



Low Impact Development to meet stormwater NPDES treatment and hydrograph modification management requirements

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Topics

1. Brief history of LID in California
2. Contra Costa's LID Approach
3. Objectives in developing San Diego's HMP criteria

A Brief History of LID in CA

- 2003
 - Contra Costa Approach
 - Hydrograph Modification Mgt.
- 2000
 - SWRCB *Bellflower* Decision
- 1999
 - Portland Stormwater Manual
 - *Low Impact Development* Manual
 - Imperviousness and flow-control
- 1994
 - *Start at the Source*
 - Stormwater NPDES Permits
- 1978
 - Village Homes, Davis

Village Homes

- Narrow streets
- Surface drainage
- Swales as an amenity



Stormwater NPDES—Early Years

- Characterization of urban runoff
- Focused on demonstrating reductions of pollutant loads
- End-of-pipe treatment vs. BMPs
- Design criteria for conventional treatment facilities
- “Do what you can, where you can.”

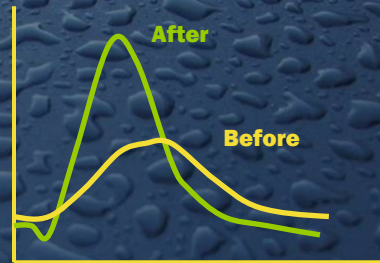
Start at the Source

- Preceded by San Francisco Bay RWQCB “Staff Recommendations” (1993)
- Emphasis on reducing imperviousness to reduce pollutant loading
- Addressed need to identify site-design alternatives
- Integrates urban design and site design
- No regulatory mandate



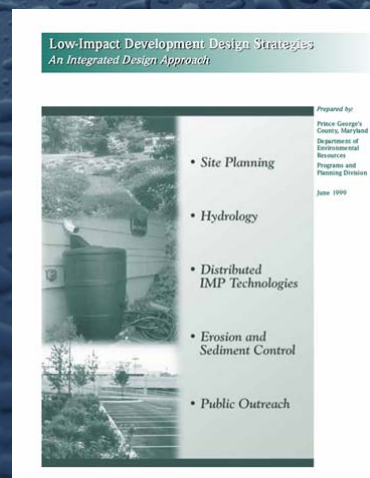
Imperviousness

- *Importance of Imperviousness* (1994)
 - Empirical relationship between watershed imperviousness and stream degradation
- Awareness of the effects of small storms and increased runoff frequency
- Peak flow control over a range of storm sizes
- Continuous simulation



Low Impact Development

- Developed as an alternative to treatment detention basins
- Addressed preserving site hydrology and natural functions
- Site design and bioretention (“rain gardens”)
- Included hydrologic criteria based on matching curve numbers



Portland Stormwater Manual

Simplified Approach for Stormwater Management Facilities

The city has produced this form to assist with a quick and simple approach to manage stormwater quality and flow control on projects. Application of these facilities using the specified sizing factor is required for use of this form. These facilities, when designed according to the required criteria, are considered to cover both quality and flow. Alternative design and sizing will not be considered under this simple approach.

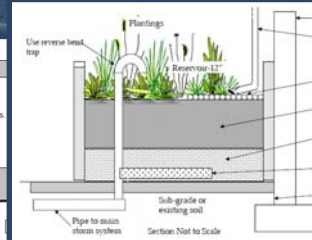
INSTRUCTIONS

1. Enter square footage of non-mitigated impervious area (total impervious site area or from the Mitigation Form, Box C) in Box 1 at the bottom of column 1.
2. Select the desired management measure(s). In Column 1, enter the amount of impervious area that will be managed by the facility(ies).
3. Add all facility impervious areas in column 1 and enter in Box 2. Note: Box 1 and Box 2 areas must be equal.
4. Multiply the unmitigated area in column 1 by the sizing factor in column 2 for each facility.
5. Use the required facility surface area if in column 3 to design the facility(ies).
6. Go to the "Simplified Approach Design Requirements" for facility descriptions and other requirements.

