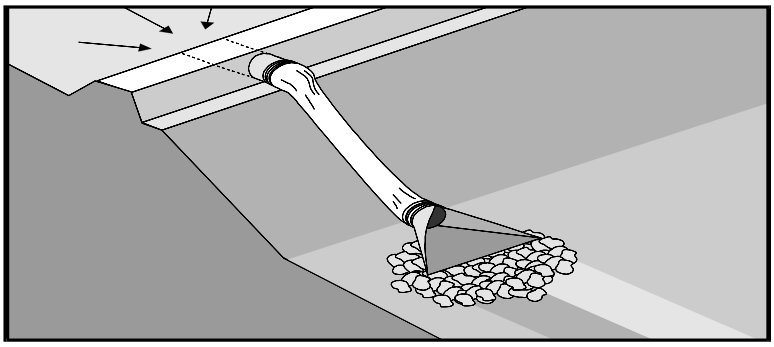
ACTIVITY: Flow Diversions, Drains and Swales | PESC – 06



Targeted Constituents				
● Significant Benefit	◗ Partial Benefit	○ Low or Unknown Benefit		
● Sediment	○ Heavy Metals	○ Floatable Materials	○ Oxygen Demanding Substances	
○ Nutrients	○ Toxic Materials	○ Oil & Grease	○ Bacteria & Viruses	○ Construction Wastes

Implementation Requirements				
● High	◗ Medium	○ Low		
◗ Capital Costs	○ O & M Costs	○ Maintenance	◗ Suitability for Slopes >5%	○ Training

Description and Suitable Applications

Permanent drains and swales are used to divert runoff from stabilized areas around disturbed areas, and direct runoff into sediment basins or detention ponds. The primary function of a slope drain is to convey runoff down cut or fill slopes, while the primary function of a subsurface drain is to drain excessive soil saturation in sloping areas. The primary function of top and toe of slope diversion swales, ditches, and berms is to minimize sheet flow over slope surfaces and reduce sedimentation by conveying collected runoff to a protected drainage system. This management practice is likely to create a significant reduction in sediment.

Installation/ Application Criteria

These systems should be designed by a licensed professional civil engineer.

Installation/Application criteria for permanent flow diversions, drains and swales are presented in TCP-22: Temporary Diversions, Drains and Swales. The principal difference between temporary and permanent measures of this type are factor of safety over sizing to account for large storm events and less frequent inspections. These practices should be designed by a licensed professional civil engineer.

Maintenance

- Drains should be inspected monthly the first year after construction and annually thereafter.
- Diversions should be inspected every other month the first year after construction and annually thereafter.
- The diversions and drains should be inspected immediately after any storm event equal to or larger than the 10-year storm event.
- Inspect outlet for erosion and downstream scour. If eroded, repair damage and install additional energy dissipation measures. If downstream scour is occurring, it may be necessary to reduce flows being discharged into the channel unless other preventative measures are implemented.

- Inspect slope drainage for accumulations of debris and sediment.
- Remove built-up sediment from entrances and outlets as required. Flush drains if necessary; capture and settle out sediment from discharge.
- Inspect ditches/berms for washouts. Replace lost riprap, damaged linings or soil stabilizers as needed.
- To avoid creating indentions that could reconcentrate flows, avoid operation of vehicles and heavy equipment in the level spreader. When indentions are formed, grade, fill, and revegetate as needed.
- Inspect for debris and sediment accumulation in spreader channel. Remove accumulated debris and sediment as needed. Sediment should be removed from the level spreader if it has reached ½ of sediment storage capacity.
- Inspect level spreaders prior to the rainy season and after significant rainfall events.
- Inspect level spreader lip to verify a zero percent slope.
- Inspect for evidence of erosion below spreader. This could indicate lip is no longer level.
- Inspect for evidence of flow reconcentration of spreader discharge.

