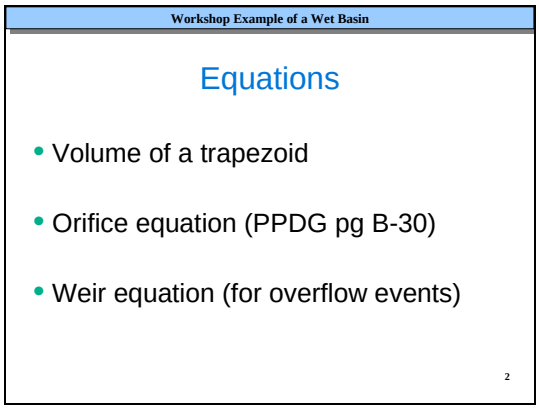
Slide 1: A Wet Basin is one of the several recently approved Caltrans Treatment BMPs that can be employed on a project. In addition to the information presented today, Appendix B of the PPDG (Project Planning and Design Guide) has a 7-page section on the Wet Basin.

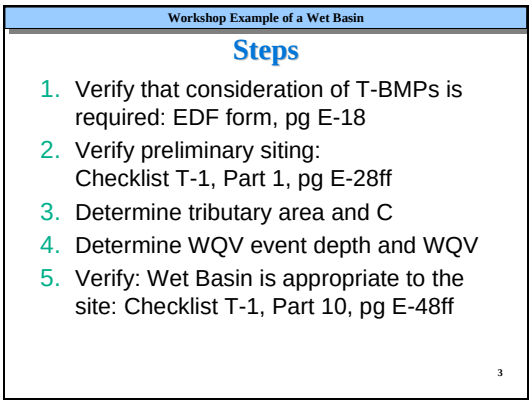
Refer to the Workshop Handout for a description of the problem, and to find the equations that will be used.



Slide 2: First we must go over a few equations that may be new to some of you. See you Workshop Handout sheet.

Some of the equations you must re-arranged, in order to solve for T, time, or H, head.

The weir equation is the same for broad-crested weirs and for sharp-crested weirs, but as you will see there are different coefficients for each type of weir. A weir will be used to allow an overflow event to pass safely from the Wet Basin. We will also discuss what is meant by 'overflow events'.



Slide 3: For this workshop we will do 10 steps to fully consider and place the Wet Basin at a site.

Step 1. Verify that consideration of Treatment BMPs is required for the project, using the Evaluation Documentation Form, PPDG page E-18

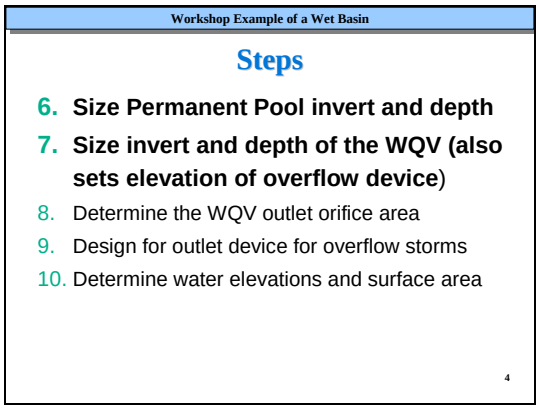
Step 2. Verify initial selection using PPDG Checklists T-1, Part 1 (pages E-28ff). Consideration of a Wet Basin should be done as part of the "TDC process" (Targeted Design Constituent" process) discussed in Appendix E of the PPDG, and although the Infiltration Devices are always the 1st Treatment BMP to be considered using the TDC process, we will focus on the Wet Basins.

Step 3. Determine the tributary; this should be known at the design (PS&E) stage of the project. It will be used in the calculation of the WQV that follows. For the PID and PA/ED phases, general siting criteria will be used for siting purposes, along with best estimate of the overall WQV if the drainage areas are not known. An area-weighted runoff coefficient C must usually be calculated. Once C is calculated, the volume of runoff is simply the depth x the

runoff coefficient x the area (all consistent units).

