

Installation, Inspection, & Maintenance of Post Construction BMPs

Or...

Save the Swales

Or...

So You Wanna Treat Stormwater, Huh?

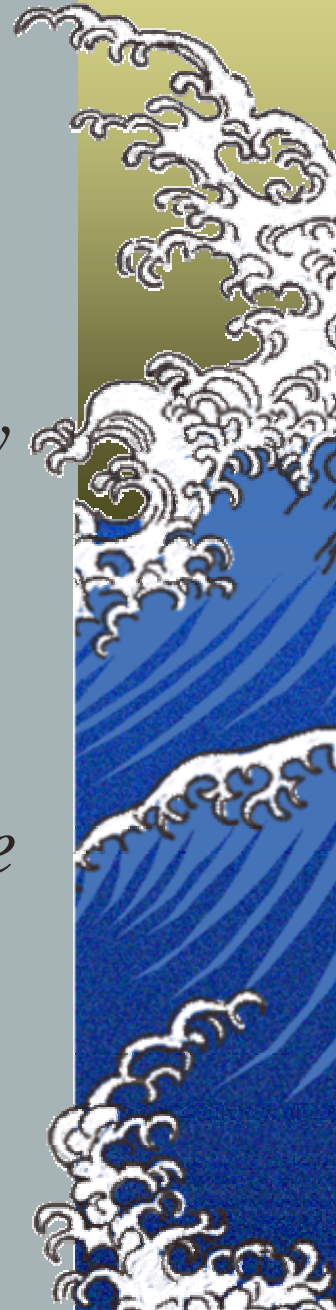
Darren Greenwood

City of Livermore



Why Require Post-Construction Stormwater BMPs?

- ▶ *Phase I Programs – Permits Require Treatment to Reduce Pollutants AND Now Controls to Minimize Runoff Volume Also.*
- ▶ *SUSMP – Standard Urban Stormwater Mitigation Plans Defined as “MEP”*
- ▶ *Phase II Programs – Permits Will Require Treatment in the Future if Not Already*
- ▶ *Like it or Not, it’s Coming to a Permit Near You...So Why Not Do it Right!*



Post Construction BMP Selection – What Works?

▲ *Manufactured Controls*

▲ *Filter Inserts – Very Limited Applications, Very Questionable Effectiveness, “Token” Controls*

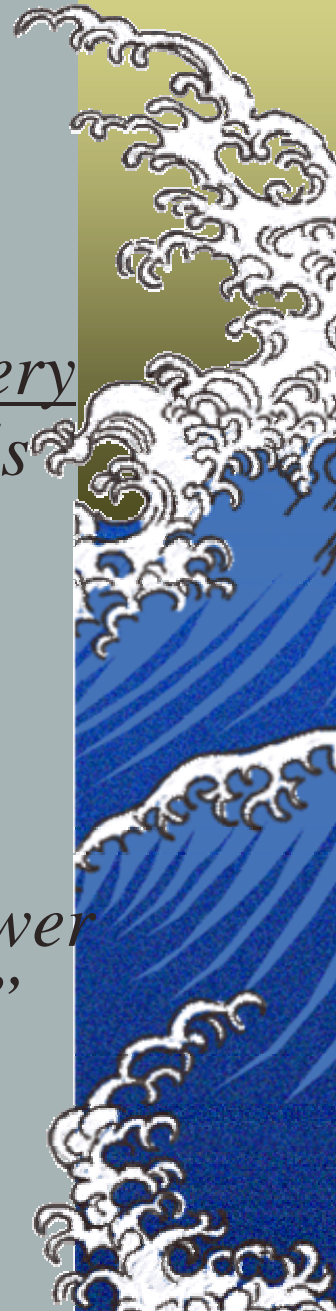
▲ *Separator Systems – “Swirl” Separators, Combination Separators. Better, But Still Limited, High Cost, High Maintenance*

▲ *Vegetated Controls*

▲ *Bioswales, Filter Strips – More Effective, Lower Maintenance, Not “Out of Sight Out of Mind”*