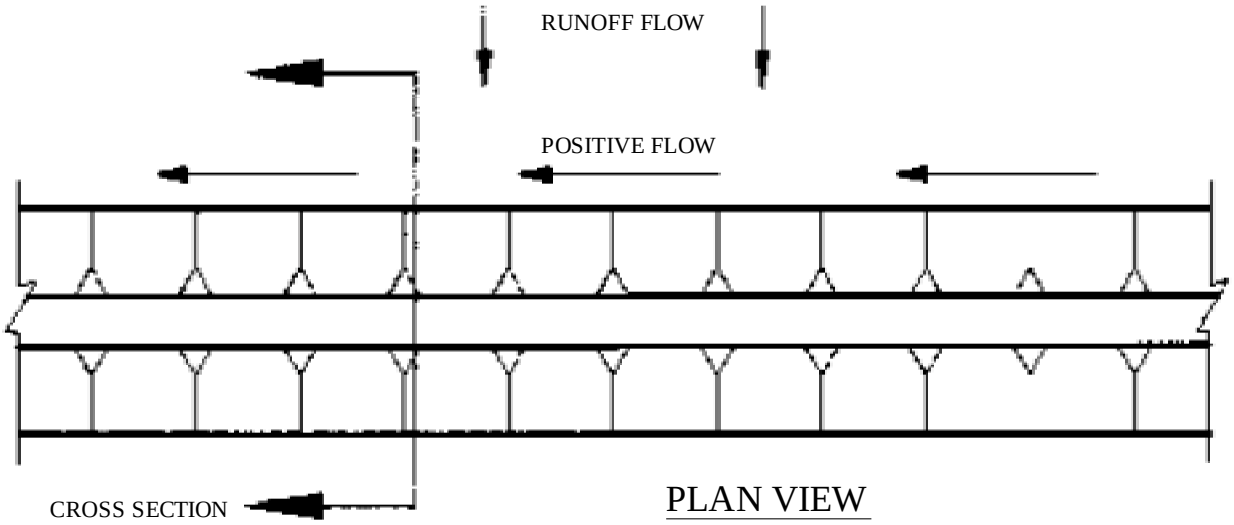
Limitations

- Subsurface drains may remove fine soils which can result in collapse of the slope. Filter cloth should be used in this case.
- Severe erosion may result if slope drains fail by over topping, soil piping, or pipe separation.
- Maximum flow into the spreader should not exceed 30 cfs (0.85 m^3/s).
- Lip of level spreader must have a zero slope for proper operation.
- A level spreader is not a sediment trapping or filtering device, but may accumulate sediment that must be removed..
- Ditches/berms are not sediment trapping devices, but may accumulate sediment that must be removed.

Primary References

California Storm Water Best Management Practice Handbooks, CDM et.al. for the California SWQTF, 1993.

Caltrans Storm Water Quality Handbooks, CDM et.al. for the California Department of Transportation, 1997.



PLAN VIEW
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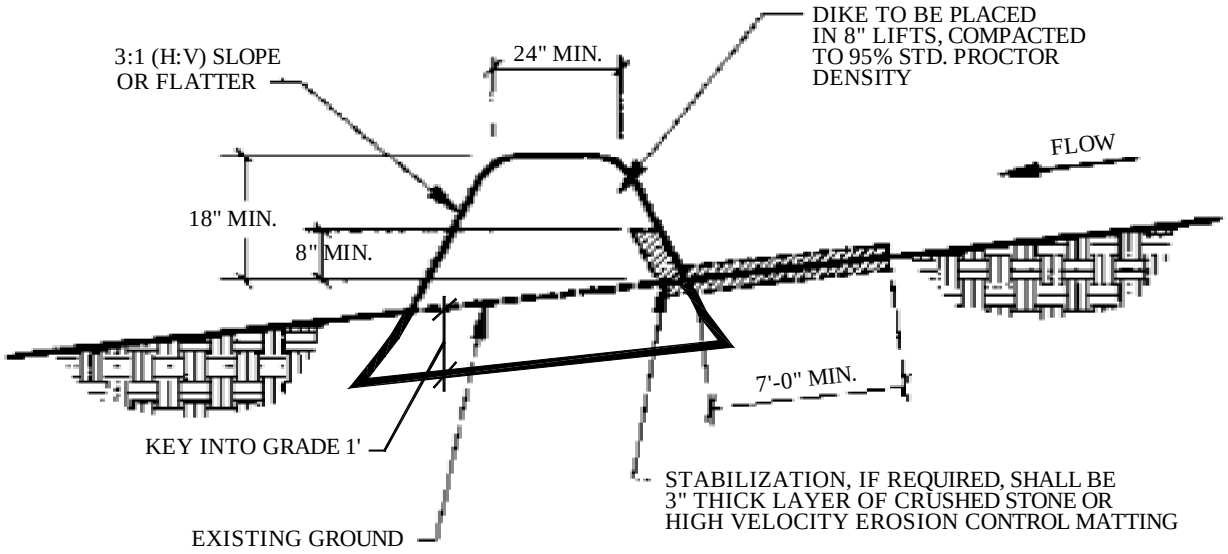
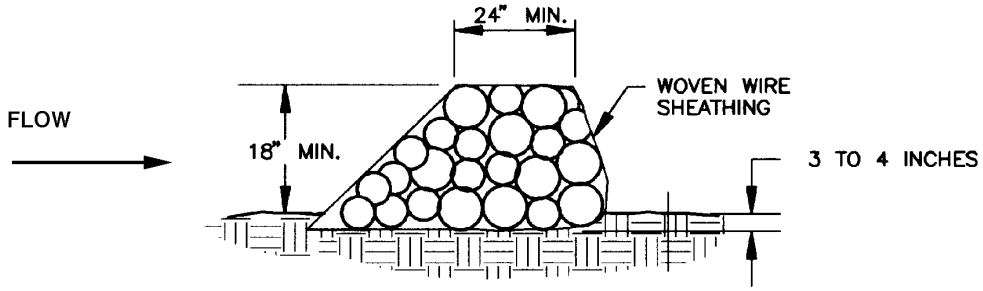


