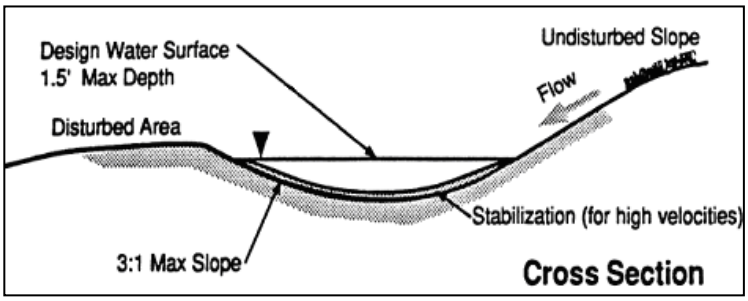
2.4 Interceptor Swale

Erosion Control



Description: An interceptor swale is a small v-shaped, trapezoidal, or parabolic channel that collects runoff and directs it to a desired location. It can either have a natural grass lining or, depending on slope and design velocity, a protective lining of erosion control blankets, turf reinforcement mats, or rock riprap.

KEY CONSIDERATIONS

DESIGN CRITERIA:

- Maximum flow depth of 1.5 feet for a 2-year, 24-hour design storm
- Side slopes 3:1 or flatter
- Minimum freeboard of 6 inches
- Maximum velocity of 8 fps with stabilization
- Maximum contributing drainage area of 5 acres

ADVANTAGES / BENEFITS:

- Prevents erosion and reduces cost of sediment controls by directing "clean" runoff around disturbed areas
- Easy to install during early grading operations

DISADVANTAGES / LIMITATIONS:

- Must be stabilized immediately after excavation or the swale will become a sediment source
- May be unsuitable to the site conditions (too flat or steep)

MAINTENANCE REQUIREMENTS:

- Inspect regularly
- Remove debris or other obstructions so as not to diminish flow capacity
- Repair damage from storms or normal construction activities such as tire ruts

TARGETED POLLUTANTS

- ● Sediment
- ○ Nutrients & Toxic Materials
- ○ Oil & Grease
- ○ Floatable Materials
- ○ Other Construction Waste

APPLICATIONS

Perimeter Control

Slope Protection

Sediment Barrier

Channel Protection

Temporary Stabilization

Final Stabilization

Waste Management

Housekeeping Practices

Fe=0.95

IMPLEMENTATION CONSIDERATIONS

- ◒ Capital Costs
- ◒ Maintenance
- ○ Training
- ● Suitability for Slopes > 5%

Other Considerations:

- *None*

2.4.1 Primary Use

The primary use of interceptor swales is to prevent erosion by diverting runoff around disturbed areas and steep slopes. The interceptor swale can either be used to direct sediment-laden flow from disturbed areas into a sediment control or to direct 'clean' runoff from upslope areas around the disturbed areas. Since the swale is easy to install during early grading operations, it can serve as the first line of defense in reducing sediment by reducing runoff across disturbed areas. An interceptor swale reduces the requirements for structural measures to capture sediment from runoff, since the volume of runoff is reduced. By intercepting sediment laden flow downstream of the disturbed area, runoff can be directed into a sediment basin or other control for sedimentation as opposed to long runs of silt fence or other filtration method.

2.4.2 Applications

Common applications for interceptor swales include roadway projects, site development projects with substantial offsite flow onto the construction site, and sites with a large area(s) of disturbance. The swale can be used in conjunction with diversion dikes to intercept flows. Temporary swales can be used throughout the project to direct flows away from staging, storage, and fueling areas to minimize the potential for construction materials and wastes to come into contact with runoff.

Runoff from disturbed areas that flows into a swale and flows within unstabilized (bare soil) swales must be routed into a sediment control such as a sediment basin. Dikes can also be used to direct runoff from disturbed areas to a filtration device, passive treatment system, or active treatment system when these are necessary to attain required levels of sediment removal.

Vegetated swales are an effective final stabilization technique if used to permanently direct flows around steep, easily eroded, slopes. The vegetation in the swale also effectively filters both sediment and other pollutants while reducing erosion potential.

2.4.3 Design Criteria

- Design calculations are required for the use of this control. The designer shall provide drainage computations, channel shape, channel dimensions, and channel slopes for each application.
- The maximum contributing drainage area should be 5 acres or less depending on site conditions.
- Maximum depth of flow in the swale shall be 1.5 feet based on a 2-year, 24-hour design storm. Positive overflow must be provided to accommodate larger storms.
- For permanent swales, the 1.5 feet maximum depth can be increased as long as provisions for public safety are implemented.
- The maximum contributing drainage area should be 5 acres or less depending on site conditions.
- Channels may be trapezoidal, parabolic, or v-shaped; however v-shaped channels may be difficult to stabilize, so they are generally used only where the volume and rate of flow is low.
- Side slopes of the swale shall be 3:1 or flatter.
- Side slopes of the interceptor swale may be 2:1 for swales to be used less than 3 months if flows in the swale are directed to a sediment control.
- Minimum design channel freeboard shall be 6 inches.
- For grades less than 2 percent and velocities less than 6 feet per second, the minimum required channel stabilization shall be grass, erosion control blankets or anchored mulch. For grades in excess of 2 percent or velocities exceeding 6 feet per second, stabilization is required in the form of turf reinforcement mats (or riprap with appropriate size, gradation, and thickness depending on flow conditions). Velocities greater than 8 feet per second will require approval by the local municipality and is discouraged.