▲ *Retention/Detention Basins*

▲ *Effective, But Require Large Land Area*



Examples of Post Construction Stormwater BMPs



Bioswale in Parking Lot



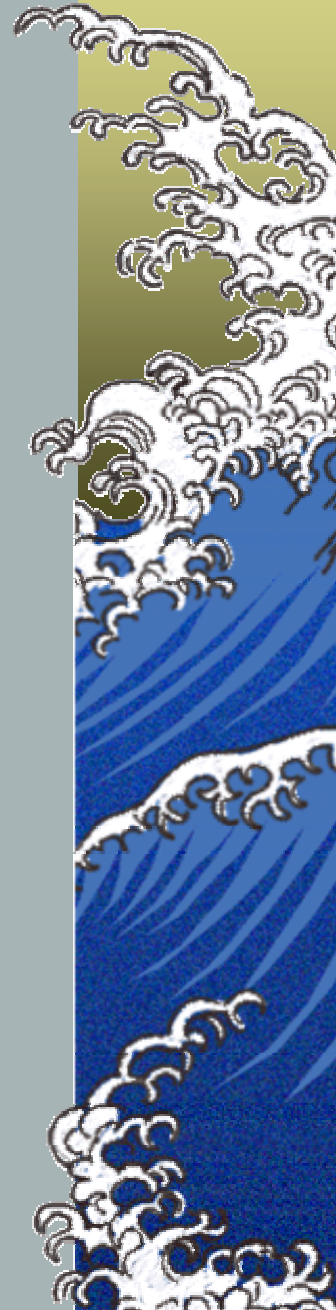
Swirl Separator in Parking Lot



Examples of Post Construction Stormwater BMPs

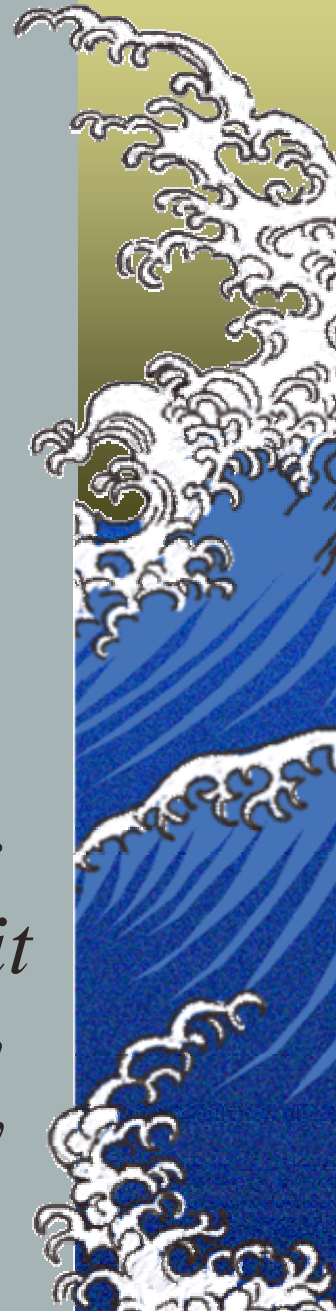


Detention Basin Adjacent to Residential Development



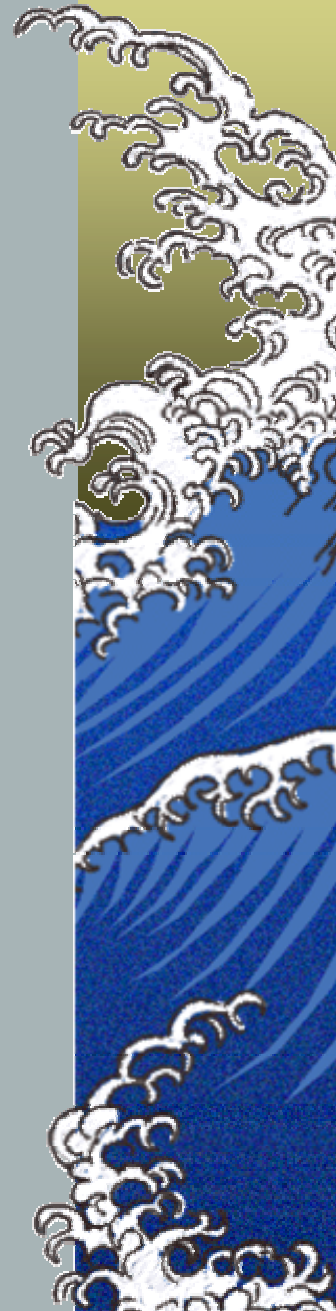
Implementing BMPs for New Development Projects

- ▶ *Two Possible Approaches:*
- ▶ *Overhaul Entire Development Approval Process to Adopt “Bulletproof” Legal Authority*
 - ▶ *Change Zoning Ordinance, Development Standards, Standard Details, Specifications*
- ▶ *Rely on Authority Contained in Stormwater Management Ordinance and NPDES Permit*
 - ▶ *In Other Words “Wing It” and Bluff Your Way Through...No One Will Challenge You Anyway*



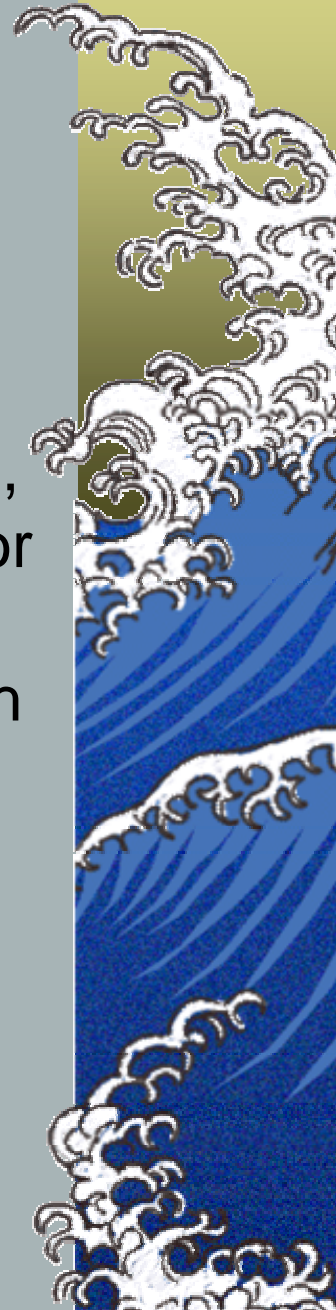
Implementing BMPs for New Development (continued)