Facility	Column 1		Column 2	
	Non-mitigated Impervious Area	Unit	Sizing Factor	
Landscape Swale	_____	sf	x 0.05 =	_____
Vegetative Filter	_____	sf	x 0.065 =	_____ sf
Stormwater Planter	_____	sf	x 0.045 =	_____ sf
Landscape Infiltration	_____	sf	x 0.04 =	_____ sf
Sand Filter	_____	sf	x 0.045 =	_____ sf
*East Side Soakage Trench	_____	sf	x 0.05 =	_____ sf
*West Side Soakage Trench	_____	sf	x 0.075 =	_____ sf
Total Areas	_____ Box 2			
Total non-mitigated impervious area	_____ Box 1			

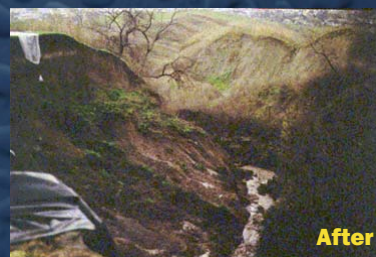
Total impervious area on the site, or the amount of non-mitigated impervious area in Box C, Form MIT

* Soakage Trenches are sized for stormwater disposal and water quality, and therefore cannot be reduced in size with mitigation. Revised September 1, 2000.



Bellflower Decision and HMPs

- *Bellflower* made the L.A. RWQCB's treatment criteria a statewide "maximum extent practicable" standard
- San Francisco Bay Board added "Hydrograph Modification Management"



Contra Costa's Approach

- LID is a means to achieve compliance with NPDES treatment and flow-control requirements
- Focus public resources on helping small developments, infill, and redevelopment to comply with NPDES requirements
- Be pro-active

