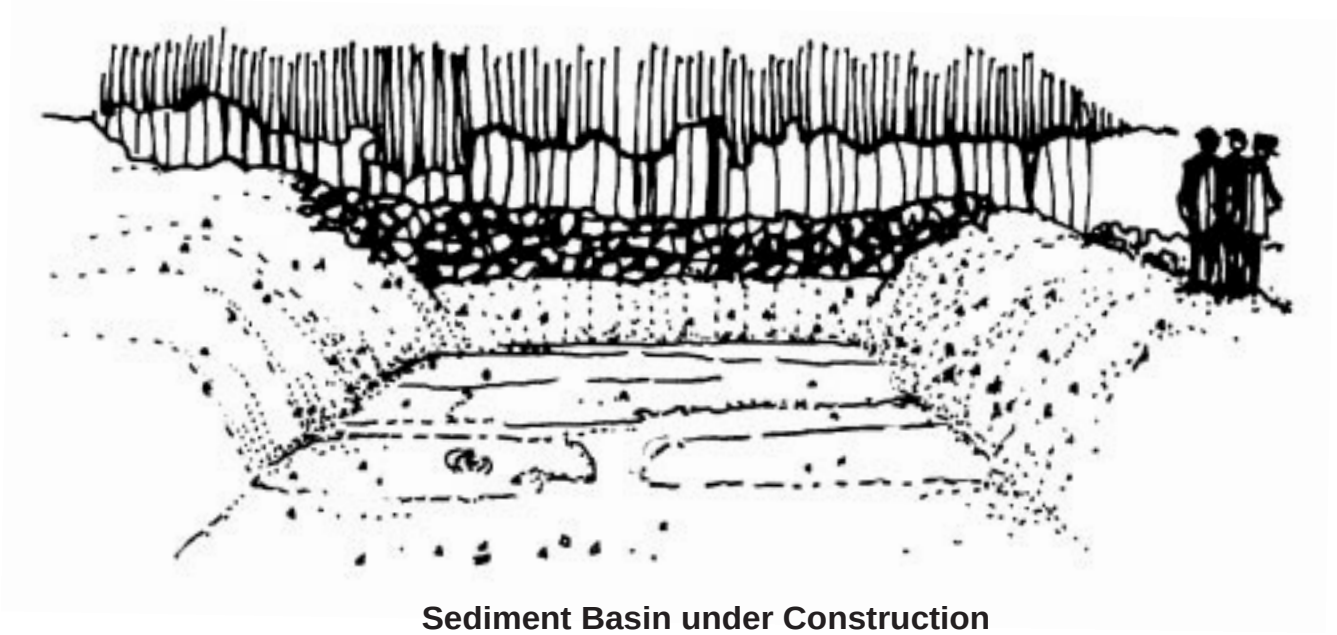
PRIMARY USE: Removal of sediment from runoff.
ADDITIONAL USES: Control of flow from a disturbed site.

SEDIMENT BASIN (WATER QUALITY ENHANCEMENT)

What is it? A temporary basin with a controlled stormwater release structure, formed by constructing an embankment of compacted soil across a drainage way.

Purpose

To detain sediment laden runoff from disturbed areas long enough for the majority of the sediment to settle out.



Sediment Basin under Construction
Perspective View

Limitations

Should not be constructed on live streams or where failure can endanger safety or property. There must be adequate space and topography for the basin to be constructed and for it to function properly. The useful life of a sediment basin is usually 18 months. Sediment basins remove only 70-80 percent of influent sediment and so should be used in conjunction with other erosion control BMP's. Maximum drainage area into basin is 25 acres (10 ha).

Materials

Earth, riprap, risers, collars, seed for stabilization of disturbed soil.

Installation

Locate the basin to intercept the largest amount of runoff from the disturbed area. The best locations are generally low areas and natural drainways below the disturbed area. Drainage into the basin can be improved by use of diversion dikes and ditches. Basins should be located to catch sediment before it enters a live stream. Unless the structure is designed as a permanent pond by a qualified professional engineer, the maximum drainage area into the basin should be 25 acres (10 ha).

