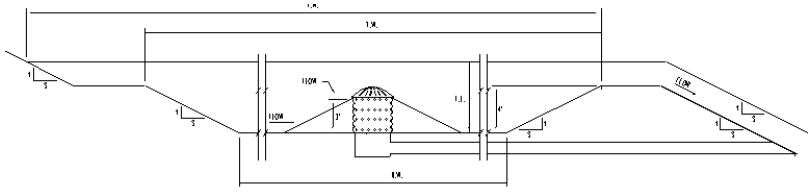
# Temporary Sedimentation Basins/Traps



## Description

A temporary *sedimentation basin* is a controlled stormwater release structure, formed by constructing an embankment of compacted soil across a drainageway and installing an outlet structure and outlet pipe. The purpose of the basin is to detain the sediment-laden runoff from disturbed areas long enough for the majority of the sediment to settle out in the basin. This reduces sediment transport off-site.

*Sediment traps* are temporary settling ponds having a simple spillway outlet structure stabilized with geotextile and riprap. Sediment traps do not include an outlet structure and pipe.

Temporary sediment basins and sediment traps are generally the most reliable measures used for treating sediment-laden runoff from construction sites. Sediment basins and traps are usually placed near the perimeter of construction-sites. Construction activity should be phased to allow them to remain functional for as long as possible, ideally until the area contributing is stabilized. Sediment basins have relatively good sediment-trapping efficiencies and require little maintenance compared to other practices used to treat sediment-laden runoff. Settling traps and basins (both a type of settling pond) are generally recommended as the principal sediment-control practice for construction sites.

## Effectiveness

### Basins

Properly sized sediment basins are relatively effective for trapping medium- and coarse-grained sediment particles. However, fine silts and clays that are suspended in runoff are very difficult to trap.

While trapping efficiency varies widely for sediment basins, it is commonly between 60 and 80 percent. Trapping efficiency should be optimized within site constraints. This can be accomplished by:

- Incorporating design criteria which maximize trapping efficiency.
- Presenting this information clearly in construction documents.
- Assuring construction is performed according to those documents.

## Purpose

**Water Quantity**

| | |
|---|---|
| Flow attenuation | ◧ |
| Runoff volume reduction | ◧ |

**Water Quality**

| | |
|---|---|
| Pollution prevention | |
| Soil erosion | ■ |
| Sediment control | ■ |
| Nutrient loading | ◧ |
| Pollutant removal | |
| Total suspended sediment (TSS) | ■ |
| Total phosphorus (P) | ◧ |
| Nitrogen (N) | ◧ |
| Heavy metals | ◧ |
| Floatables | ◧ |
| Oil and grease | ◧ |
| Other | |
| Fecal coliform | □ |
| Biochemical oxygen demand (BOD) | □ |

■ Primary design benefit
◧ Secondary design benefit
□ Little or no design benefit

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If higher trapping efficiencies are desired, larger pool volumes and slower discharge rates can be used.

However, the value of increased sediment basin size diminishes rapidly once a certain size of basin is reached. For this reason, extraordinary methods such as chemical flocculation may be needed to achieve a very high level of control.

Sediment basins by no means trap all the sediment that washes into them. Sometimes more than half the sediment flows through. Therefore, sediment basins as with all sediment controls should be used in conjunction with erosion control practices such as temporary seeding to reduce the total amount of sediment washing to them.

### Traps

Temporary sediment traps provide good control of coarse sediment and are moderately effective for trapping medium-sized sediment particles. However, they have a low trapping efficiency for fine silt and clay particles suspended in runoff. If a higher trapping efficiency is desired, a temporary sediment basin with a larger storage volume and longer detention time should be used. Trapping efficiency should be optimized within site constraints as described for sediment basins.

## Advantages

- One of the most useful and cost-effective measures for treating sediment-laden runoff.
- Help to control overall stormwater runoff for small storms thus protecting streams and rivers off site.
- Relatively easy to construct.

