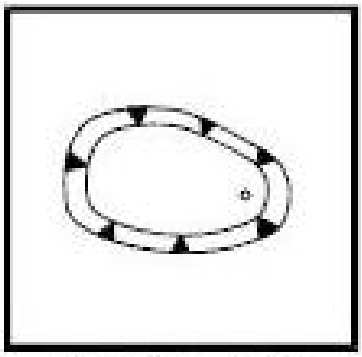
SC-9 SEDIMENT BASIN

Refer to: ITD Standard Specifications, Section 212.



Standard Symbol

BMP Objectives

- ☐ **Perimeter Control**
- ☐ **Slope Protection**
- ☐ **Borrow and Stockpiles**
- ☒ **Drainage Areas**
- ☒ **Sediment Trapping**
- ☒ **Stream Protection**
- ☐ **Temporary Stabilizing**
- ☐ **Permanent Stabilizing**

Definition and Purpose

Sediment basins are one of the most effective sediment control measures. They are *designed* to temporarily hold a specified volume of runoff while slowly releasing flows at a controlled rate to a conveyance system. By detaining water and controlling release rates, detention basins can be designed to reduce peak runoff rates and promote sedimentation.

Appropriate Applications

Sediment basins may be appropriate in the following applications:

- At the toe of slopes or embankments where slope drains discharge.
- At the lower end of waste areas or borrow pits.
- At the outlet of perimeter controls.
- At the outlet of any structure discharging sediment-laden runoff.
- Upstream to an inlet, or channel ditch check dam.
- Upstream to the outlet of a staging or storage area.
- One or a series of small basins constructed along a concentrated runoff flow path.
- Drainage area greater than 5 acres and less than 75 acres[1].
- Sediment basins can be used as temporary control measure on construction site, but also can be incorporated as a permanent control measure in the final drainage design.

[1] This is a conservative range after review of other DOT recommendations. This range may be increased with approval from the Engineer.

Limitations

- Normally collects particles that are sand-sized or larger, with fine clay-sized particles remaining in suspension. Because finer silts or clays may not settle out, additional sediment control measures may be required (e.g., chemical treatment).
- Require large surface areas to permit infiltration and sedimentation.
- Cannot be used in active stream channel or established natural buffer area. (Reference 1)
- May present a drowning hazard. Protective fencing and warning signs are required on permanent basins and should be considered on temporary basins if there is the potential for unauthorized persons at the basin site.

Required Design Parameters

- All basins shall be designed by a Professional Engineer (P.E.) registered in the State of Idaho.
- The basin must be designed to meet all applicable local ordinance(s).
- For projects with Construction General Permit (CGP) coverage, the minimum required detention volume is either (1) the calculated volume of runoff from a 2-year, 24-hour storm, or (2) 3,600 cubic feet per acre drained. Maintain at least half of the designed detention capacity at all times. (Reference 1)
- Water within the detention storage volume shall be withdrawn from the surface of the basin through a skimmer or similar device, unless infeasible. If infeasible, documentation shall be provided in the SWPPP as to why it is infeasible. (Reference 1)
- Some traps may be regulated as “dams” by the Idaho Department of Water Resources (IDWR). Coordination with IDWR is required prior to construction of a “dam”. See Table 1 to determine if a proposed design would be regulated. (Reference 2)
- A sediment basin may be considered a “Shallow Injection Well” and be subject to additional regulation by IDWR if the dug or drilled depth is greater than the largest surface dimension, it is an improved sink hole, or it has a subsurface fluid distribution system. (Reference 3)

Table 1. (Provided by IDWR)

MATRIX SERVES ALL HYDRAULIC BARRIERS *		HEIGHT OF BARRIER		
		Less than 6.0 Feet	6 -to- 10 Feet	10 Feet or More
STORAGE	Less than 10.0 Acre-Feet	NO	NO	NO
	10 -to- 50 Acre-Feet	NO	NO	YES
	50 Acre-Feet or More	NO	YES	YES

*** Note: In general accordance w/ Idaho Code 42.1709, any Significant or High Hazard structure**

***may be regulated* on a case-by-case basis regardless of height or storage capacity**

Additional Design Parameters[2]