Step 4. Determine the WQV depth from Basin Sizer or as stipulated by the applicable RWQCB for the project area.

Step 5. Step 5. Verify preliminary design selection using PPDG Checklists T-1, Part 4 (page E-36). Recall also that the minimum WQV that is deemed economically feasible to treat according to the PPDG is 123 m^3 (4,356 ft^3). In general, this should be from the impervious area, as that is the area needing treatment (e.g., other areas, such as grassy slopes, provide treatment whether designated as a Treatment BMP or as a Design Pollution Prevention BMP). We will assume today that all these steps have been completed.



Slide 4: Step 6. Size the invert area of the Permanent Pool.

Step 7. Size invert area of the WQV pool.

We will talk about Steps 6 and 7 in the next slides.

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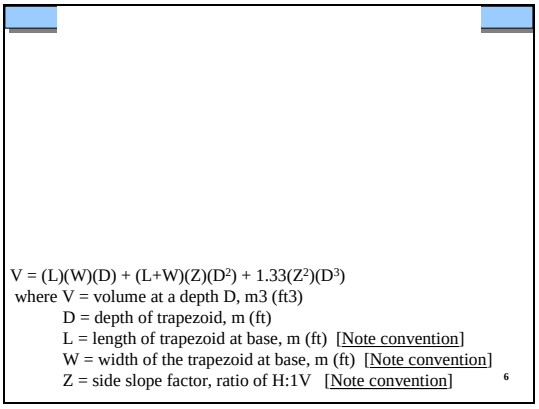


Slide 6: This is a formula for the volume of a basin using dimensions at the invert. Note well: "invert" dimensions!

Workshop Example of a Wet Basin

Workshop Example

Determine Plan View Dimensions of a Wet Basin

Assume: * WQV as 123 m^3 (4,356 m^3)
* Depth to groundwater at 5 m (16.4 ft)

Estimate total depth of Wet Basin as 2.0 m
* WQV depth: try 0.25 & 0.5 m, , Z = 4
* Permanent Pool depth: 1.5 m, Z = 3

Use Workshop Handout to find trial dimensions

7

Slide 7: The numbers in blue will be used later in the exercise. Note that we will later consider freeboard above the WQ pool elevation.

Workshop Example of a Wet Basin

Workshop Example

Determine Plan View Dimensions of a Wet Basin

Question: what is the design volume of the permanent pool?

8

Slide 8: Refer to the text on the slide.

Workshop Example of a Wet Basin

Workshop Example

Determine Plan Dimensions of a Wet Basin

Question: what is the design volume of the permanent pool?

Answer: the permanent pool is sized at 3x WQV, so its volume will be 369 m^3

Use Sheet 19 of the Workshop Handout, with Z=3 and D=1.50 to obtain trial dimensions for the invert of the Permanent Pool (goal – 90% of required volume)

9

Slide 9: Refer to the text on the slide.

Workshop Example of a Wet Basin

Workshop Example

Determine Plan View Dimensions of a Wet Basin

Permanent pool invert trial dimensions for a depth of 1.5 m and volume of 370 m^3

A) 11 m x 10 m; B) 12.5 x 10 m C) 9.5 m x 12 m; D) 8.0 m x 14 m

Select 12.5 x 10 m, then determine the surface dimensions of the Permanent Pool.

10

Slide 10: Refer to the text on the slide.

Workshop Example of a Wet Basin

Workshop Example

Determine Plan View Dimensions of a Wet Basin

The invert dimensions of 12.5 m by 10.0m will be larger at the 'surface' of the Permanent Pool, based on the depth at 1.5 m and a side slope ratio of 3H:1V

Calculate the surface dimensions.

11

Slide 11: Refer to the text on the slide.

Workshop Example of a Wet Basin

Workshop Example

Determine Plan View Dimensions of a Wet Basin

The surface dimensions are:

12.5m + (2 x 3 x 1.5m) = 21.5

10.0 m + (2 x 3 x 1.5) = 19.0

Use in the next step 22m x 20 m.