- ▶ *Livermore Staff Have Required Swales Routinely for 4 Years Without Challenge*
- ▶ *Adequate Authority Exists in Stormwater Ordinance & NPDES Permit*
- ▶ *Developers Mostly Just Want to Know What They Need to Install to Get Their Projects Approved Anyway*



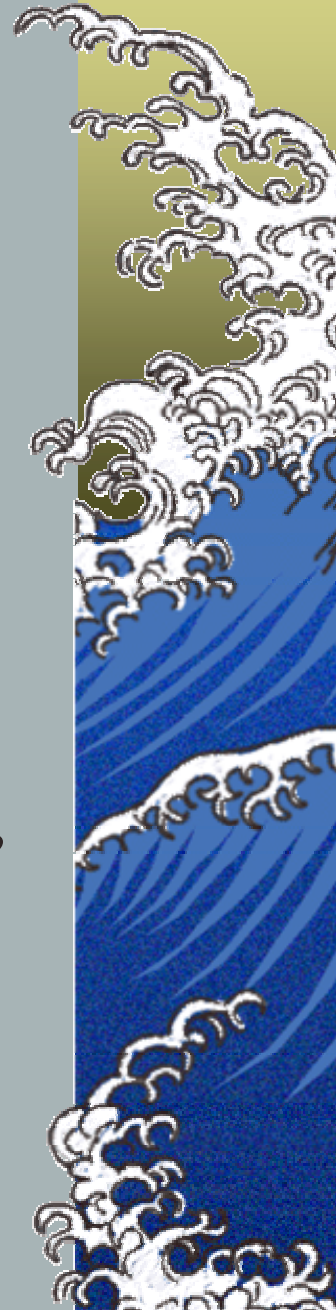
Legal Authority for Post Construction BMPs

- ▶ *Stormwater Ordinance Requirements:*
 - ▶ Where best management practice guidelines or requirements have been adopted by any federal, state of California, regional and/or city agency for any activity... every person undertaking such activity or operation, or owning or operating such facility shall comply with such guidelines or requirements...
- ▶ *NPDES Permit Provisions – Specifically Require Treatment Controls for New Development Projects*



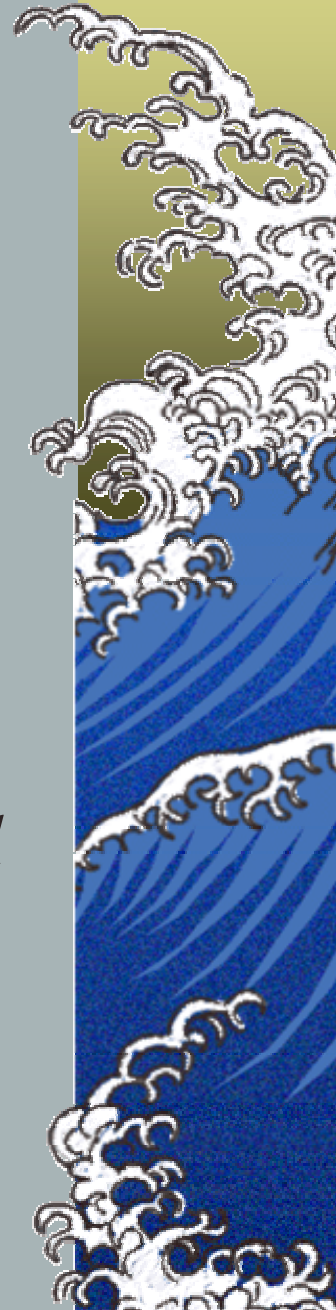
Legal Authority for Post Construction BMPs (cont.)

- ▶ *Specific and Detailed Ordinance Requirements and Specification are Always Best, BUT*
- ▶ *Don't Get Bogged Down Waiting for them, AND*
- ▶ *Stop Using That as an Excuse to Continue Doing Nothing!*
- ▶ *Avoid "PLANNER PARALYSIS" and Just Do It!*