## Limitations

- Sediment basins are relatively large, generally requiring a good deal of site area.
- It can be difficult to keep a sedimentation basin functioning during the entire construction phase.
- On high-density sites, sedimentation basins are often eliminated before the site is fully stabilized.
- Improper construction and maintenance greatly reduces their effectiveness.
- Not particularly effective for fine silts or clay soils, or for intense rainfall events, which can resuspend sediment within the trap or basin.

## Requirements

## Design

### Temporary Basins

The principal difference between a temporary sediment basin and a trap is that a basin includes an outlet structure and pipe. Sedimentation basins control the rate of discharge and are therefore more effective in removing sediment than sediment traps. However, the pipe and outlet structure make them more expensive. Sediment basins are almost always associated with high-sediment-production areas, such as construction sites. For a sediment basin to

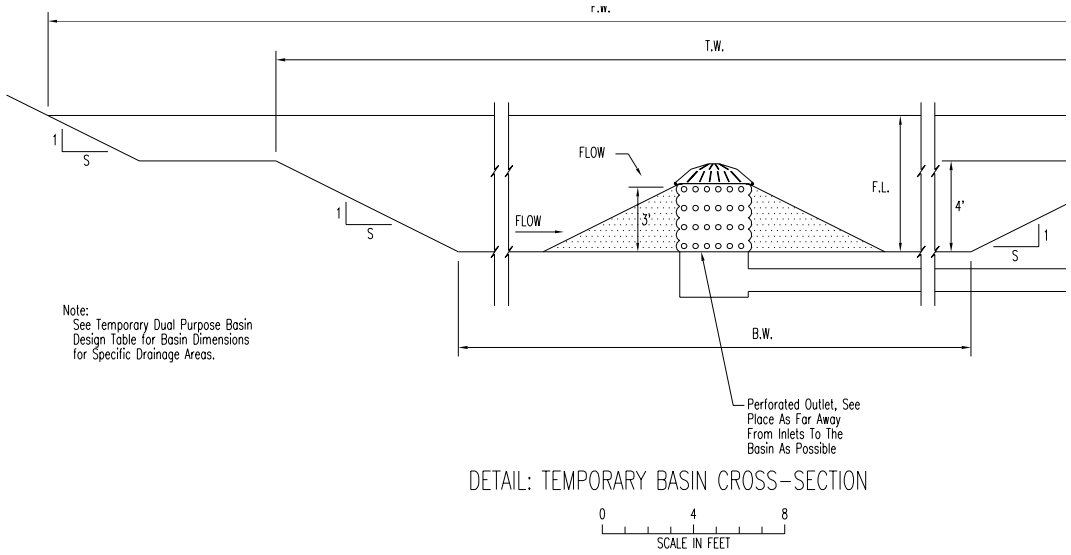


**Figure 1**
Source: Barr Engineering Company

## Table 1: Design Table
## Temporary Dual Purpose Basin (Water Quality Treatment/Flood Control)
## For Outlet-Controlled Facilities

| Drainage Area (Acres) | Square Basins S=3 (3:1 Side slopes) | | | Square Basins S=4 (4:1 Side slopes) | | | For Basins of Any Shape | | | | | | Overflow Peak Discharge (CFS)[5] |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | B.W. (Feet) | T.W. (Feet) | F.W. (Feet) | B.W. (Feet) | T.W. (Feet) | F.W. (Feet) | Basin Volume "A"[1] (Acre-Feet)[2] | Basin Volume "B"[3] (Acre-Feet)[2] | Basin Volume "C"[4] (Acre-Feet)[2] | O.F. (Feet) | F.L. (Feet) | H (Feet) | |
| 1.0 | 15 | 39 | 47 | 15 | 47 | 55 | 0.02 | 0.05 | 0.09 | 6 | 4.6 | 0.6 | 2.4 |
| 2.5 | 26 | 50 | 58 | 21 | 53 | 61 | 0.05 | 0.13 | 0.25 | 7 | 4.9 | 0.9 | 6 |
| 5.0 | 39 | 63 | 69 | 34 | 66 | 74 | 0.10 | 0.25 | 0.40 | 10 | 5.0 | 1.0 | 12 |

