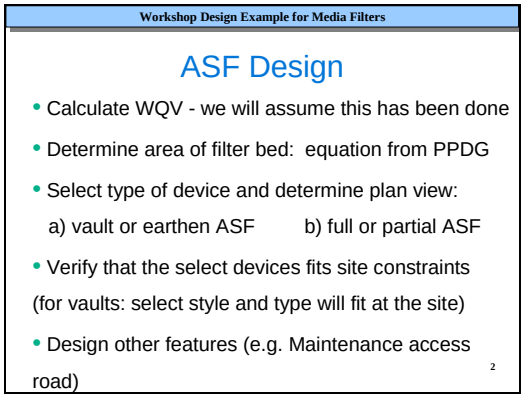
Slide 1: The Media Filter is one of the several newly-approved Caltrans Treatment BMPs that can be employed on a project. In addition to the information presented today, Appendix B of the PPDG (Project Planning and Design Guide) has a 7-page section on the Media Filter.

Please contact your NPDES coordinator if in the design process for your project you have questions that were not answered today, or call the Headquarters Design Office of Storm Water Management.

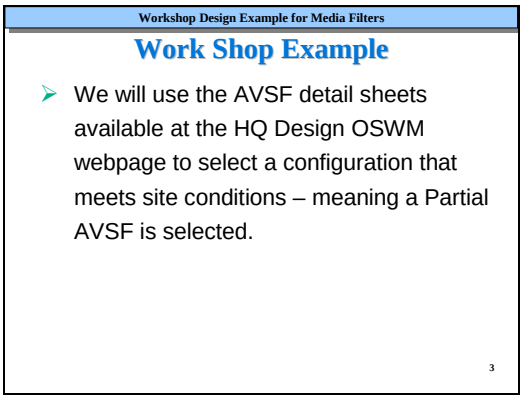
Check also with the NPDES unit to determine if standard detail sheets are available for this Treatment BMP.



Slide 2: These are some of the design issues that apply to the PE, especially when the structural detail sheets for the AVSF are used. In fact, these are expected to become X-S sheets in the near future. For issues related to maintainability, the partial AVSF has been selected as the basis of design for these sheets.

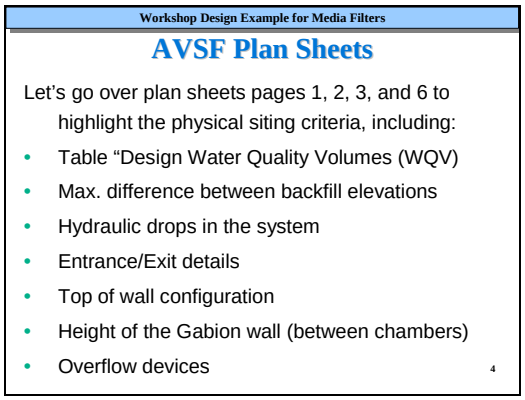
Using the detail sheets the design consists in large part of siting and performing the hydraulic calculations necessary to verify performance when placed in the drainage system.

In the remaining part of this session we will concentrate on understanding what the plan sheets show.

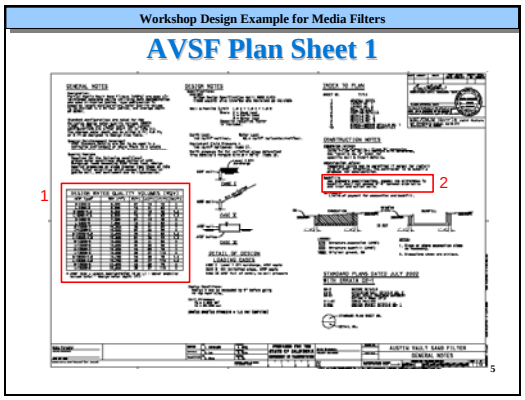


Slide 3: We will go over an example using the plan sheets for a Partial AVSF, available on line from HQ, and using the Workshop Handouts containing Sheets 1, 2, 3, and 6.