Note: This technique is similar to methods presented in TCP-15: Sand Bag Barrier and TCP-16: Brush or Rock Filters and Continuous Berms.

CROSS SECTION
N.T.S.

Figure PESC-06-1
Diversion Dike w/o Excavation



CROSS SECTION

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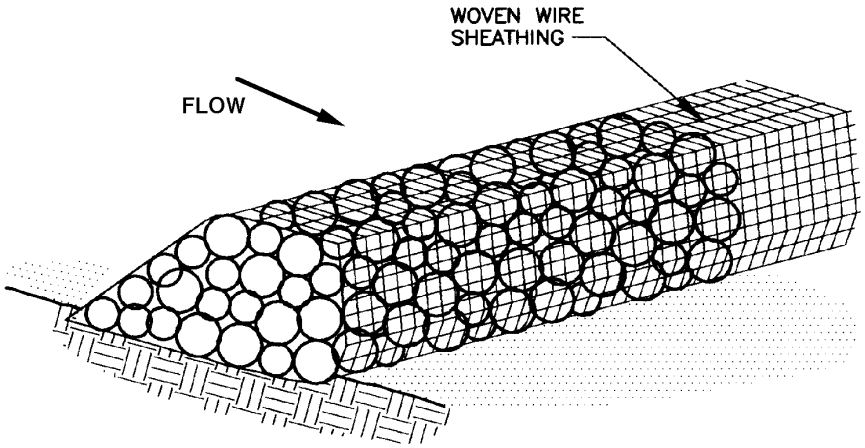
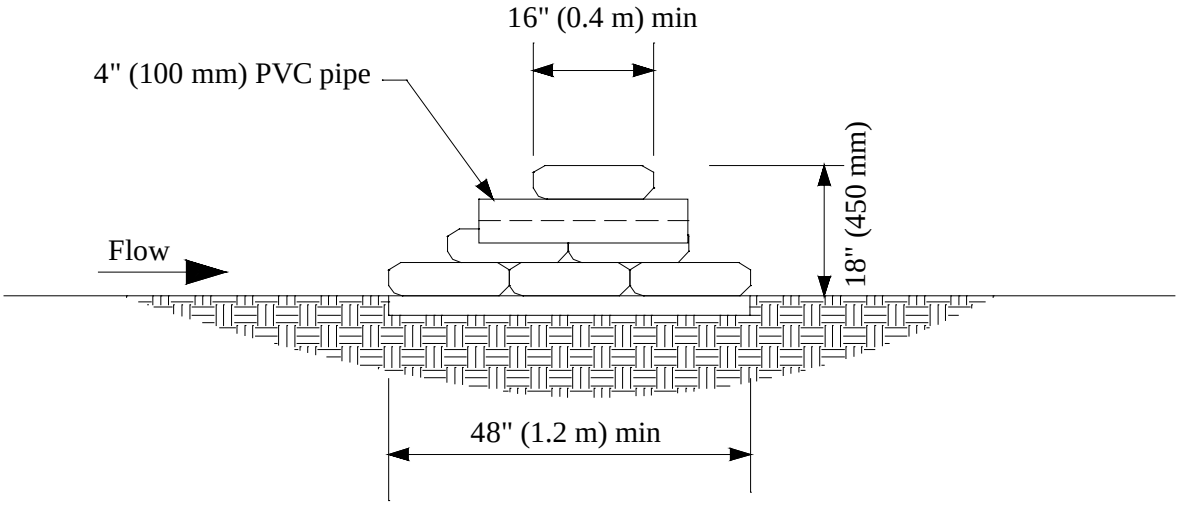


ISOMETRIC PLAN VIEW

N.T.S.

