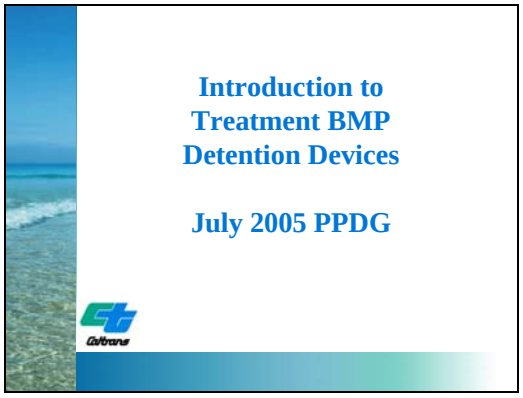
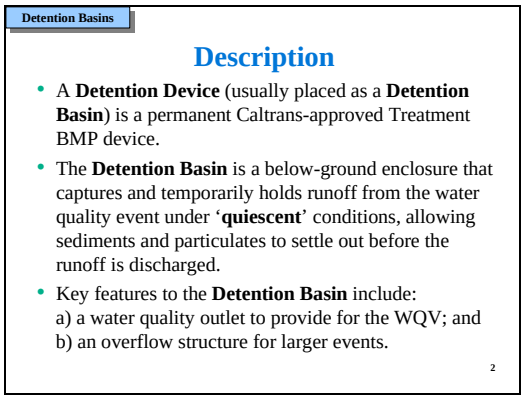
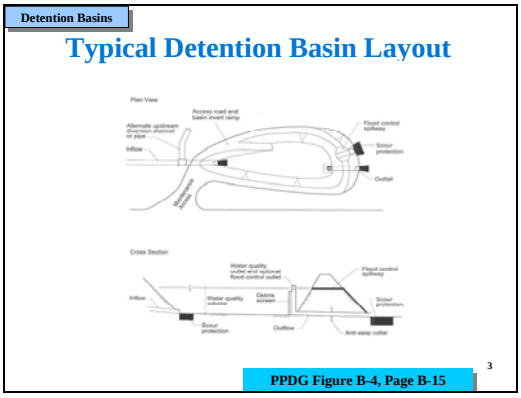


Slide 1: This module will present the Caltrans-approved Treatment BMP Detention Devices, usually placed as Detention Basins.



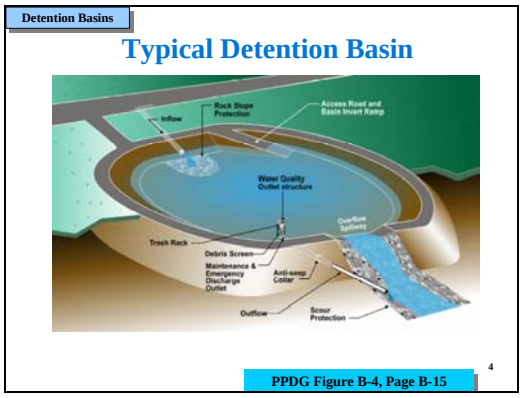
Slide 2: The BMP that Caltrans refers to as "Detention Basin" is referred to in literature as an "extended Detention Basin" or a "dry Detention Basin." The PPDG also refers to Detention Devices; Detention can also be accomplished using a below-ground vault.



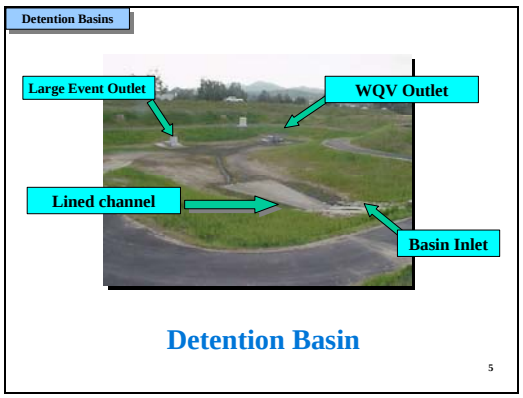
Slide 3: There are many similarities between a Detention Basin and an Infiltration Basin, especially when dry. If observed in the dry, probably the key difference would that a riser pipe is found in the Detention Basin, which acts as the water quality outlet device; the riser has holes ("orifices") along its sides that release the water. Note shown on this figure, a low-flow concrete ditch is often provided, to minimize gullying at the invert. Invert slope is 1 to 2%. This figure does show an access road completely surrounding the Basin; at some sites, space may not be available for a road around the Basin, however, it is important to at least provide access to the Basin invert (floor) for maintenance mowing and periodic cleaning.