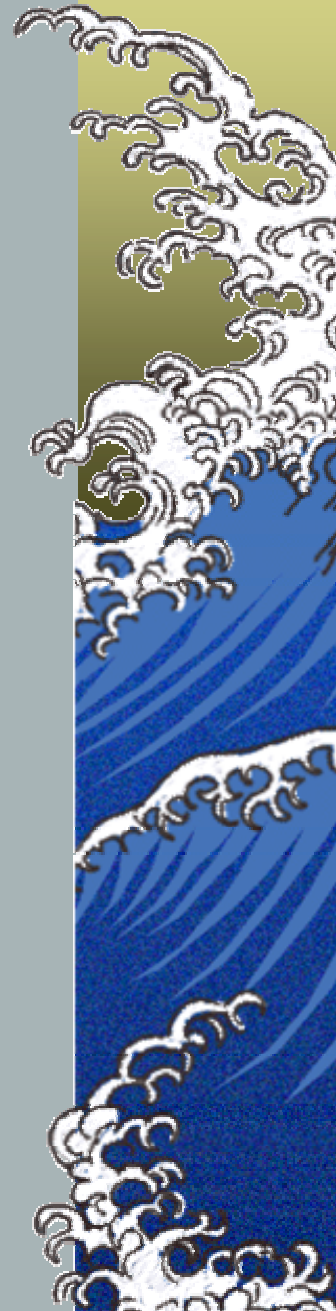
Getting the Word Out To Developers

- ▶ *Start as EARLY as Possible in the Planning Process to Avoid Resistance*
- ▶ *Clear Guidance Doesn't Necessarily Mean Designing it For Them...Let the Design Engineers Earn Their Money!*
- ▶ *Sites Vary Anyway....No One-Size Fits All Solutions*
- ▶ *General Guidance, Requirements, AND Educational Resources*



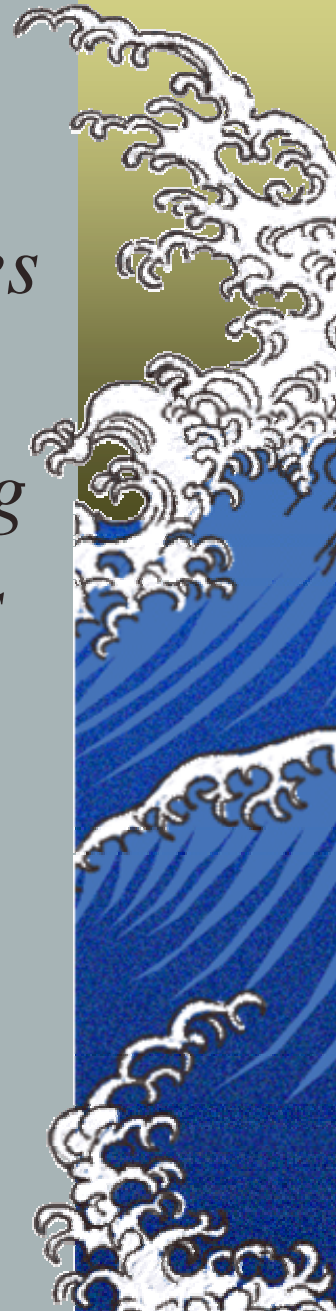
Design Resources

- ▶ *Start at the Source – Design & Technical Manual*
Developed by BASMAA



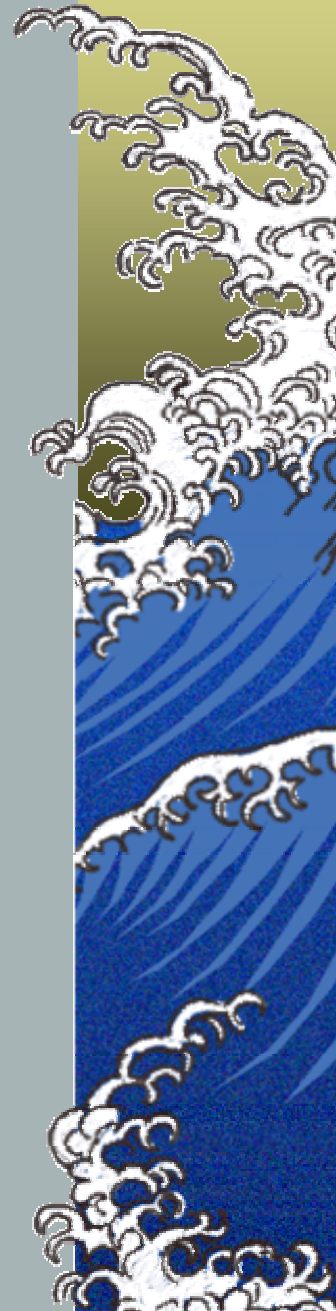
Livermore Swale Design Guidelines

- ▶ *Compiled From Various Studies/Resources*
- ▶ *Longitudinal Slope between 1-5%*
- ▶ *Adequate Underdrains to Prevent Ponding*
- ▶ *Over 3% Slope May Require Check-Dams*
- ▶ *No Ponding Longer than 48 Hours*
- ▶ *Side Slopes no more than 3:1 (Horizontal to Vertical)*
- ▶ *Swale Bottom Must be Graded Flat to Improve Pollutant Removal (No V-Ditch)*



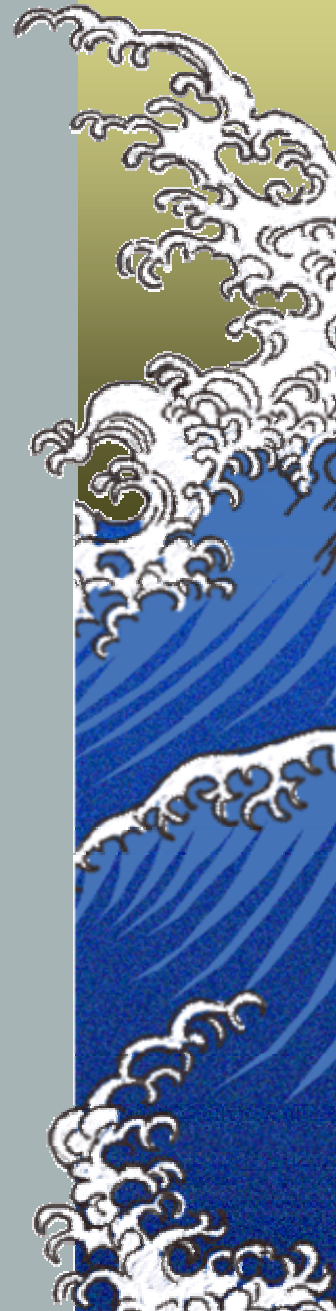
Livermore “Draft” Swale Guidelines (continued)