Note: This technique is similar to methods presented in TCP-15: Sand Bag Barrier and TCP-16: Brush or Rock Filters and Continuous Berms.

Figure PESC-06-2
Rock Berm



CROSS SECTION

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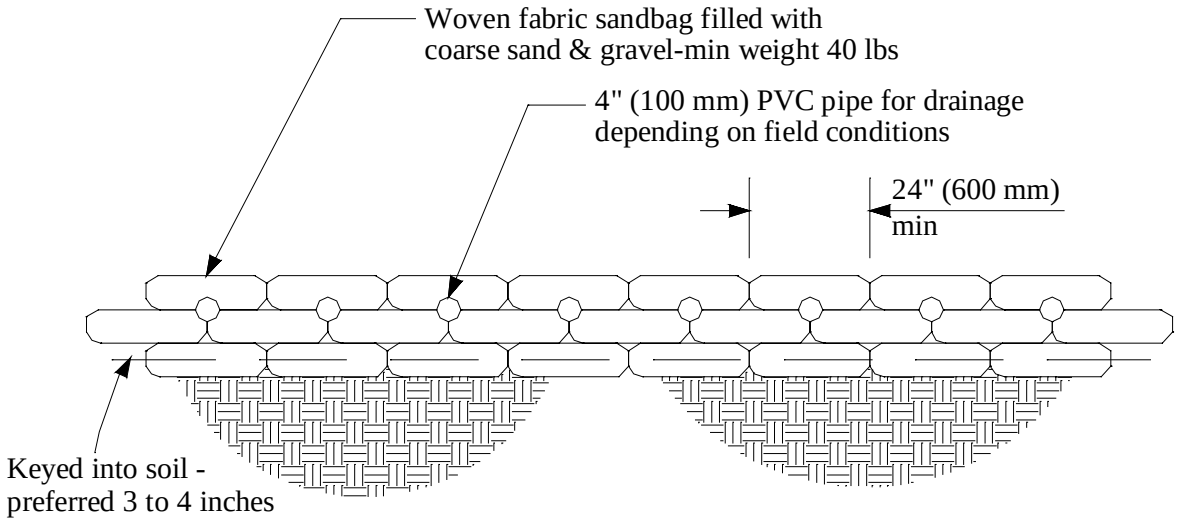

PROFILE VIEW

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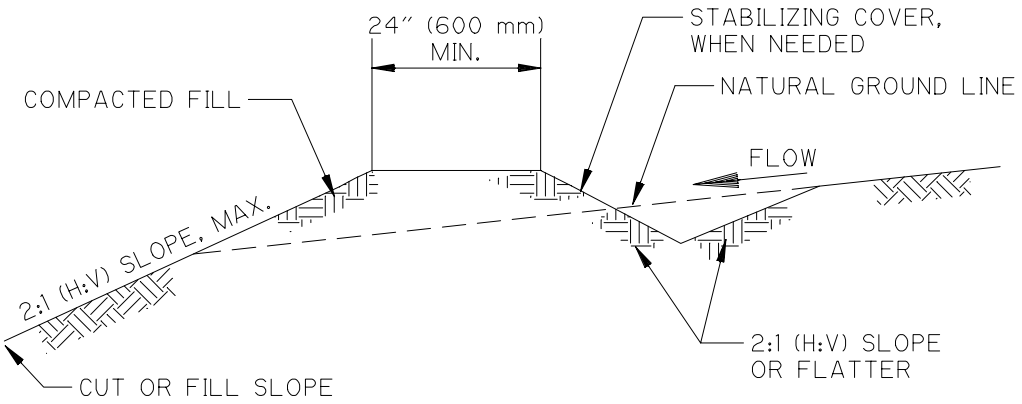
Figure PESC-06-3
Sand Bag Berm