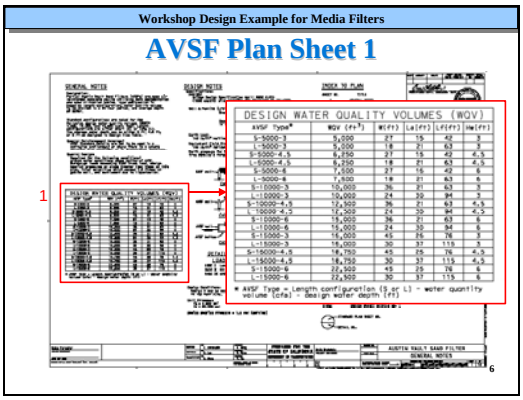
We will discuss the site conditions that must be met, mostly related to hydraulic issues, including flow into and from the vault, and overflow events (larger than the Water Quality Volume events).



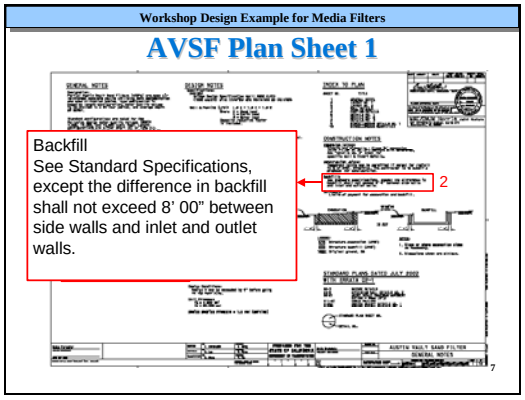
Slide 4: Let's go over plan sheets 1, 2, 3, and 6 to highlight the physical siting criteria, including:
•Table "Design Water Quality Volumes (WQV) •Maximum difference between backfill elevations
•Hydraulic drops in the system
•Entrance/Exit details
•Top of wall configuration •Height of the Gabion wall (between chambers) •Overflow devices



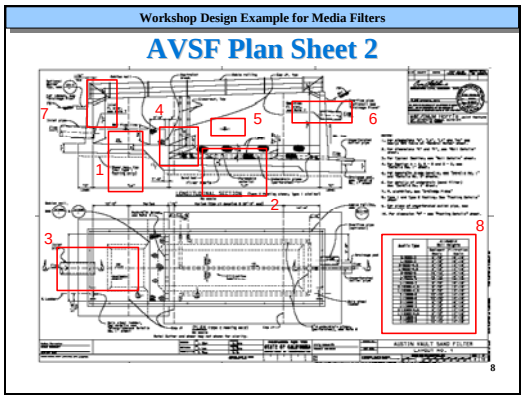
Slide 5: We're going to talk about the text in these two areas.
The is the cover sheet. The Project Engineer should extensively review it when an AVSF is proposed for a project. In addition to the structural information needed for construction, description of terms (such as limits of structure excavation and structure backfill), loading cases, and other information are important to the project siting and item payment quantities.
If you are familiar with the Standard Plan sheets for Retaining Walls, there is much similarity and in fact many of the 'concepts' used for presenting information here were borrowed from the Retaining Wall Standard Plans.



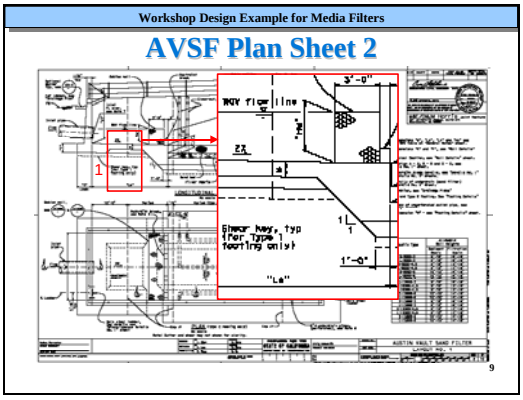
Slide 6: In particular for discussion today:
Box 1. This table presents the standard designs, ordered in terms of the WQV.
Note that there is a convention, under the AVSF Type column (1st column): all the styles shown have an S or L as the first term in the designation, indicating where it is 'short' or 'long' (relative to the others at that same WQV).
Continuing from left to right in the columns are the: WQV; the width W; the length of the 1st chamber, Ls; the length of the 2nd chamber, Lf; and last is the Hw, the height of the Gabion Wall used to separate the two chambers and also relates to the height of water in the device under that WQV. We will talk more about the HW elevation and the inflow pipe invert elevation on a later sheet.