- Design of the sediment basin should be based upon the total area being drained. Consideration should be given to the volume of sediment, the percent of sediment load to be removed, particle size, ground water levels (min. 3ft. separation), and estimated peak rates of runoff.
- When possible, place the basin in a natural swale, using natural slopes so that only the frontal dike needs to be constructed. The top toe of the natural or excavated slope that starts the basin shall be no higher than the top of the basin dike portion. Construct the basin so that excavated and embankment quantities will be reasonably balanced.
- The size (volume) of the basin should be based on an assessment of potential downstream impacts and expected sedimentation rates. Only providing the required detention volume to capture the design storm will not ensure maximum constituent removal. An effectively configured basin will have a long flow path, establish low velocities, and avoid stagnant areas.
- The basin may be designed to include baffles (berms) or other deflectors, such as floating sediment barriers, to spread and reduce the velocity of water flow throughout the basin. Runoff should enter the basins as far from the outlet as possible to maximize retention time.
- The dike must be compacted to at least 95% of maximum standard dry density. Maximum permeability is $K = 2.5 \times 10^{-7}$.
- The entrance to the basin must be stabilized with rip rap of appropriate depth and length for inlet velocity and slope. Riprap should extend to the bottom of the basin.
- The minimum sediment storage volume should be 900 cubic feet per acre. (Reference 4)
- Detention storage depth should be 3-5 feet to promote sedimentation.
- The length to width ratio should be at least 3:1 and preferably 5:1. (Reference 5)
- Side slopes should be gentle (3:1 or flatter). Steep slopes create a greater potential for erosion and sloughing inside the basin, an increased safety hazard and make routine maintenance (i.e. mowing) more difficult.
- Minimum top width of the embankment should be 6ft. (Reference 6)
- The basin should not produce a public nuisance (vegetation overgrowth, vector issues associated with standing water, etc.) To reduce the potential for these issues and allow for adequate sedimentation, the drawdown time should be 48-72 hrs.
- The skimmer should be sized to discharge at a pre-determined flow rate. Maximum outflow rate from the skimmer shall not be more than the pre-development rate of runoff.

[2] These parameters are considered Best Engineering Practices (BEPs). Unless noted by a specific, referenced source, these parameters were either published in the previous version of this document and are still considered BEPs or they were developed as BEPs in this version after reviewing similar guidance in other states.

- The sediment clean out elevation should be clearly marked on the discharge riser. Sediment shall be removed when it reaches the level marked on the riser. The clean out elevation should correspond to the top of the sediment storage capacity or a level that will maintain at least half of the detention storage capacity of the basin at all times.
- An emergency spillway (lined flume or riprap trough with geotextile liner) should be included in the basin, in case the skimmer is plugged or blocked. The emergency spillway structure will be designed on a site-specific basis to safely pass flows above the design capacity of the basin. The area to which the spillway discharges must be stabilized using rip rap and/or other energy dissipation devices.

Discharge Riser

- The discharge riser will consist of a vertical pipe or box-type riser joined to a horizontal conduit (barrel) that will extend through the embankment. The horizontal pipe conduit (barrel) should be a minimum of 12 inches in diameter. The riser should be a minimum of 15 inches in diameter. The cross-sectional area of the riser should be at least 1.5 times the cross-sectional area of the horizontal conduit.
- Crest Elevation: The crest elevation of the riser should be at least 12 inches below the elevation of the control section of the emergency spillway.
- Base: The riser should have a base attached with a watertight connection and should have sufficient weight to prevent flotation of the riser.
- Antivortex Device: Install an antivortex device on the top of the riser. An approved antivortex device is a thin, vertical plate normal to the centerline of the dam and firmly attached to the top of the riser. The plate dimensions are: length = diameter of the horizontal pipe.
- Trash Rack: A trash rack should be welded across the top of the riser.
- Antiseep Collars: Conduits through embankments should be provided with antiseep collars. All basins should have a minimum of one antiseep collar located near middle of fill that is rectangular, blocking all potential flow through the backfilled material and extending to the sides of the barrel trench. The horizontal dimension should be at least 24 inches larger than the barrel diameter. The bottom side of the antiseep collar should extend a minimum of 24 inches below the grade line, and the topside should extend 12 inches above the barrel.
- See Figures 1-3 for design examples.