Bioretention Areas — Subdivision



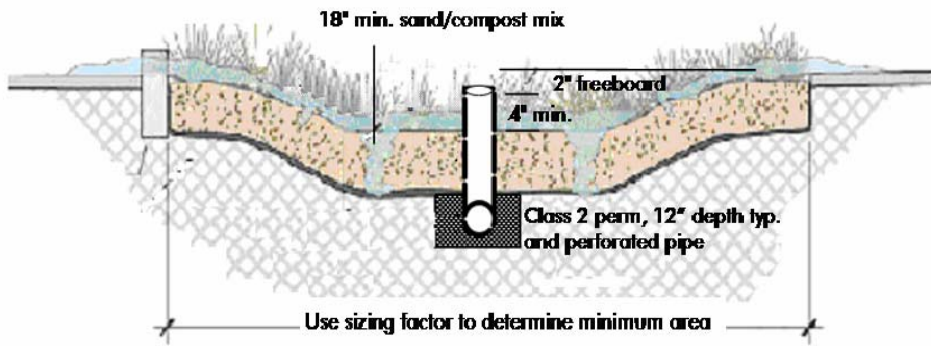
Swale — New Office/Retail



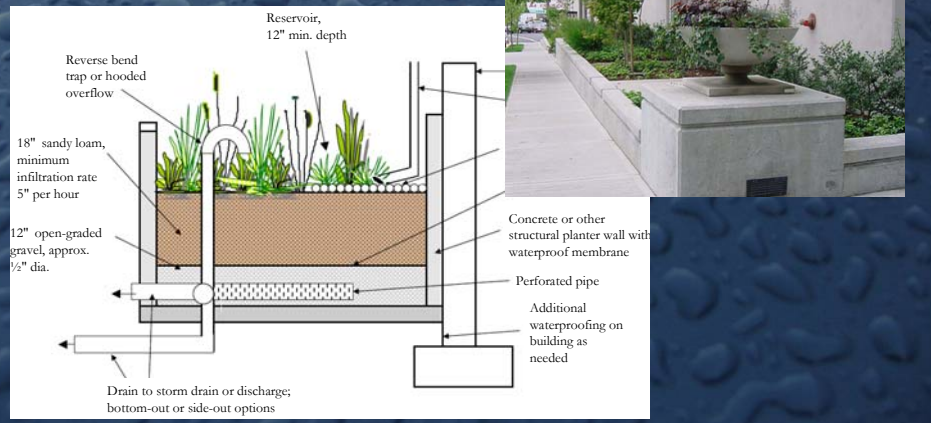
Large Hillside Development



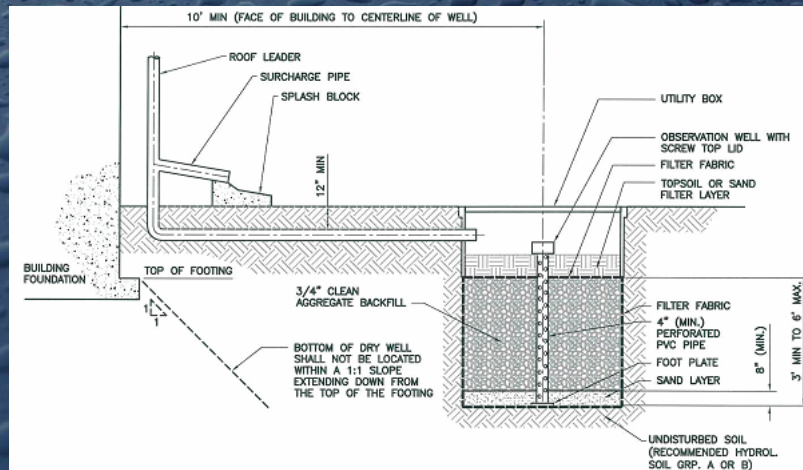
Swale



Planter Box

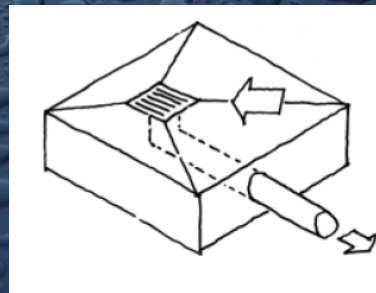


Dry Well

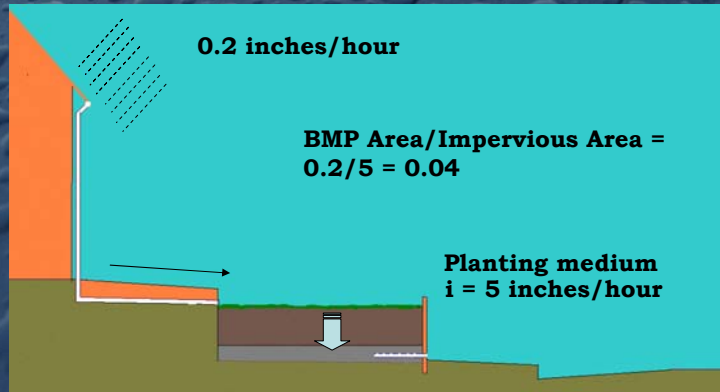


Showing Treatment Compliance

- NPDES Permit sizing criteria for treatment control:
 - “collect and convey” drainage design
 - Conventional “end of pipe” treatment
 - Composite “C” factors to determine design inflow or volume



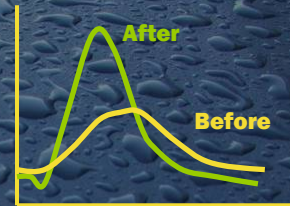
Sizing criterion for treatment



Application of sizing factor



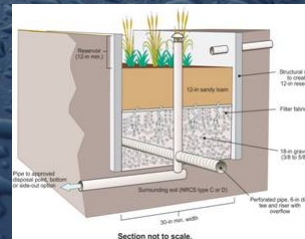
LID for flow control



- Can LID facilities mitigate increased peaks and volumes of flows from impervious areas?
- How would we demonstrate that?
- What are the design criteria?

Analysis for flow control

- 1-acre “unit” catchment
- 33 years hourly rainfall
- Pre-project condition
- 100% impervious condition
- Hydrologic soil groups A, B, C, D
- 7 types of facilities
- Larger sizing factors



HMP Criteria for San Diego

- Translate stream flow objectives into criteria for individual development sites
- Easy-to-implement criteria for smaller developments and redevelopment projects
- Simple to build, reasonably sized LID facilities

Other Compliance Options

- Show project will not increase impervious surface
- Perform site-specific hydrologic analysis using continuous simulation
- Demonstrate receiving streams are not vulnerable to erosion