Slide 7: Box 2. This note indicates that there can be a maximum difference in elevation of the backfill on either side of 8 ft; this allows placement in rolling terrain or near the toe of slopes. As will be shown on Sheet 3, the four walls of the device can have different elevations, and the elevation can even change along the length of each of the four walls.



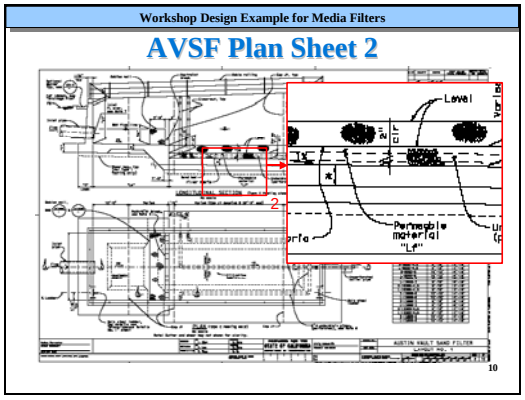
Slide 8: We're going to talk about the text in these areas on Sheet 2.



Slide 9: Box 1: One dimension of the sediment chamber, the 1st chamber, is called out as "Ls" in box 1.

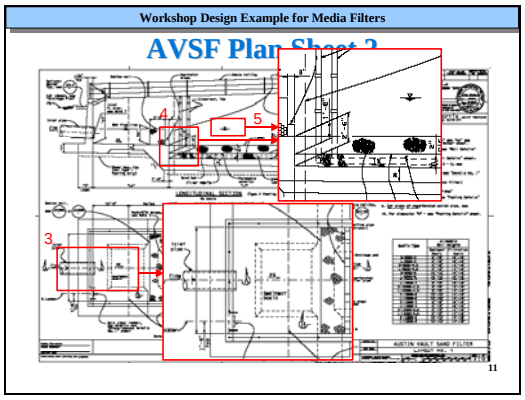
Note that Box 1 includes the 2% internal slope on the 1st chamber. Note also the 1:1 change in elevation of the invert of the vault; this provides a major hydraulic drop within the structure; this drop is required because the filter media drains downward, and a collection system below the filter media is used to remove the treated runoff from the device.

The "HW" elevation is also shown clearly here; it is coincident with the height of the gabion wall that is used to separate the 1st chamber from the 2nd chamber. The gabion wall has several functions: it will help evenly distribute runoff across the width of the filter chamber; it will slow down the runoff as it enters the 2nd chamber, and thereby prevent erosion and localized scour; it helps capture and retain litter in the 1st chamber; lastly, it will also slow down the runoff so that larger sediments can drop out of solution prior to entering the 2nd chamber (thereby extending the life of the 2nd chamber's filter bed).



Slide 10: Box 2: the definition of sediment chamber, the 1st chamber, is called out as Lf in box 2. All these are interior dimensions. Call outs for these lengths are shown on Sheet 1.

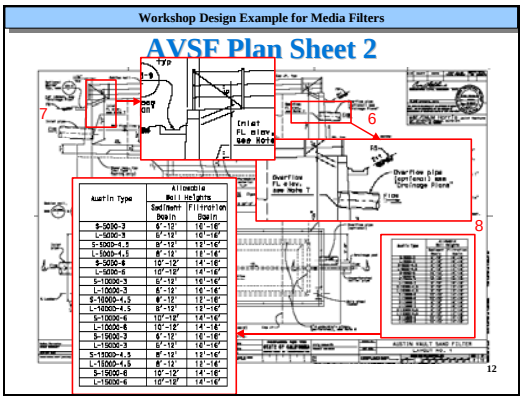
Note that the internal slope of the 2nd chamber is 1%. The thickness of the Permeable Material surrounding the perforated underdrain (plastic pipes shown as dashed lines, which function to empty the treated runoff from the 2nd chamber after filtration), and the thickness of the filter bed are shown in this view.



Slide 11: From Box 3: the inflow pipe (and in fact the outflow pipe) are aligned in the center of the device, although it can be skewed up to 45 degrees, as is shown on a later sheet.

Box 4. In addition to the slopes of the 1st and 2nd chambers, there are other hydraulic drops that must be considered; box 4 shown a 2-½ ft drop between the 1st and 2nd chambers, as the W dimension.