- ▶ *Swale Bottom Should be 4-6 ft Wide, but at Least 2ft Minimum*
- ▶ *Velocity Not to Exceed 2 ft/sec, Ideally Should be 1 ft/sec. Use Manning Equation with 2 n Factors – Low Flow and High Flow Conditions, OR.....*
- ▶ *Use Start @ the Source Guidance of 1200 sq ft of Usable Swale per Acre of Impervious Surface of Drainage Area*

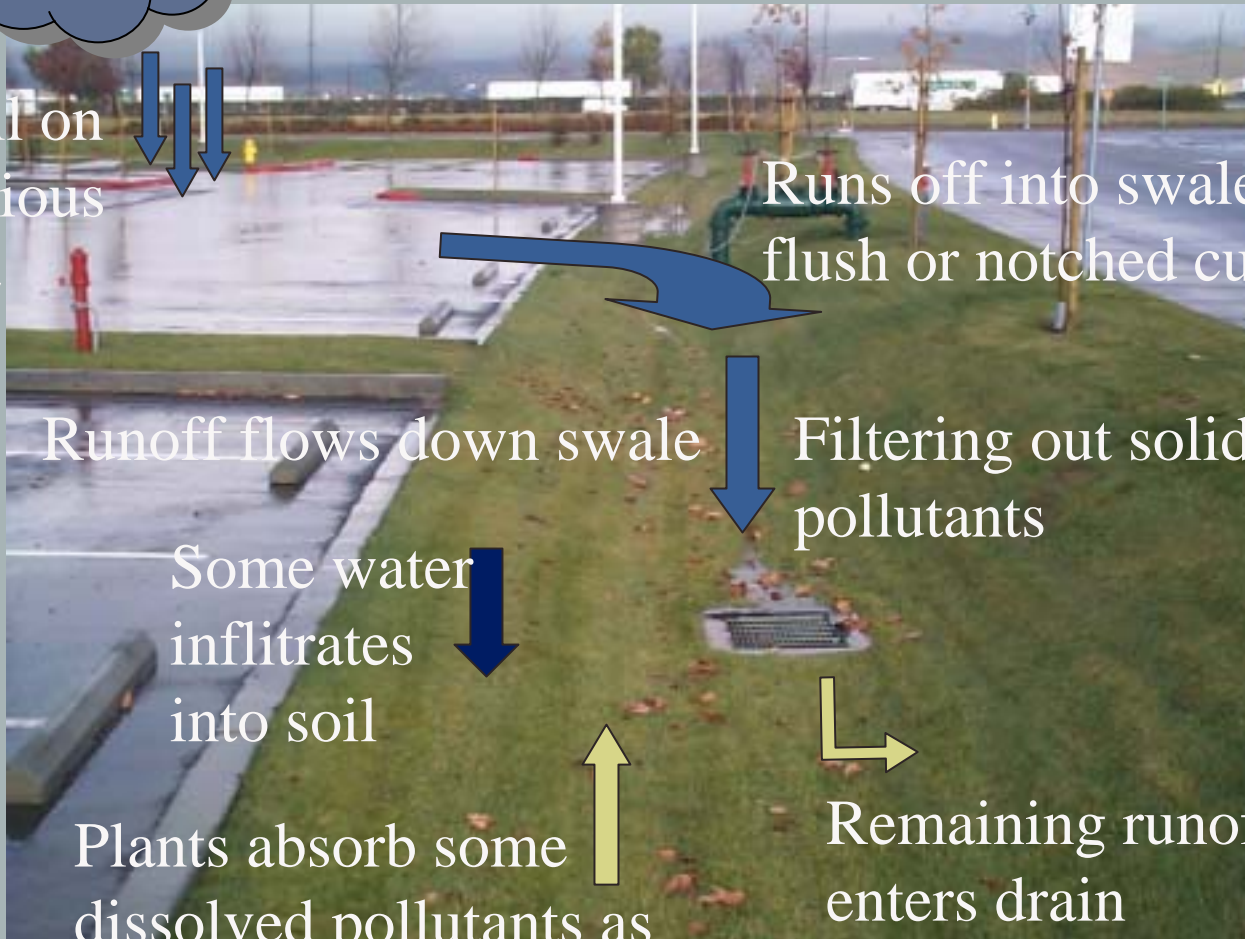


Livermore “Draft” Swale Guidelines (continued)

- ▶ *Residence Time Should be 10 min or Greater in Swale to Maximize Pollutant Removal*
- ▶ *Swales in Residential Parkway Strips Must be a Minimum of 12 feet wide. 15 ft or More is Recommended*
- ▶ *Use Imported Soils or Sand in Areas of Low Permeability to Reduce Ponding*
- ▶ *Starting to Require Signed Maintenance Agreement for Treatment Controls*



What Does a Bioswale Look Like & How Does it Work?