Some sites also provide a release valve emergency valve. The valve would be operated in the event that the Basin has not emptied within the time allowed to prevent vector growth, 72 hours, or in other unusual situations. Generally, the valve provided is a slide gate valve and can be opened from the crest of the confinement or from outside of the Basin.

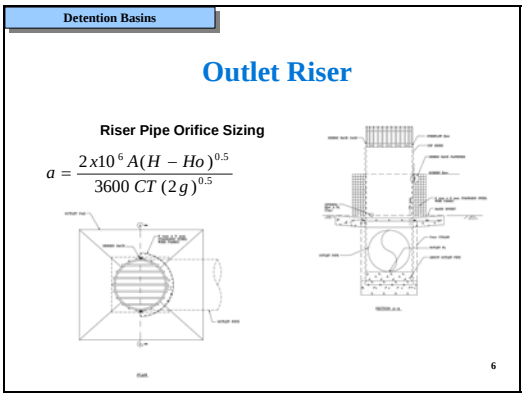
An "anti-seep collar" is shown – this is to prevent the backfill surrounding from acting as a conduit for flows, which might lead to subsurface erosion from under the confining berm, which potentially could lead to berm failure.



Slide 4:
Note the similarity between a Detention Basin and an Infiltration Basin. Detention Basins, to function properly, are designed to maintain a flow path within the Basin from the inlet to the outlet, over the long direction of the Basin. The ratio of the Basin length, this flow path, to Basin with, is recommended for Caltrans projects to be at least 2:1 or greater. For this reason, Detention Basins are often constructed as a rectangle, in plan view. Some means within the Basin can be used to direct the flow path of the water to maintain this 2:1 ratio, if the Basin is not shaped in a rectangle; these would be berms within the Basin, at an elevation near or just to the elevation when the Detention Basin is full to capacity with the WQV.



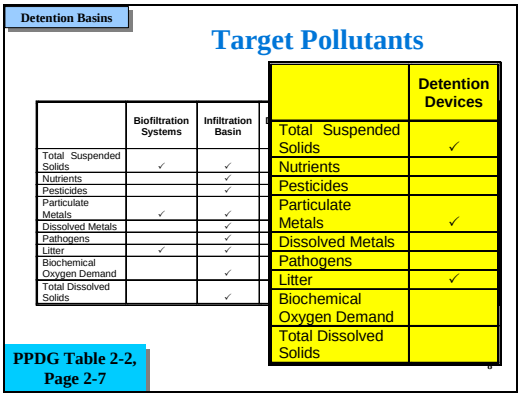
Slide 5: Note the features highlighted on this slide: an inlet approximately opposite the WQV outlet; an overflow release structure; vegetated invert; and a lined low flow channel and apron just below the inlet.



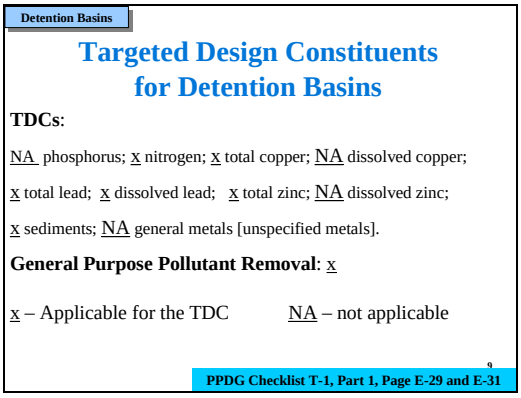
Slide 6: Once the WQV to be treated has been determined, and the area where the Detention Basin will be placed has been determined, the depth of water at the WQV can be determined. After that, one of the two key design parameter is sizing water quality release device, shown here using an "Outlet Riser". The formula is for orifice opening at the invert of the Basin is also shown on this slide. The formula will provide the total open area needed; several orifice openings may be used, summing to the required open area. The orifice(s) should be at least 13 mm (1/2 inch) in diameter. This formula provides for the open area when all the open area is at the same elevation, at the floor of the Basin (at the bottom of the riser). In some instances it may be preferable to use openings in columns vertically along the riser, as in theory water at the top of the 'water column' would be cleaner; there is a separate formula for that, and it is given in the PPDG Appendix B. One other concept that should be noted for this device: runoff will begin flowing through this device virtually at the start of rainfall, and will continue until most

events have ended, with a design drainage time of between 40 to 48 hours.