[1] Basin Volume "A" is the volume of water the basin can hold when it has 3 feet of water in it.
[2] Acre-Feet is a volume measurement. To convert acre-feet to cubic feet, multiply the column number by 43,560 (i.e., .75 acre-feet = (.75 x 43,560) $Ft^2$ = 32,670 $ft^3$).
[3] Basin Volume "B" is the volume of water the basin can hold when it has 4 feet of water in it.
[4] Basin Volume "C" is the volume of water the basin can hold when it has the depth of water in it shown in the "F.L." column of this table.
[5] CFS stands for cubic feet per second.

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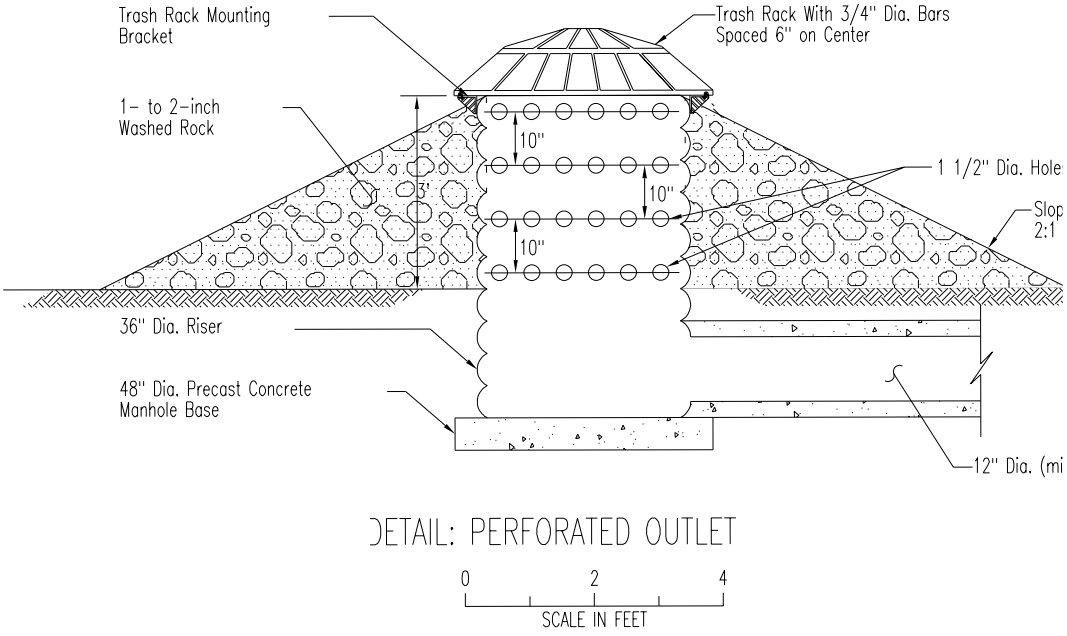