Rainfall on
impervious
surface

Runs off into swale over
flush or notched curb

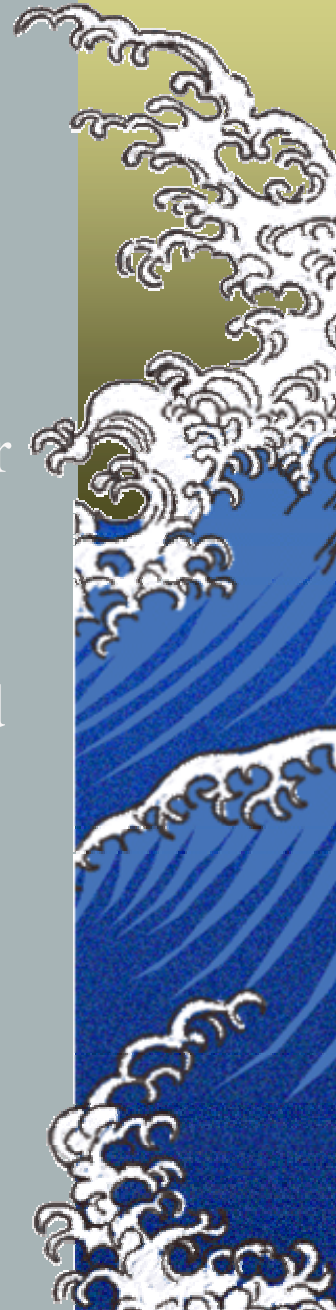
Runoff flows down swale

Filtering out solids and
pollutants

Some water
infiltrates
into soil

Plants absorb some
dissolved pollutants as
micronutrients

Remaining runoff
enters drain



Examples of Livermore Swales

- ▶ *Residential Area With Swales, 18-24 ft Streets to Minimize Impervious Area*



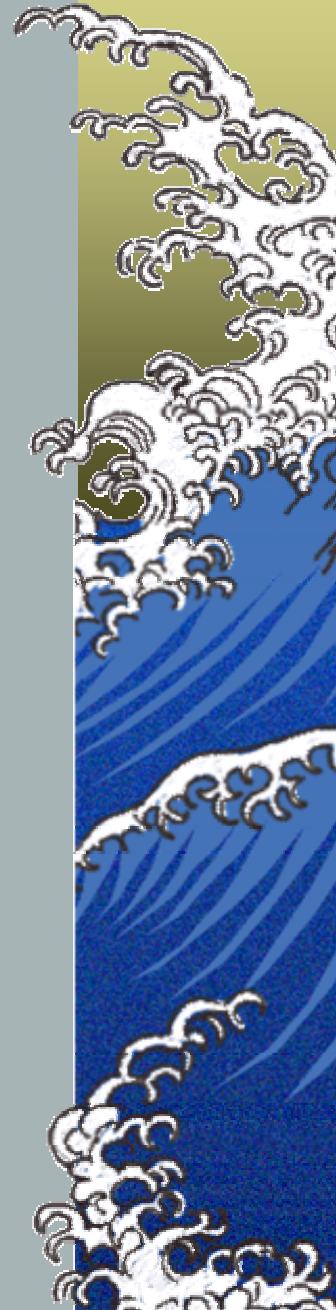
- ▶ *Parking Bays, Separated Driveways, Disconnected Roof Leaders*



Examples of Livermore Swales

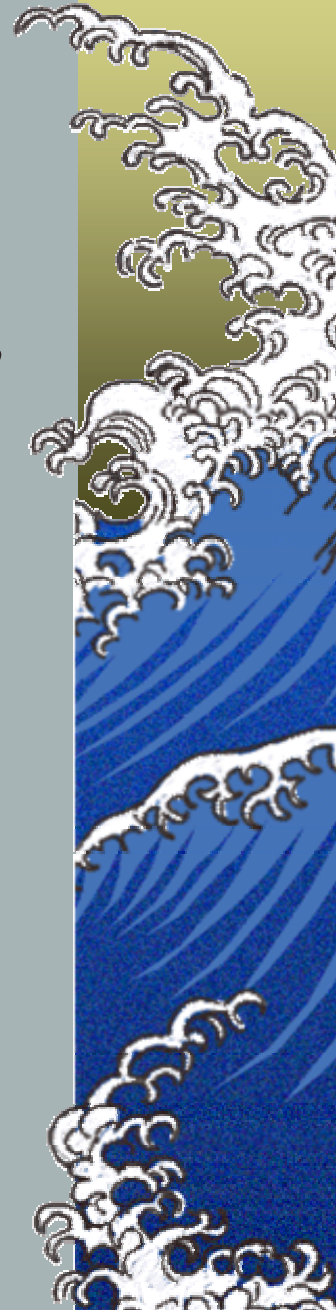


Parking Lot Swale With Flush Curb and Wheel Stops



Swale Installation Tips

- ▶ *Lowest-Level Laborer on Jobsite Can Cause Huge Problems – Landscapers Key*
- ▶ *Remember, it's Not Just Landscaping, it's a Drainage System, and MUST be Installed Carefully to Avoid Low Spots*
- ▶ *Install Turf 1-2 in BELOW Pavement or Curb to Allow Flow Into Swale*
- ▶ *Use Cobbles at Curb-Cuts as Energy Dissipaters to Reduce Scouring of Turf*