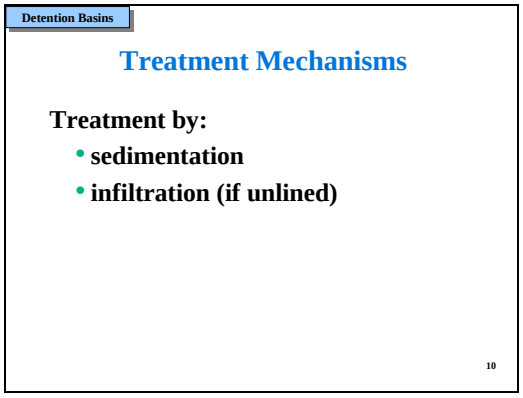
Slide 7: This slide illustrates a current research project by the Caltrans Division of Environmental Analysis. In this slide a different water quality release device is being tested – on the 'arm' connected to the riser pipe are PVC connections having holes – this arm will flow just at the top of the pool of detained runoff, and the WQV will drain through these holes – in effect the outlet orifice is always just at the top of the pool, rather than at the base of the pool. This probably will be much more effective in increasing the sediment captured by the Detention Basin. One other device being tested is a hold a release valve – this will restrict outflow until the end of the storm, in contract to the release during the event shown on our present style of outlet riser.



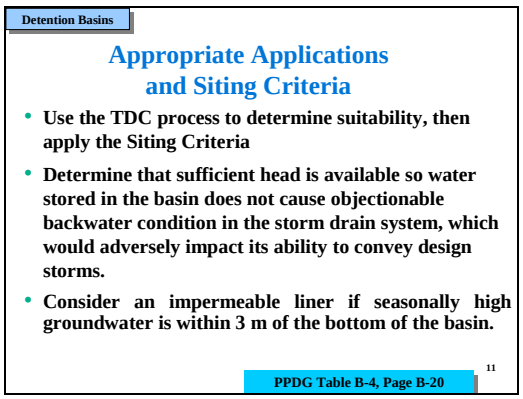
Slide 8: Detention Devices are effective against TSS (sediments), particulate metals, and litter. Note how much less effective Detention Basins are at removing pollutants of interest than are Infiltration Basins.



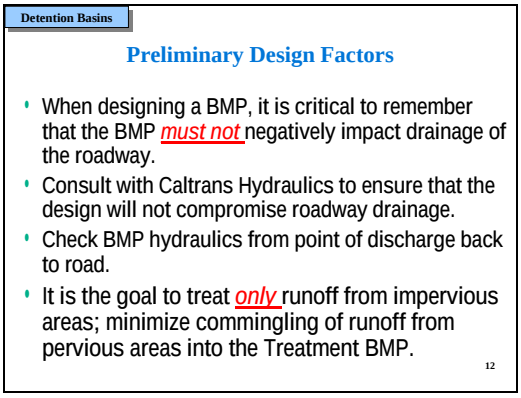
Slide 9: This table shows the target pollutants that Detention Basins are effective in removing. They include totals suspended solids, particulate metals, and litter. Although litter may be trapped in the Detention Basins, litter removal is not a primary function of Detention Basins. Detention Basins are included in the TDC process for these constituents (Questions 8, 9, 11, 12, 13, 15 for specific pollutants, and 17 for General Pollutants).



Slide 10: Refer to the slide for the text.

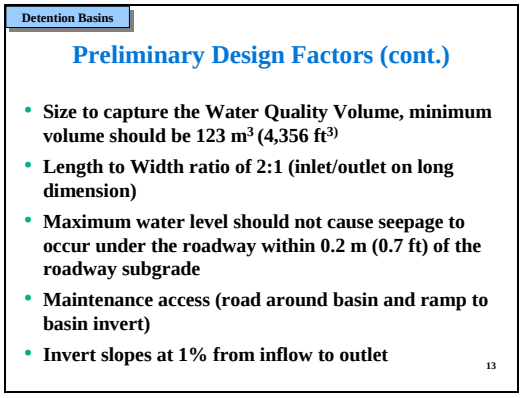


Slide 11: Use the TDC process to determine suitability of a Detention Basin, then apply the Siting Criteria.
Determine that sufficient head is available so water stored in the basin does not cause objectionable backwater condition in the storm drain system, which would adversely impact its ability to convey design storms.
Consider an impermeable liner if seasonally high groundwater is within 3 m of the bottom of the basin. If the groundwater is less than 3 m below the bottom elevation of the Basin, then the Basin must be lined. From a practical standpoint, even if the Basin is lined the seasonally high groundwater should not be higher than 0.3m (1 ft) below the bottom of the Detention Basin.