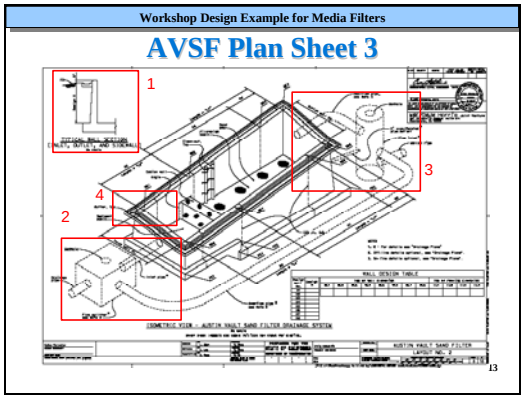
Box 5. Note the water level in the 2nd chamber; it has a counterpart in the 1st chamber at the same elevation, HW.



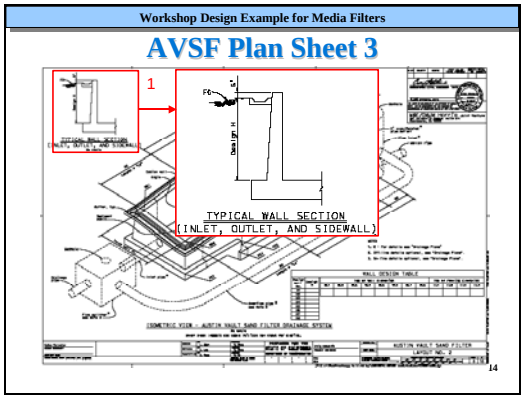
Slide 12: Box 6. An overflow pipe is mandatory (in usual situations is might not be placed, but this would be considered as a special design) and would be on the outflow wall. In almost all situations it would be placed with its invert at the same elevation as defined by the HW term.

Box 7. Top of wall detailing – this shows the convention for top of wall treatment, which is for a 6 inch project about the ground surface, but this is better viewed on Sheet 3.

Box 8. These are the wall heights for level ground conditions. This table should be interpreted to indicate the wall height for level ground configurations for typically placed pipes (e.g., depth).



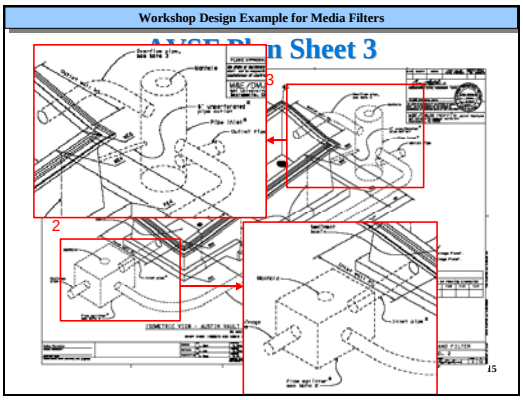
Slide 13: We're going to talk about the text in these areas on sheet 3.



Slide 14: We're going to talk about the text in these areas.

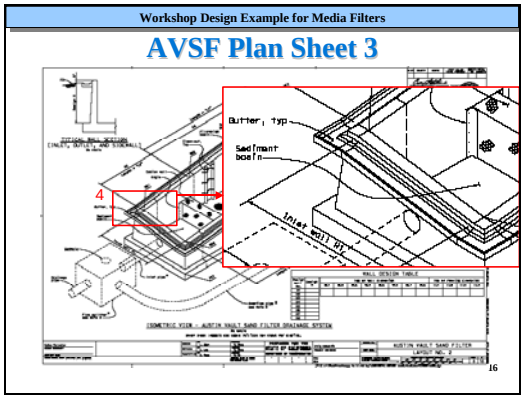
Box 1. This figure shows how the wall height is measured, and that there is a 6-inch clearance above the ground line. This is the general condition, but if needed (under some conditions) you can use a higher wall that would project more above ground. The key concept is the wall height H always has the 6 inches included, as for example, in the quantities of concrete. Note also that the correct top of wall detail. In most cases a gutter is used to prevent direct overflow of runoff into the device, and to convey water from upslope that would otherwise be directed around the device and cause erosion.

The convention of "Design H" applies to all walls, that is on the inflow and outflow walls, and for the sidewalls.