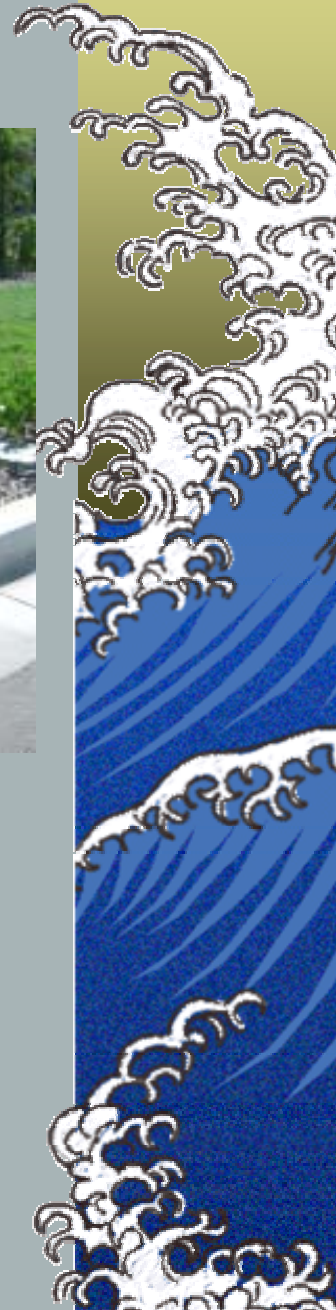


Installation Problem Example

▲ *Turf Installed Too High Creates “Lip” & Restricts Flow Into Swale*

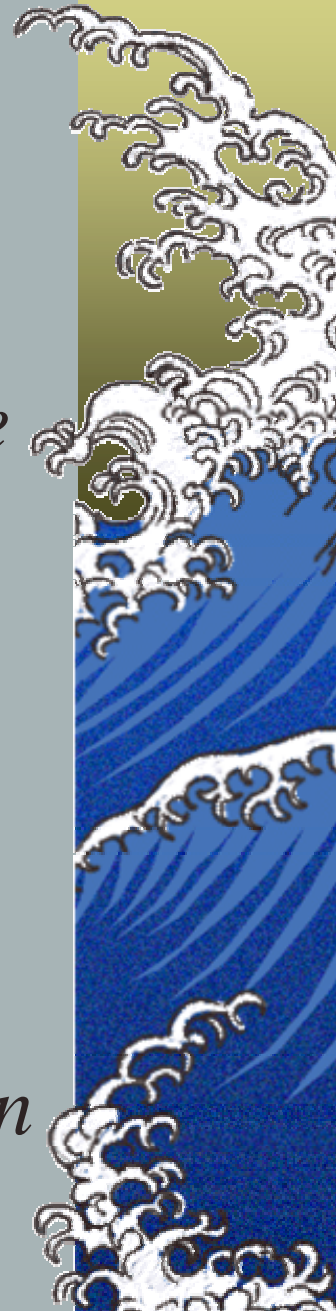


▲ *Swale Graded to “V-Ditch” Limits Effectiveness & Channels Flow*



Swale Plan Review Tips

- ▶ *Don't Assume Vegetation is Turf – Check Landscaping Plans Closely*
- ▶ *Ensure Swale is Wide Enough to Do Some Good – Check Grades & Side Slopes*
- ▶ *Ask for Clear Drainage Plans Showing Swale Area in Sq Ft and Contributing Drainage Area in Acres to Check 1200sqft/Acre Requirement*
- ▶ *Check Utilities (hydrants, lights, transformers, valve boxes) Often Shown on Separate Sheets*