Source: NRCS Planning and Design Manual, NRCS.

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Additional Considerations:

The design capacity should be at least 67 cubic yards / acre (130 cu m/ hectare) of drainage area (measured from bottom of basin to crest of spillway or riser). Capacity can be estimated: C = 0.4 x height x surface area .

1. Sediment should be removed when capacity has been reduced to 27 cubic yards / acre (52 cu m/ hectare) of drainage area. Sediment should never be allowed to accumulate to within 12 in (305 mm) of the crest of the spillway or riser. Mark the clean out depth clearly on the riser or at some other conspicuous location.

2. The effective flow length of the basin should be at least twice the width.

3. Embankment Minimum width: 8 ft (2.5 m); bank slope: 2:1 or flatter; maximum height: 10 ft (3 m) if the slope is 2:1, 15 ft (4.5 m) if 2.5:1 or flatter.

4. The outlet(s) must pass peak runoff from a 10 year storm without damage to the embankments. Runoff computations should be based on the soil cover conditions expected to prevail during the life of the basin.

5. Spillways should be designed to maintain a permanent pool of water between storm events.

6. The principal spillway should consist of a vertical pipe or box joined by a watertight connection to a horizontal pipe (barrel) extending through the embankment and outletting beyond the downstream toe of the fill. If the principal spillway is used in conjunction with an emergency spillway, the principal spillway should have a minimum capacity of 0.2 cfs per acre (14 liter/sec per hectare) of drainage area when the water surface is at the crest of the emergency spillway. If no emergency spillway is used, the principal spillway must be designed to pass the entire peak flow expected from a 10 year storm. If the principal spillway is used in conjunction with an emergency spillway, the crest of the principal spillway shall be a minimum of 12 in (305 mm) below the crest of the emergency spillway. If no emergency spillway is used, the crest of the principal spillway shall be a minimum of 36 in (915 mm) below the top of the embankment. In either case, a minimum freeboard of 12 in (305 mm) shall be provided between the design high water and the top of the embankment. An anti-vortex device and trash rack shall be attached to the top of the principal spillway to improve the flow of water into the spillway and prevent floating debris from being carried out of the basin.

7. Dewatering should be done to remove the relatively clean water without removing any of the sediment that has settled out and without removing any appreciable quantities of floating debris. As a minimum, provisions shall be made to dewater the basin down to the sediment cleanout elevation. This can be accomplished by providing a hole at the maximum sediment retention elevation. Perforated pipe may also be used.

8. The base of the principal spillway must be firmly anchored to prevent floating. If the riser of the spillway is greater than 10 ft (3 m) in height, computations must be made to determine anchoring requirements. A minimum safety factor of 1.25 should be used. For risers 10 ft (3 m) or less in height, the anchoring may be done in one of the two following ways: 1. a concrete base 18 in (457 mm) thick and twice the width of riser diameter should be used and the riser embedded 6 in (152 mm) into the concrete; or 2. a square steel plate a minimum of 1/4 in (6 mm) thick and having a width equal to twice the diameter of the riser, shall be welded to the base of the riser. The plate shall then be covered with 2.5 ft (0.75 m) of stone, gravel or compacted soil to prevent floatation.

Source: NRCS Planning and Design Manual, NRCS.

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Additional Considerations continued:

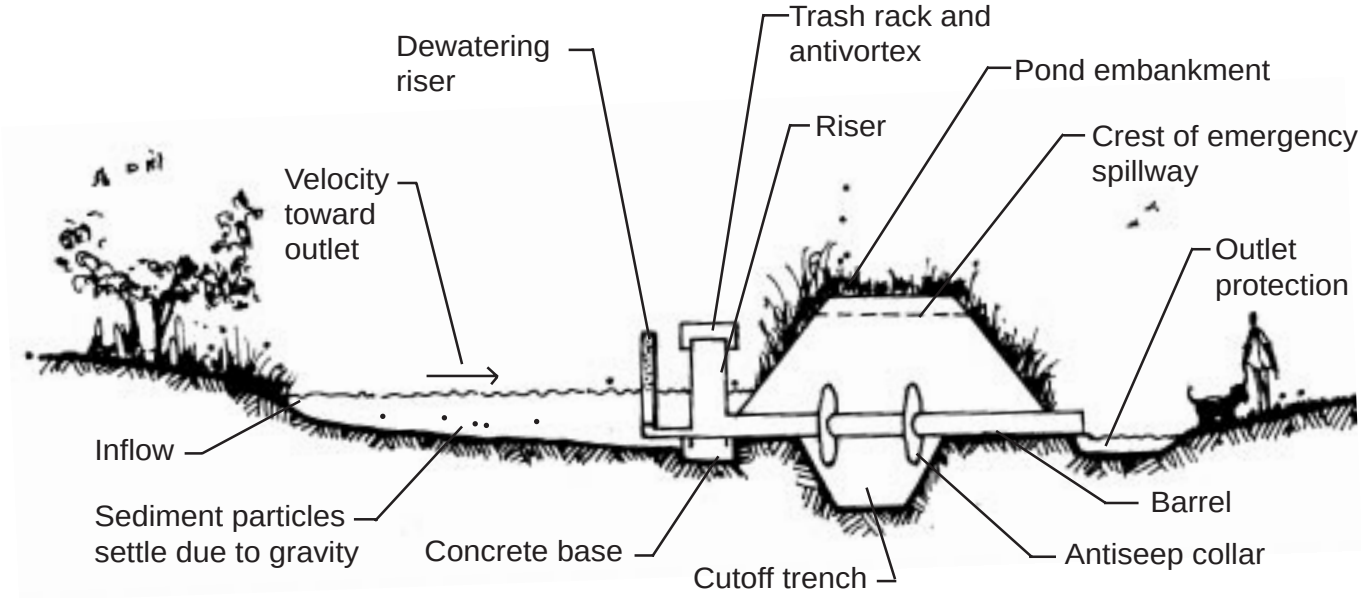
9. The barrel of the principal spillway, which extends through the embankment, should be designed to carry the flow provided by the riser of the principal spillway with the water level at the crest of the emergency spillway. The connection between the riser and the barrel must be watertight. The outlet of the barrel must be protected to prevent erosion or scour downstream. Anti-seep collars should be used on the barrel of the principal spillway within the normal saturation zone of the embankment to increase the seepage length by at least 10 percent, if either of the following two conditions is met: 1. the settled height of the embankment exceeds 10 ft (3 m); or 2. the embankment has a low silt- clay content (Unified Soil Classes SM or GM) and the barrel is greater than 10 in (25 mm) in diameter.

10. The anti-seep collars shall be installed within the saturated zone. The maximum spacing between collars should be 14 times the projection of the collar above the barrel. Collars shall not be closer than 2 ft (610 mm) to a pipe joint. Collars should be placed sufficiently far apart to allow space for hauling and compacting equipment. Connections between the collars and the barrel shall be watertight.

11. The emergency spillway shall consist of an open channel constructed adjacent to the embankment over undisturbed material. The spillway shall have a control section at least 20 ft (6 m) in length. The control section is a level portion of the spillway channel at the highest elevation in the channel.

12. The emergency spillway shall be designed to carry the peak rate of runoff expected from a 10 year storm, less any reduction due to the flow through the principal spillway. The design high water through the emergency spillway shall be at least 1 ft (305 mm) below the top of the embankment. The crest of the emergency spillway channel shall be at least 1 ft (305 mm) above the crest of the principal spillway.

13. The emergency spillway channel shall be located so that it will not be constructed over fill material. The channel shall be located so as to avoid sharp turns or bends. The channel shall return the flow of water to a defined channel downstream from the embankment.



Sediment Basin - designed to be converted to permanent stormwater detention/ retention
Section View

Source: NRCS Planning and Design Manual, NRCS.