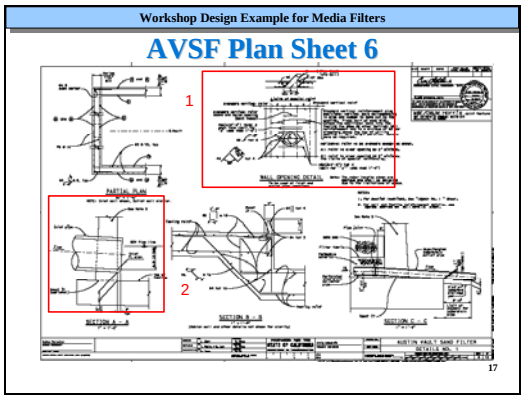
Slide 15: Boxes 2 and 3. Some projects will include an optional upstream flow splitter (Box 2, to divert storm events larger than the WQV event and to limit 'surcharging' of the upstream pipe system, and for optimum efficiency of the AVSF), and a downstream junction structure (Box 3) to place any overflow back into the drainage system and to rejoin the treated runoff to the downstream drainage system. The design elevation of the bypass will relate to the HW elevation in the AVSF, plus the head loss that occurs during flow. If used, they will not be part of these sheets, which is why they are shown only in dropout on Sheet 3.

Note shown at this time on Box 3: a baffle to keep 'floatables inside the device during overflow events is under development; this will increase the effectiveness of this devices for capture of litter, and would be especially important in areas where a TMDL regulation for litter has been implemented.

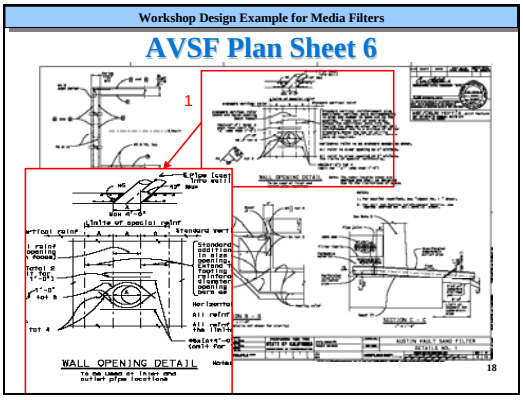


Slide 16: Box 4. Related both to top of wall projecting above the surrounding ground, and the defined location where surface overflow can occur: each corner of the vault can be a different height (and these would be shown on the plans as elevations on this sheet). The Project Engineer would complete this section with the various wall heights for the site-specific location.

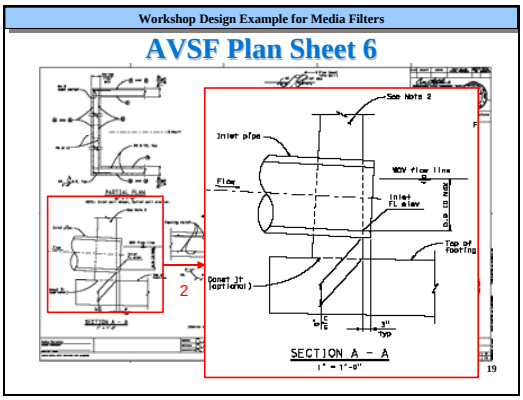
Recall that from Sheet 1 there is a maximum difference in elevation from side to side (longitudinally and laterally) of 8 ft.



Slide 17: We'll talk about these areas shown on plan sheet 6



Slide 18: Box 1. The structural detailing for the inflow, WQ outlet, and overflow pipes with the vault. Of particular interest to the PE, the layout of the AVSF can allow up to a 45 degree skew to any of these pipes. This may be needed in some situations. Verify that the opening in the structure wall can accommodate the proposed inflow/outflow pipe if a skew is used, as a maximum opening dimension of 4 ft is shown.

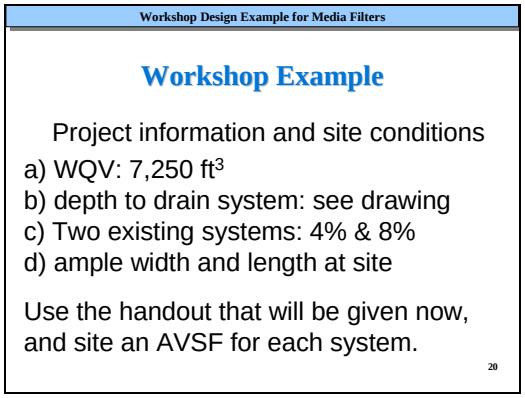


Slide 19: Box 2. This is the section detail of the inflow pipe entering the 1st chamber of the vault.