Installation

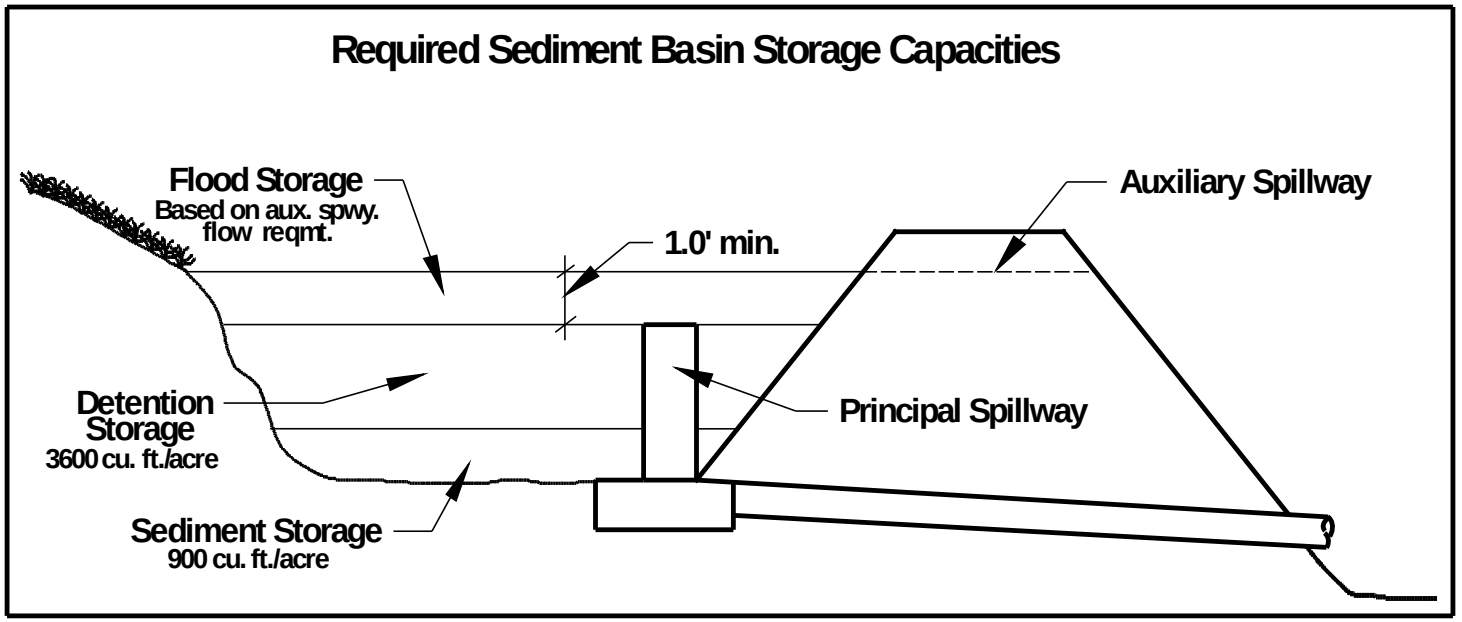
- Locate and construct temporary sediment basin early in the construction phase.
- Clear existing vegetation and other debris if present in the basin construction area.
- Construct the sediment basin in an area where there is sufficient room and topography to allow for access and clean-out of the basin or incorporate an access road into the design.
- The banks or slope of the sediment basin may require that geosynthetic liner or jute matting be installed to protect against erosion. Care must be taken not to disturb the liners

or matting during clean out of the basin. A temporary soil stabilization or erosion control surface application may be used to stabilize the surrounding area.