DIVERSION BERM/SWALE

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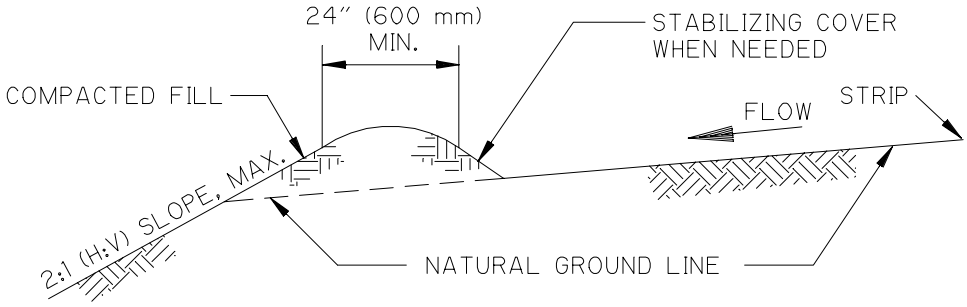
NOTES:
1. STABILIZE INLET, OUTLETS AND SLOPES.
2. PROPERLY COMPACT THE SUBGRADE.



DIVERSION BERM

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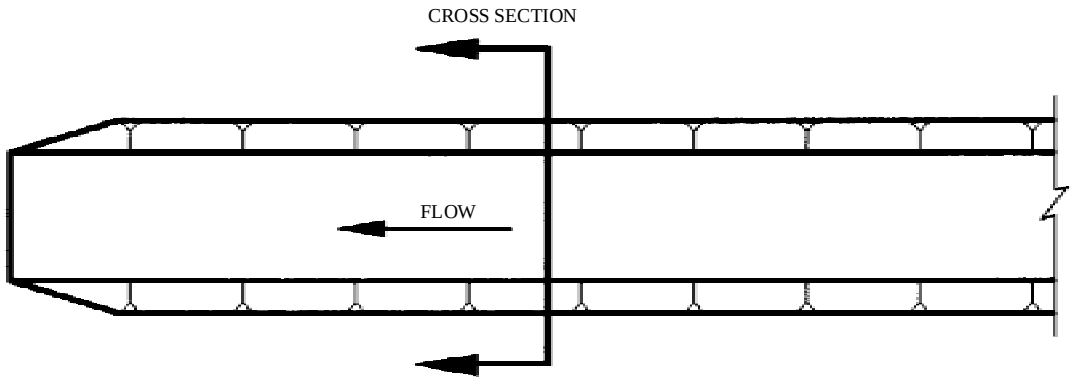
Figure PESC-06-4
Diversion Berm and Berm/Swale



PLAN VIEW
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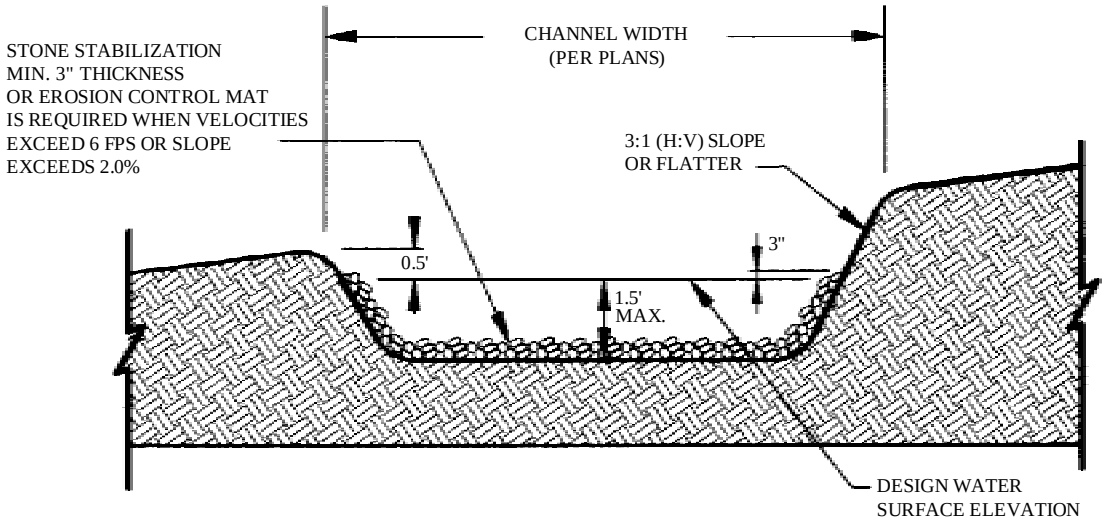

