Module 7: Sediment trap and sediment basin review work problems

Objective: This module will illustrate the common calculations and design considerations that should be checked by the plan reviewer. Earthen structures which are not designed properly may fail resulting in downstream sedimentation or damage.

Participants will work through each of the problems and discuss the answers for each one.

7a. Sediment trap work problems (ESCH III-70-76)

1. **Given a total drainage area of 2.5 acres, what is the total volume (V) of sediment trap required?**

$$V = A \times 134$$

V (Total Volume, cubic yards) = A (Total Drainage Area, acres) x 134(cubic yards/acres)

V = ( ) acres x 134 (cubic yards/acres) = ( ) cubic yards

2. **If the drainage are is 1.5 acres, what volume (V) is required for the permanent pool for wet storage?**

$$V = A \times 67$$

V (Perm. Pool Vol., cubic yards) = A (Total Drainage Area, acres) x 67(cubic yards/acre)

V = ( ) acres x 67 (cubic yards/acres) = ( ) cubic yards

3. **For a total drainage are of 2.8 acres, how much volume (V) is required for the temporary pool or drawdown volume for dry storage?**

$$V = A \times 67$$

V (Temp. Pool Vol., cubic yards) = A (Total Drainage Area, acres) x 67(cubic yards/acres)

V = ( ) acres x 67(cubic yards/acres) = ( ) cubic yards

4. If the sediment trap receives drainage from 0.75 acres of disturbed area onsite and receives runoff from 1.5 acres of undisturbed area offsite, at what volume (V) should sediment be removed?

$$V = A \times \frac{67}{2} = A \times 33.5$$

V (Sediment Vol., cubic yards) = A (Total Drainage Area, acres) x 33.5(cubic yards/acres)

V = ( ) acres x 33.5(cubic yards/acres) = ( ) cubic yards

5. What is the minimum length (L) of outlet required for a sediment trap with a drainage area of 1.9 acres?

$$L = A \times 6$$

L (Outlet Length, feet) = A (Total Drainage Area, acres) x 6(feet/acre)

L = ( ) acres x 6 (feet/acres) = ( ) feet

6. If a sediment trap has a 4.5 feet high embankment, what is the minimum top width required on the embankment?

From ESCH III-74, Plate 3.13-1

Embankment Height, H = ( ) feet Top Width, W = ( ) feet

7b. Sediment basin work problems (ESCH III-77-115)

1. **For a total drainage area of 25 acres, what volume (V) sediment basin is required?**

$$V = A \times 134$$

V (Total Volume, cubic yards) = A (Total Drainage Area, acres) x 134(cubic yards/acre)

V = ( ) acres x 134 (cubic yards/acre) = ( ) cubic yards

2. **If the total drainage area is 18 acres, what is the volume (V) of the permanent pool or wet storage?**

$$V = A \times 67$$

V (Perm Pool Vol., cubic yards) = A (Total Drainage Area, acres) x 67(cubic yards/acres)

V = ( ) acres x 67(cubic yards/acres) = ( ) cubic yards

3. **Given 5 acres of disturbed area onsite and 10 acres undisturbed above the site but draining to the sediment basin, what is the required volume (V) of the temporary pool or drawdown volume?**

$$V = A \times 67$$

V (Temp. Pool Vol., cubic yards/acres) = A (Total Drainage Area, acres) x 67(cubic yards/acres)

V = ( ) acres x 67(cubic yards/acre) = ( ) cubic yards

4. **Given that the sediment cleanout level shall be no higher than one foot below the dewatering device, determine the maximum volume (V) of sediment that will require removal from the permanent pool of a sediment basin serving 27 acres?**

$$V = A \; x \; = A \; x \; \frac{67}{2} \qquad 33.5$$

V (Sediment Vol., (cubic yards) = A (Total Drainage Area, acres) x 33.5(cubic yards/acres)

V = ( ) acres x 33.5(cubic yards/acres) = ( ) cubic yards

5. **If a plan shows a sediment basin with a flow length of 125 feet, what is the maximum effective width required such that no baffles are required?**

$$\frac{L}{W_e} \; x$$

x 2 2 ... no baffles required

x < 2 ... baffles required

L (Flow length, feet) / W_e (Effective Width, feet) *2* 2 (no baffles; < 2 (baffles required)

$$\frac{L}{W_e} \quad 2$$

o r

$$W_e \quad \frac{L}{2}$$

W_e (feet) = L (feet) / 2 = ( ) feet / 2 = ( )

6. **What is the minimum top width of a sediment basin embankment with a 15 feet height?**

From ESCH III-80:

Embankment Height	Minimum Top Width
< 10 feet	6 feet
10-14 feet	8 feet
15 feet (max)	10 feet

H (Embankment Height, feet) = ( ) feet

T (Minimum Top Width, feet) = ( ) feet

7. **What is the size of two anti-seep collars given a 3 feet diameter barrel with a saturated length of 85 feet?**

From ESCH III-106, Plate 3.14-12:

On the lower chart, select the saturated length.

Saturated Length, Ls = ( ) feet

Read across chart to number of collars.

Number of Collars = ( )

Read up to top of chart to pipe diameter.

Pipe Diameter, D = ( ) feet

Read across chart to size of anti-seep collars.

Size of Anti-Seep Collars = ( ) feet x ( ) feet