**Figure 2**
Source: Barr Engineering Company

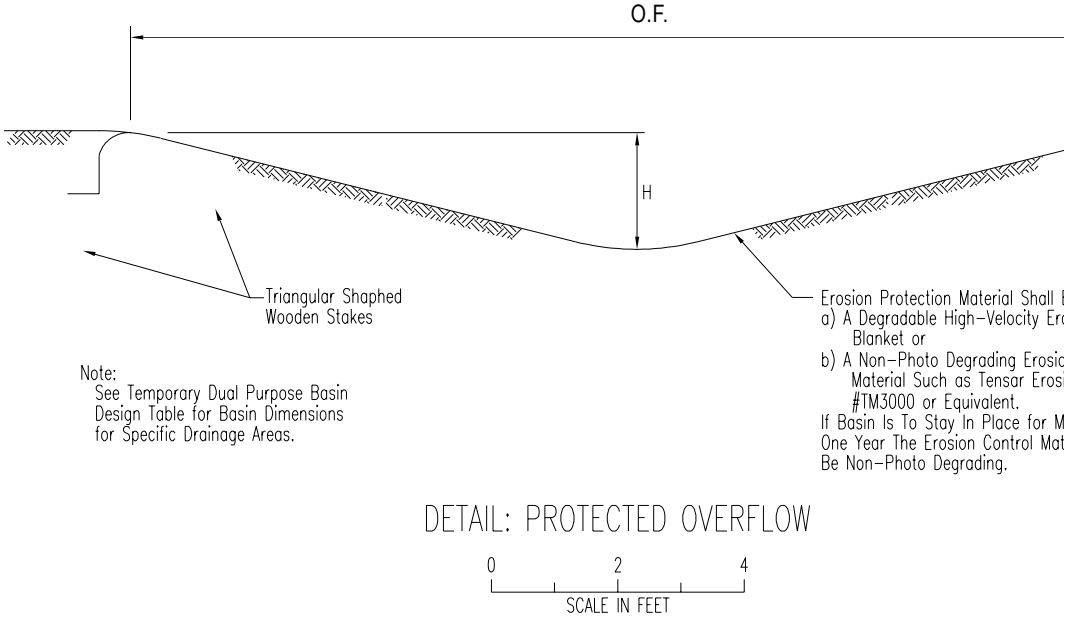


**Figure 3**
Source: Barr Engineering Company

# Temporary Sedimentation Basins/Traps



## Design (continued)

be effective, it should have a permanent pool of water. It should be located at the lowest downstream point on the site to maximize the area served by it.

There are three general components to a temporary sedimentation basin:

- Runoff and sediment storage.
- Principal spillway.
- Overflow spillway.

Table 1 and Figures 1, 2 and 3 provide design recommendations for these three components.

- Total storage volume below the overflow spillway crest should be at least 80 cubic yards per acre of drainage area (0.05 acre-feet/acre). When one-half of this volume is filled with sediment, the basin must be cleaned out to maintain its effectiveness.
- The principal spillway is a pipe that provides the main outlet for the temporary sediment basins. Principal spillways can be constructed of a variety of materials, such as corrugated metal, corrugated polyethylene (CPE), polyvinyl chloride (PVC) or concrete. For temporary sediment basins, corrugated metal or CPE is often used because it is relatively easy to remove and reuse once the basin has been abandoned. Special coatings for corrosion protection are not typically needed because this is a temporary practice.
- The perforated outlet significantly restricts the outflow up to the top of the riser.
- The outlet pipe should have capacity to handle the weir flow and orifice flow into the riser flow over the overflow spillway should be limited to extreme events.
- Restricting the outflow further will result in higher efficiencies, but larger temporary storage volumes. The storm that should be routed for the principal spillway depends upon the downstream environmental and safety impacts if the system exceeds design capacity.
- A skimmer-type debris trap can be installed to the top of the perforated outlet if skimming is required.
- If considerable amounts of floating debris are expected, a trash rack and anti-vortex baffle can be used.

### Temporary Traps

- A temporary sediment trap should typically be used in a location with a drainage area of five acres or less and where it will be used for two years or less. The volume of the trap should be at least 67 cubic yards per acre of watershed.
- The gravel outlet swale must be capable of handling the runoff from a 10-year frequency, 24-hour-duration storm without failure or significant downstream erosion.
- The gravel outlet should be located in the low point of embankment or drainageway. The crest of the gravel outlet should be level and should be 1 foot below the top of the embankment.
- See Figures 4 and 5 for the gravel outlet swale dimensions.