CROSS SECTION
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Figure PESC-06-5
Interceptor swale

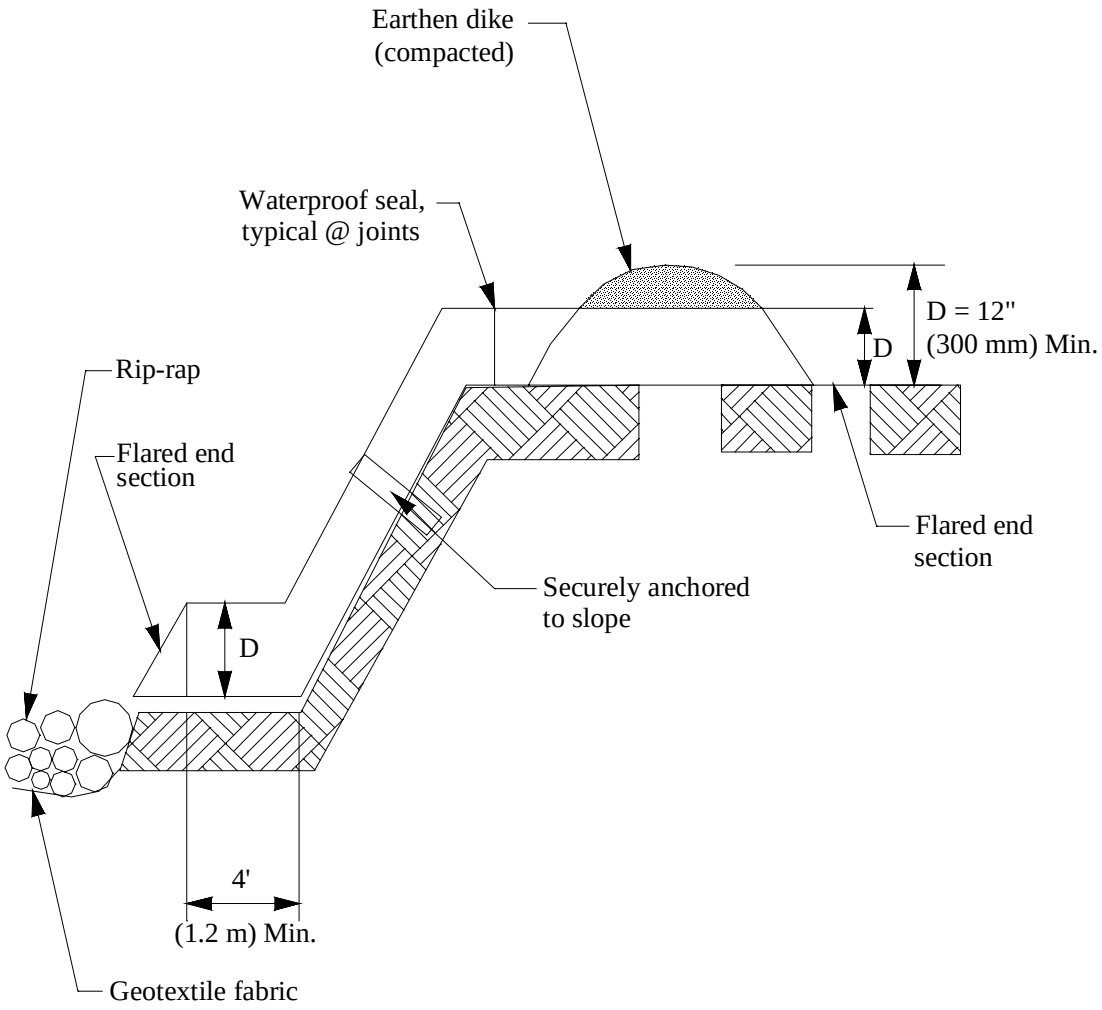
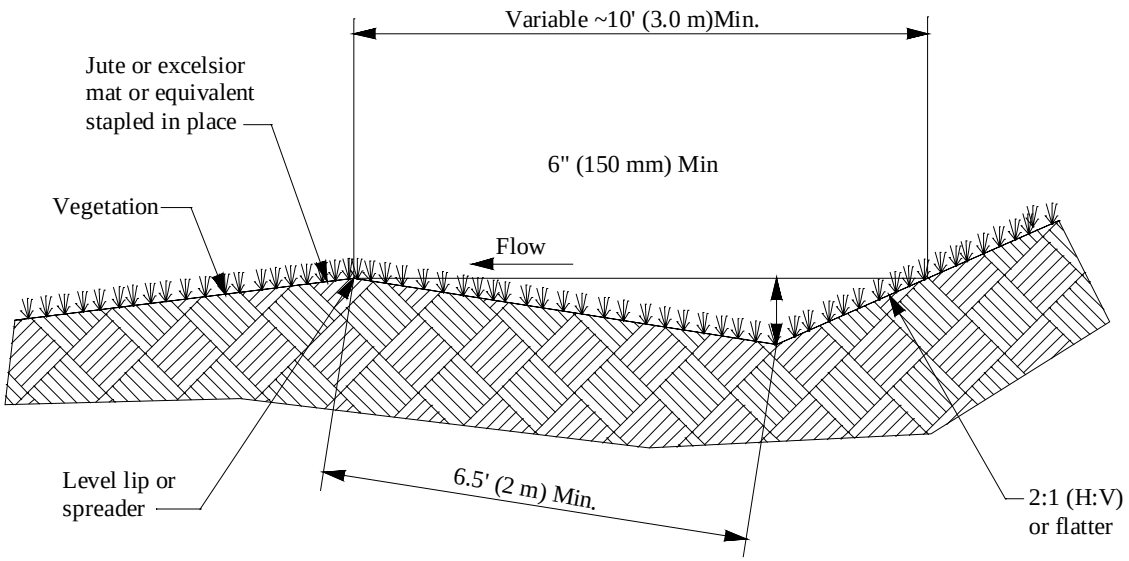