- Refer to *Section 2.9 Vegetation* for design criteria and guidance on establishing vegetation in the swale.
- Check dams can be used to reduce velocities in steep swales. See *Section 2.1 Check Dam* for design criteria.
- Interceptor swales must be designed for flow capacity based on Manning's Equation to ensure a proper channel section. Alternate channel sections may be used when properly designed and accepted.
- Consideration must be given to the possible impact that any swale may have on upstream or downstream conditions.
- The outlet (discharge point) of the swale shall be designed to have non-erosive velocities or designed with velocity dissipation devices.
- Diverted runoff from a disturbed area or other construction activity shall be conveyed to a sediment-trapping device.
- A diversion dike may be used with an interceptor swale. Refer to *Section 2.2 Diversion Dike* for dike design criteria.

2.4.4 Design Guidance and Specifications

Specifications for construction of this item may be found in the Standard Specifications for Public Works Construction – North Central Texas Council of Governments, Section 201.6 Interceptor Swale.

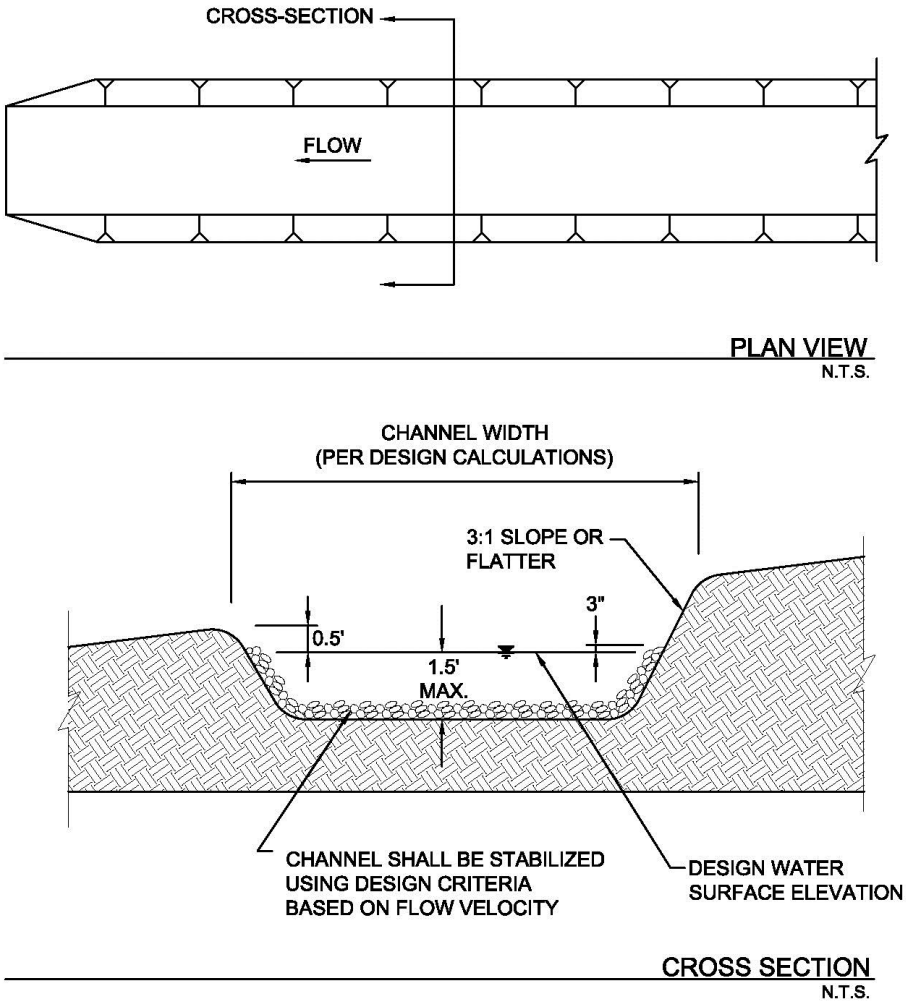
2.4.5 Inspection and Maintenance Requirements

Swales should be inspected regularly (at least as often as required by the TPDES Construction General Permit) to locate and repair any damage to the channel or to clear debris or other obstructions so as not to diminish flow capacity. Damage from storms or normal construction activities such as tire ruts or disturbance of swale stabilization shall be repaired as soon as practical. Accumulated sediment deposited from water in the swale should be removed regularly to maintain the hydraulic capacity of the swale.

2.4.6 Example Schematics

The following schematics are example applications of the construction control. They are intended to assist in understanding the control's design and function.

The schematics are **not for construction**. They may serve as a starting point for creating a construction detail, but they must be site adapted by the designer. In addition, dimensions and notes appropriate for the application must be added by the designer.



NOTE: DIMENSIONS OF THE SWALE SHALL BE DESIGNED BASED ON FLOW CONDITIONS. PROVIDE CALCULATIONS THAT DOCUMENT THE FOLLOWING PARAMETERS USED TO DESIGN THE SWALE.

- SIZE OF CONTRIBUTING DRAINAGE AREA
- DESIGN STORM
- SWALE CROSS SECTION DIMENSIONS AND SIDE SLOPES
- GRADE OF FLOW LINE IN THE SWALE
- DESIGN VELOCITY IN SWALE

Figure 2.9 Schematics of Interceptor Swale