The 1st dimension is shown on the sheet as 6 inch minimum – meaning that for placement of rebar at least 6 inches must be allowed between the OD of the pipe and the invert of the vault. This is a drop that must be considered. Related, the flow line of t inflow pipe must be known or assigned, as it must show on

the plans; this elevation is the beginning point for all hydraulic drops within the vault structure. Lastly, the wall thickness of the pipe must also be accounted for in the hydraulic drops – we will talk more about that on a separate handout, but to illustrate how important this can be: a typical RCP 24 inch ID pipe has 3 inch thick walls.

The other major item related to Box 2: at this time the plans indicate that the invert elevation of the inflow pipe should be no lower than 0.9 diameters below the HW elevation, as a mandatory placement. The text on the plan sheets is undergoing revision – this is the recommended elevation so that the inflow pipe is seldom submerged; the Hydraulics unit should consider all aspects of inflow pipe elevation, as in some situations temporary submergence will not adversely reflect drainage of the highway upstream, but the condition and type of pipe joints should be fully considered if pressure conditions (that is, submergence) of the inflow pipe is allowed.

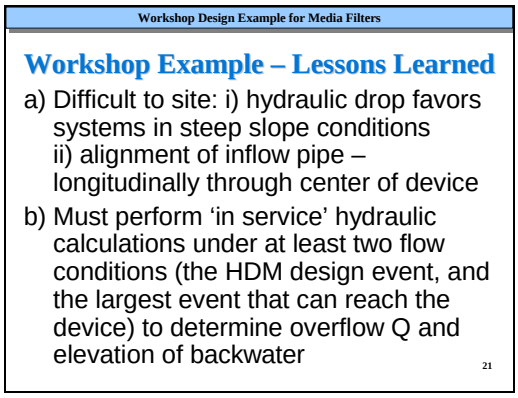


Slide 20: We'll use this information and the handouts to site an AVSF on the project.

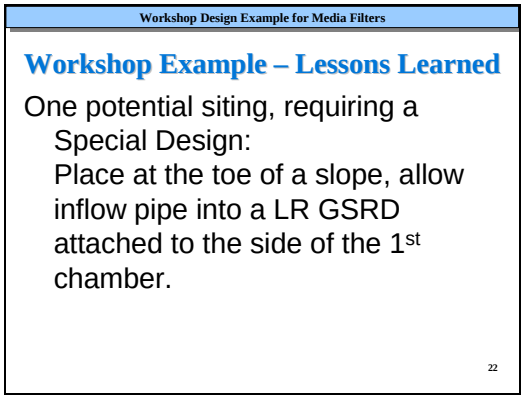
[If done outside of a classroom setting, two flow lines for 2-ft interior diameter drainage pipes should be drawn to scale on lined paper to represent an existing drainage system. From Plan Sheet 1, verify that the S-5000-6 and L-5000-6 AVSF Types provide 7,500 ft^3 capacities.

Then, the interior dimensioning of the S-5000-6 and L-5000-6 (walls and floor) should be drawn to scale on clear plastic sheet, and elevations indicated to represent the outflow pipe invert; the HW elevation, a 6-inch clearance over the floor into the first chamber). The clear sheet should be overlain onto the existing drainage system such that: a) the 0.9 difference in elevation of the inflow pipe relative to the HW elevation is provided; b) submergence of the inflow pipe is allowed.]

Comments about the siting issues should be developed (some are given on the next slide).



Slide 21: a) Difficult to site because the hydraulic drop favors systems in steep slope conditions and the alignment of inflow pipe must be carefully considered.
b) Must perform 'in service' hydraulic calculations under a variety of flows. In fact, the key design aspect is: how are events larger than the WQV event passed through the device. The elevation of the upstream bypass (see sheet 3) if used, and the internal overflow device (either on the surface on using of 'overflow' pipe, again see sheet 3) are some of the key parameters for design.



Slide 22: Special Design: a LR GSRD is under consideration as special attachment to the side of the 1st chamber; this placement would increase the effectiveness of the AVSF as a litter capture device.

Slide 23: End of the presentation.