Figure PESC-06-6
Diverted Flow Slope Drain



VEGETATED LIP

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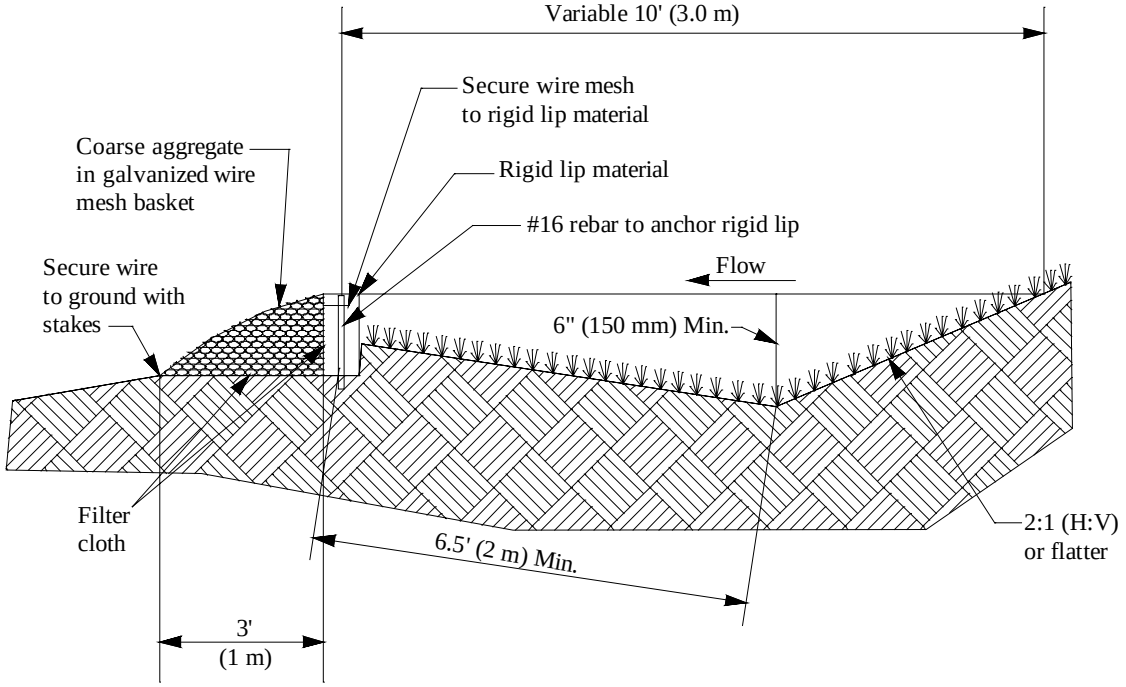

RIGID LIP

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Figure PESC-06-7
Level Spreaders