Slide 12:

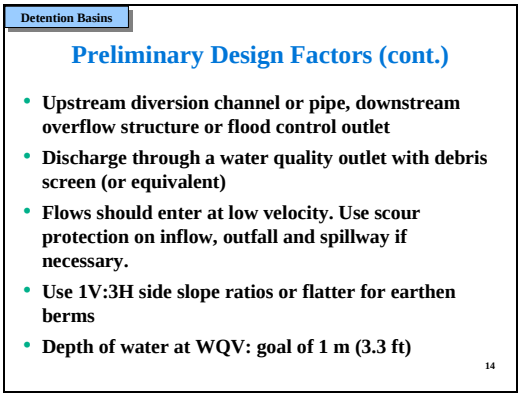
- When designing a BMP, it is critical to remember that the BMP *must not* negatively impact drainage of the roadway. Consult with Caltrans Hydraulics to ensure that the design will not compromise roadway drainage.
- Check BMP hydraulics from point of discharge back to road. This is related to the previous bullet.
- It is the goal to treat *only* runoff from impervious areas; in possible, minimize commingling of runoff from pervious areas into the Treatment BMP. Regarding the this bullet: while it is true that it is goal to only treat runoff from the impervious areas (i. e., the roadway surface), if the runoff from those surfaces cannot be routed around the treatment device, then this additional area must be considered when determining the design volume for the treatment device, and treated if possible; if it is neither possible to prevent commingling nor to provide a larger Treatment BMP device to handle the commingled volume, attempt to treat the WQV determined from the impervious area.



Slide 13:

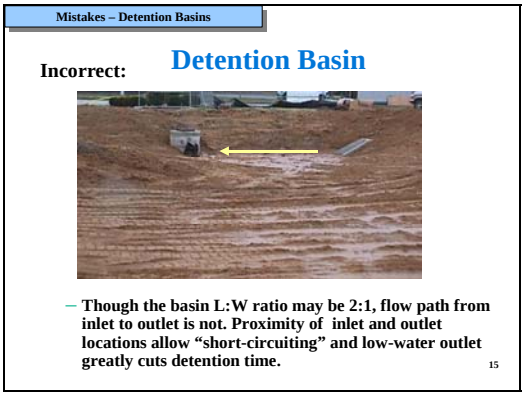
- Size to capture the Water Quality Volume, minimum volume should be 123 m3 (4,356 ft3)
- Length to Width ratio of 2:1 (inlet/outlet on long dimension). If space is available, greater than the 2:1 suggested ratio should be used, as discussed above.
- Maximum water level should not cause seepage to occur under the roadway within 0.2 m (0.7 ft) of the roadway subgrade. Although this condition is unlikely to occur at the roadway being drained, it may affect a nearby roadway that is lower than the roadway being drained. Assume a 2V:1H wetting front, if no other information is available.
- Maintenance access (road around basin and ramp to basin invert)
- Invert slopes at 1% from inflow to outlet

Not shown as a bullet, but a trash rack and anti-vortex plate should be provided is an outlet riser is used.

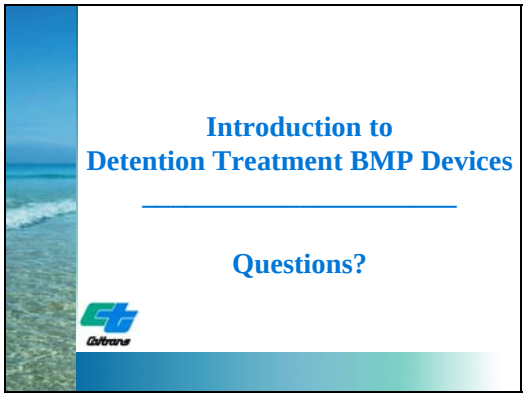


Slide 14: The suggested 1-m (3 ft) depth of water at the WQV is so that fencing around the Basin is not needed, per local codes or as directed by Caltrans Traffic Operations.

Consider if a fence is needed to prevent entry into the confinement, especially if a deep Detention Basin is used.



Slide 15: While this is probably under construction, some problems appear evident about this Detention Basin: a) the invert of the Basin is not 'stabilized', meaning that no vegetation has established; b) interior side slopes appear to be steeper than 1V:3H, and would therefore be erosion prone and liable to add to the sediment loading of the runoff from the basin, even after treatment; and c) probably worst of all, the 2:1 length to width ratio has not been provided.



Slide 16: End of the presentation.