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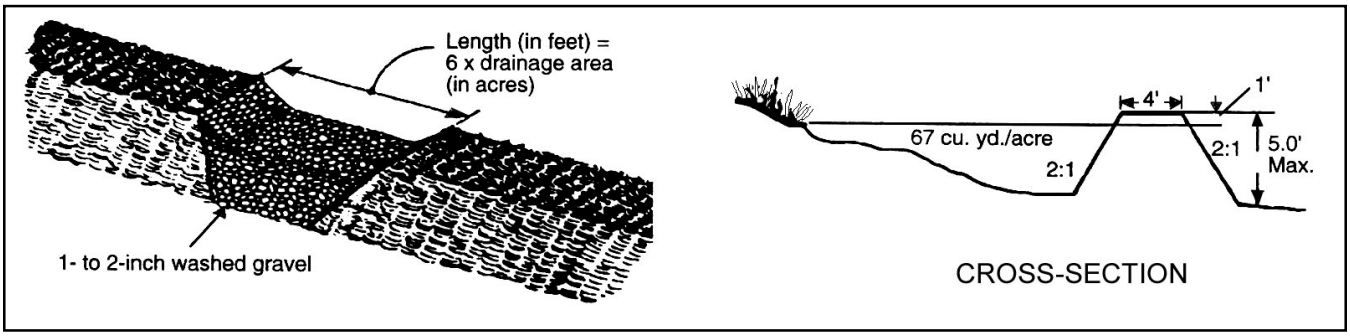


**Figure 4: Temporary Sediment Trap**
Source: Minnesota Pollution Control Agency.

## Requirements

### Design (continued)

- To ensure performance and effectiveness, structures planned under this practice should be designed and constructed using the same standards as used for permanent detention ponds.
- Sediment basins should be located so that runoff from the largest possible erosion-prone area flows into them. Practices such as diversions can be used to increase the area that is controlled by a sediment basin.
- Temporary sediment basins should not be installed in main streams. They should be located on tributaries before the water enters a main stream.
- Refer to *Standard Specifications for Construction* (MnDOT, 2000), Section 2573 for temporary sedimentation basin and trap specifications.

For a sediment trap constructed using an embankment, the gravel used for the outlet should be 1- to 2-inch size, such as MnDOT CA-1 or CA-2 coarse aggregate. A filter fabric can be installed inside the gravel filter to improve the sediment-trapping efficiency of the structure. However, this increases the probability that the outlet will become clogged with sediment.

### Sequencing

- Sediment basins, along with other sediment-control practices, must be constructed as a first step in any land disturbing activity and must be functional before upslope land disturbance takes place.
- Temporary sediment basins and traps are intended to be used only during the construction period of a development, usually less than two years.
- If a permanent detention pond is desired, it can be built at the beginning of construction and also used for sediment control during construction.
- Sediment should be removed from the pond at the end of the construction period to prepare it for permanent use. In this situation, the basin should be designed according to detention pond or extended detention pond design.
- Temporary sedimentation basins and traps should be removed and their areas stabilized upon the complete stabilization of the remainder of the construction project.