Maintenance and Inspection

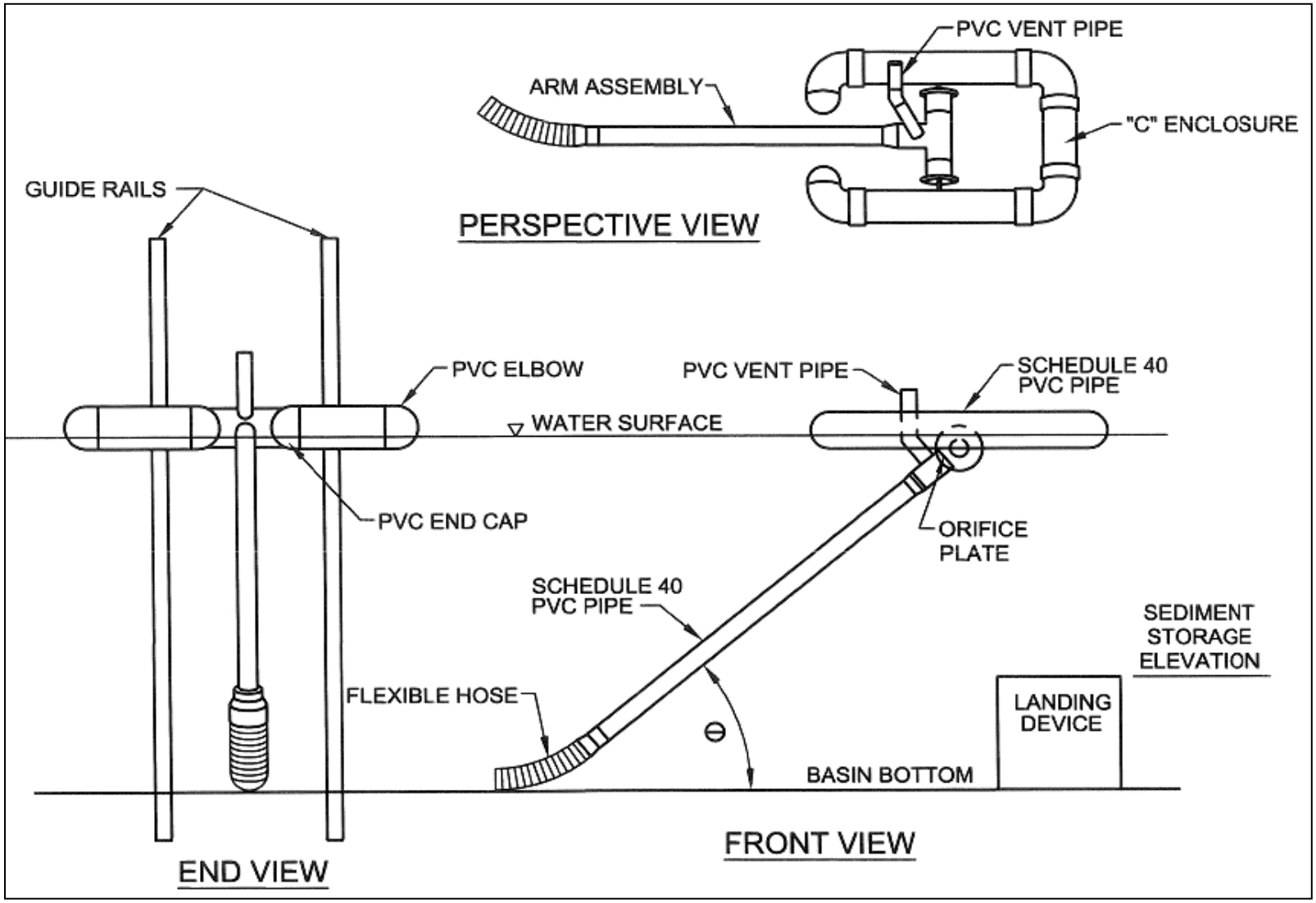
- Conduct inspections as required by the NPDES permit or contract specifications.
- Make necessary repairs to ensure the basin is operational and performing properly.
- Clean out the basin when the designed sediment storage capacity is reached. Dispose of the removed sediment in an approved areas that will prevent the sediment from returning to the basin or downstream areas during a storm event.
- Maintain at least half of the designed detention capacity at all times. (Reference 1)
- If not incorporated into the final stormwater design as a permanent BMP, remove the basin infrastructure and re-grade the area to match preconstruction conditions.

Figure 1. Example of basin layout (skimmer and anti-seep collars not shown)



Adapted from Natural Resources Conservation Services, Conservation Practice Standard, *Sediment Basin*, Code 350, January 2010, pg 350-2.

Figure 2: Skimmer detail example



Adapted from the Pennsylvania Department of Environmental Protection, *Erosion and Sediment Pollution Control Program Manual*, March 2012, pg. 167.

Figure 3. Photo showing example of a riser, trash rack, anti-vortex device, skimmer and landing pad.

Adapted from Pennsylvania Department of Environmental Protection, *Erosion and Sediment Pollution Control Program Manual*, March 2012, pg. 166.

References:

1) U.S. Environmental Protection Agency, Construction General Permit 2012, Section 2.1.3.2.

2) Idaho Statues, Title 42 *Irrigation and Drainage – Water Rights and Reclamation*, Chapter 17 *Department of Water Resources – Water Resource Board*, Section 42-1711.

3) Idaho Department of Water Resources, *Idaho Department of Water Resources Memo for Shallow Injection Well Criteria*, Effective date 1 July 2011. Available at http://itd.idaho.gov/enviro/Stormwater/FAQs/default.htm.

4) Natural Resources Conservation Services, Conservation Practice Standard, *Sediment Basin*, Code 350, January 2010.

5) Idaho Department of Environmental Quality, *IDEQ Storm Water Best Management Practices Catalog*, September 2005, pg. 77.

6) Natural Resources Conservation Services, Conservation Practice Standard, *Pond*, Code 378, May 2011.