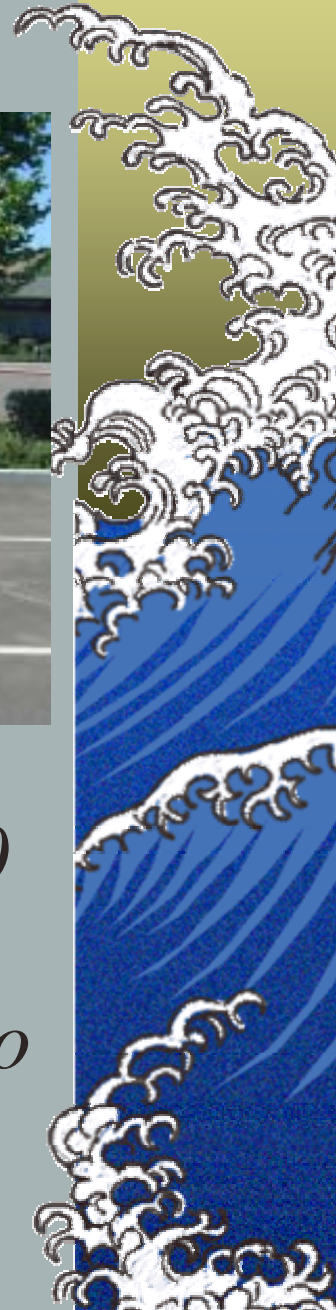


Plan Review Oversights

- ▶ *Check Landscaping Plan...Bark & Bushes in Swale*



- ▶ *Check Grading – 10 ft Wide But Only 2-3ft are Usable due to Grading*



Planning and Installation Oversights

▲ *Installed Too Flat With No Underdrain Creates Standing Water*



▲ *Plan Omitted Turf or Vegetation, Allowing Cattails to Invade the Swale*

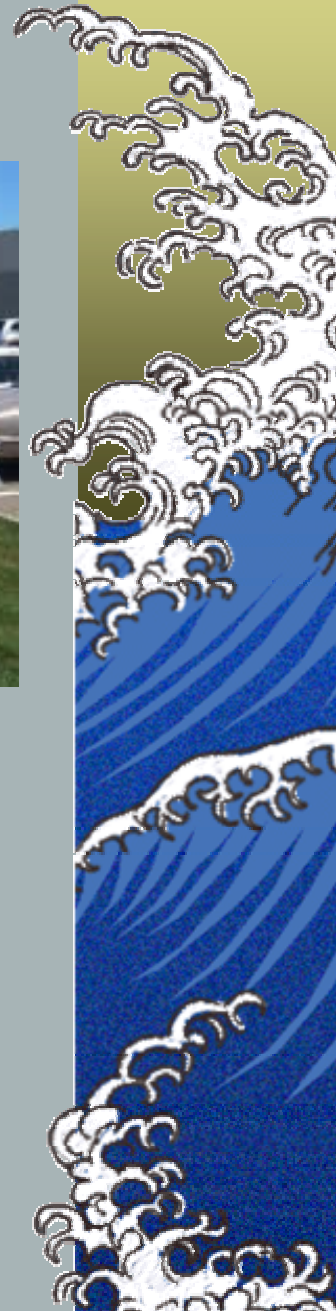


Inspecting BMPs - Vegetated Swales

- ▶ *Properly designed swales need less maintenance than manufactured controls... Basically Mow & Water*

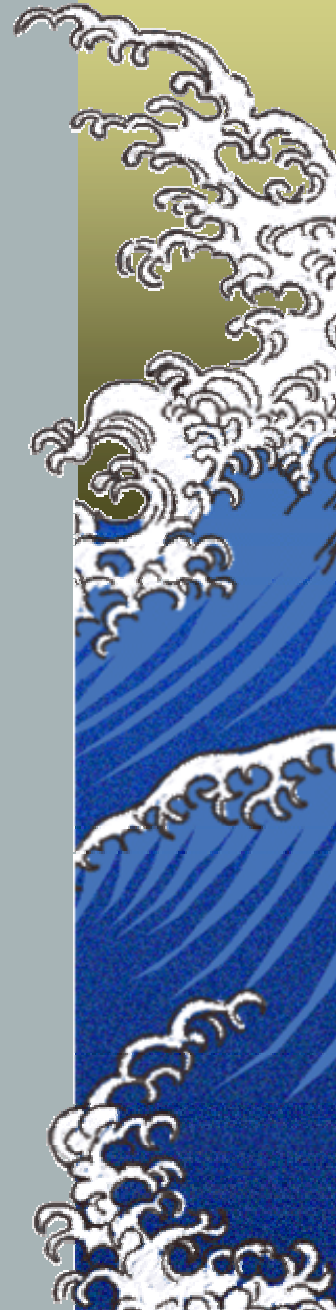


- ▶ *Inspections: look for sparse vegetation, channeling, erosion, ponding. Check inlets for debris.*



Inspecting BMPs - Separators & Inlet Filters

- ▶ *Inspect Device for Accumulated Oils, Sediment, Debris.*
- ▶ *Check Depth of Solids in Separators*
- ▶ *Pump Out Liquid & Sediments at Least Annually, if Not More Often*
- ▶ *Refer to Vendor Specifications for Cleaning Frequencies*
- ▶ *Visually Inspect Inlet Filters for Debris and/or Clogging*



Maintenance of Post Construction BMPs

- ▶ *Separators – Pump Out and Remove Solids Based on Manufacturers Specifications or More Frequently to Remove Scouring During High Flow Events*
- ▶ *Basins – Remove Accumulated Solids, Clear Vegetation if Necessary to Eliminate Standing Water, Repair Erosion of Side Slopes*
- ▶ *Swales – Reseed if Necessary, Maintain Permeability With Aeration, Remove & Replace Soils After 15-20 Years If Necessary*



Summary/Conclusions

- ▶ *Don't be Afraid to Start Requiring Treatment Controls NOW – Avoid “Planner Paralysis”*
- ▶ *Notify Developers of Requirements ASAP*
- ▶ *Give Guidelines and Education But Let Developers Design Controls*
- ▶ *Check Plans Closely for Adequate Sizing, Slopes & Vegetation Types*
- ▶ *Stress the Importance of Good Installation Techniques & Inspection (No Low Spots or Elevated Turf “Lips”)*