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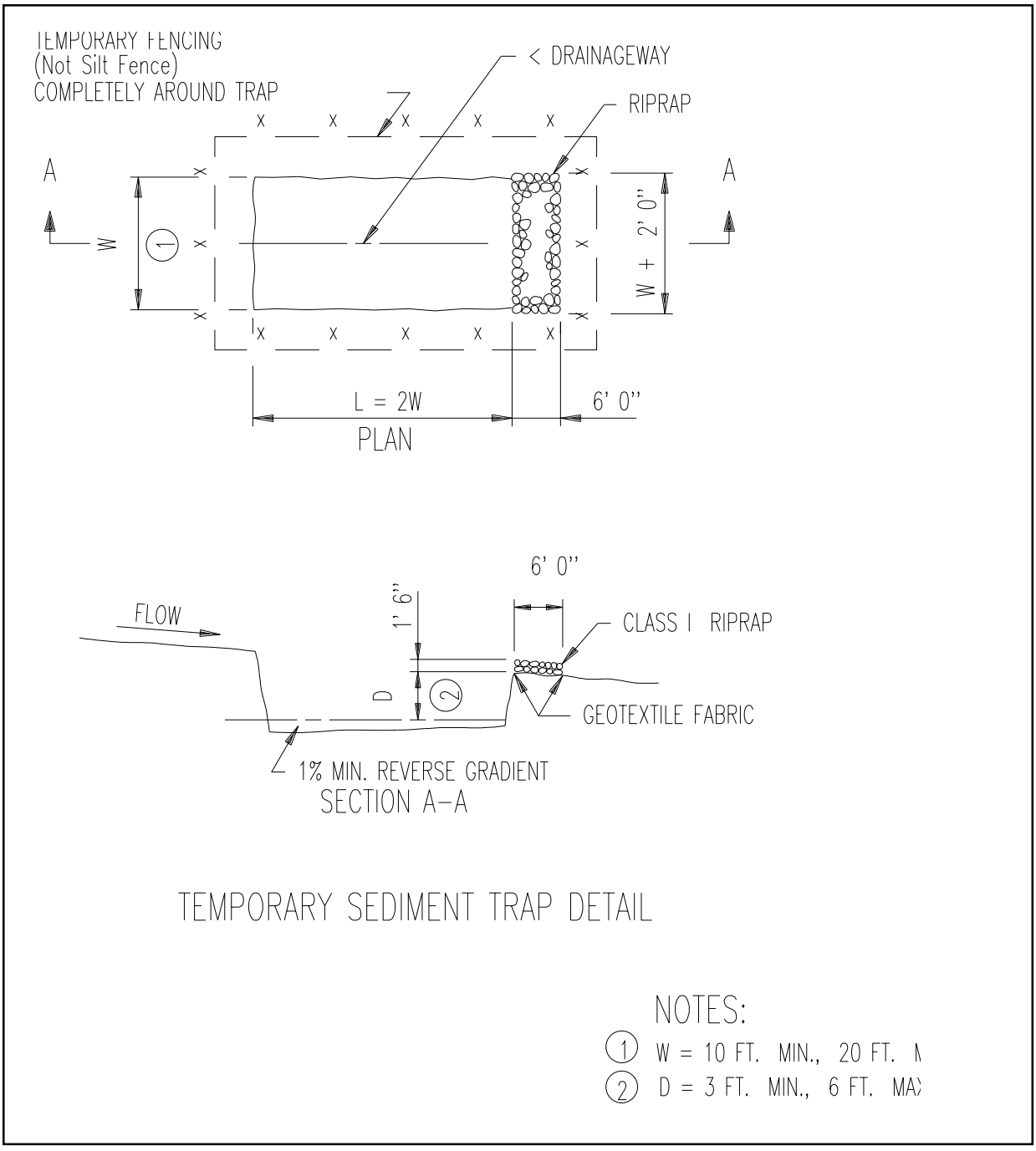


**Figure 5: Temporary Sediment Trap in a Drainageway (Excavated)**
Source: Minnesota Pollution Control Agency.

Source:



# Temporary Sedimentation Basins/Traps



## Construction

- *Construction Phases.* Sediment traps should be placed so they function through all phases of the sites development, both before and after new drainage systems are constructed.
- *Below Storm Drains.* Sediment traps may be placed in drainageways or beyond the ends of proposed storm-sewer systems. Postponing construction of the last sections of storm drain may be necessary to provide adequate area for the sediment basin between the outlet and receiving watercourse.
- *Storm Sewer Diversions.* Storm drains may also be temporarily redirected through sediment traps during construction. After construction, the detours are removed and runoff is allowed to flow through the permanent storm drain as originally intended.
- *Utilities.* Give special consideration to sediment trap location and possible interference with construction of proposed drainageways, utilities and storm drains.

## Maintenance

- Sediment basins require routine maintenance to remain effective as sediment traps. When sediment reaches the maximum level assumed in the design (usually one-third to one-half the basin volume), it must be removed.
- Excavated sediment must be placed in a location where it will not easily be eroded again. In addition to sediment cleanout, sediment basins should be inspected after storms to determine whether the embankment or spillways sustained any damage that requires repair.
- If the outlet becomes clogged with sediment, it should be cleaned to restore its flow capacity.
- The structure should be inspected after significant runoff events to check for damage or operational problems. Once the contributing drainage area has been stabilized, the structure can be removed or, if possible, modified to become part of the permanent control features.
- Maintain any diversion structures on berm.

# Temporary Sedimentation Basins/Traps

## Sources


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