12

Slide 12: The first number is the dimension at the invert of the Permanent Pool. Within the parentheses: the 1st number relates to the fact that there are slide slopes on both sides, and the 2nd and numbers relate to the side slope ratio, and the 3rd number is the height we determined from the previous step.
So that we may use our Workshop Handout spreadsheet on page 19, we will use the

number in blue shown as the invert dimensions, rounding up slightly.

Workshop Example of a Wet Basin

Workshop Example

Determine Plan View Dimensions of a Wet Basin

Find WQV depth for a volume of 123 m^3, and invert dimensions of 22 x 20 from the Workshop Handout.

13

Slide 13: Refer to the text on the slide.

Workshop Example of a Wet Basin

Workshop Example

Determine Plan View Dimensions of a Wet Basin

From the Workshop Handout, for dimensions of 22 x 20 m, Z=4:1, and WQV = 123 m^3

- If depth @ 0.25, WQV is 121 m^3
- If depth @ 0.50 , WQV is 265 m^3

Use the depth as 0.25

14

Slide 14: Refer to the text on the slide.

Workshop Example of a Wet Basin

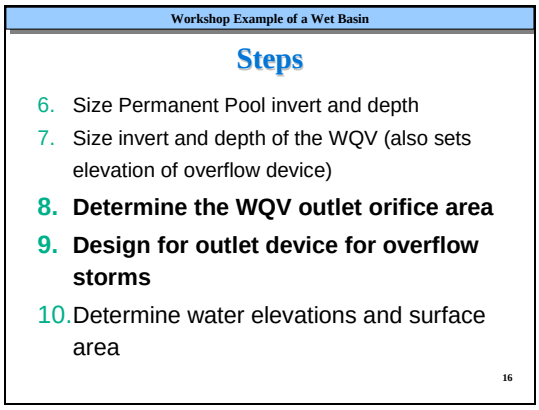
Workshop Example

Determine Plan View Dimensions of a Wet Basin

With some fine tuning of vertical and plan view dimensions, the Permanent Pool volume and the WQV volume can be provided, as can the minimum 0.3 m (1 ft) freeboard above the overflow storm elevation.

15

Slide 15: We have not calculated the elevation in the Wet Basin when the overflow event enters, but our approximate depths from these calculations are 1.5 m and 0.25 m, for 1.75 m; we round up some dimensions, so more accurate volumes and depths must be calculated.



Slide 16: Steps 8 and 9. Size the water quality outlet devices using an Outlet Riser and the overflow device using either a broad-crested weir or a sharp crested weir (an open-topped outlet riser). You may be familiar with these calculations if you have done a design for a Detention Basin. The formulas are on your Workshop Handout sheet. We will not do these calculations in this session. Regarding the height of the overflow event as it leaves the Wet Basin from a broad-crested weir or the sharp crested weir atop the WQV outlet riser: the release must be designed to accommodate the largest event (up to the 100-yr event) that could reasonably be expected to enter the Wet Basin, and the methods described in the Workshop Handout for Large Event Releases from Infiltration Basins Using Overflow Spillways (for the broad-crested weir) and the Large Event Release from the top of a CMP Riser (sharp-crested weir) presented under Detention Basins should be consulted.

Step 10. Elevations and a check on the surface area of the shallow zone compared to the entire surface area; recall that shallow zone should encompass about 25 to 50% of total surface area of the Wet Basin. We won't do these steps today.

Slide 17: End of the presentation. We have now finished the 'civil' design of the basin. We have not designed the conveyance systems leading to the basin, the vegetation in the basin, the maintenance road around the basin, among key items. You will need to work with other functional units in some cases, including District Landscape Architect and Geotechnical Services, but you have completed the main treatment aspects.
Please contact your NPDES coordinator if in the design process you have questions that were not answered today, or call the Headquarters Design Office of Storm Water Management.

Check also with the NPDES unit to determine if standard detail sheets are available for this Treatment BMP.