



GLOBAL CONNECTIONS DAY
OCTOBER 23, 2019

**WATER: SAFETY, EFFICIENCY
AND CONSERVATION**

2019 ANNUAL CONFERENCE
Oct. 20–23, 2019 | Rio Hotel & Convention Center





STORMWATER RETENTION SOLUTIONS FROM LOS ANGELES BASIN

Ara Sargsyan & Lisa Naslund
Los Angeles Basin Chapter ICC

Stormwater Retention – Solutions from La Basin



**Our Planet
Faces
enormous
challenges**

Global Warming

Resource Shortages

Mass migration

“Business as usual” won’t work

We have to assist our planet

What we do as stormwater regulators, enforcers,
collaborators is a small but significant contribution

Stormwater Retention – Solutions from La Basin



What would happen if the water ran out:

It already almost did in Cape Town, South Africa
They had been bracing for 4 years to have ZERO water
in April 2018

Rains in June 2018 relieved a shortage of water for 4
million people.

Chennai, India has been the next city to face water
supply failure

Los Angeles, El Paso TX, Miami FL, Phoenix AR, and
Atlanta GA are US cities that could run out of water. *



*<https://weather.com/news/weather/video/5-us-cities-that-could-run-out-of-water>

Stormwater Retention - Our Contribution



From beaches to deserts

From urban to rural

All projects in these various locales have the potential to
make a contribution – to recharge the water table

Storing our most valuable resource - WATER

Stormwater Retention - Our Contribution



We know what we should and could do. Now how do we implement stormwater retention to do our part?

Today's Topics:

Brief overview of LA Basin's stormwater Low Impact Development (LID) Requirements – above and beyond the minimum

Small scale residential

Large scale non-residential

LID review and inspection

Project Examples

Instead of this . . . do that . . .

Paradigm shift for designers, contractors, inspectors

Concerns – vector control, removals (rain barrels), maintenance

Stormwater Retention - Our Contribution



Los Angeles Basin LID

SUSMP

- Became effective in 2002 by MS4 Permit issued by LA-RWQCB
- Covered 8 categories
- Infiltrate or treat runoff from 3/4" storm

LID

- Became the law of the land in 2013 through MS4 by Waterboard
- City and County of LA adopted more stringent ordinances

LID

Applicability

- New residential structures and significant additions
- Non-Residential that have 500 sq. ft. or more disturbed area

LID

Requirements

- Must retain 85th or first 3/4" rain event
- If not feasible; then biofilter 1.5 times the volume

History of LID in the LA Basin



LID becomes law of the land
for ALL Cities within LA
County

MUST retain the 85th
percentile or first ¾" inches
whichever is greater
through infiltration, capture
& use. If not, biofilter
(150%)

SUMP required through
MS4 Permit issued by LA-
RWQCB
Only 8 categories
Infiltrate OR treat runoff
from the first ¾" – that's it!!

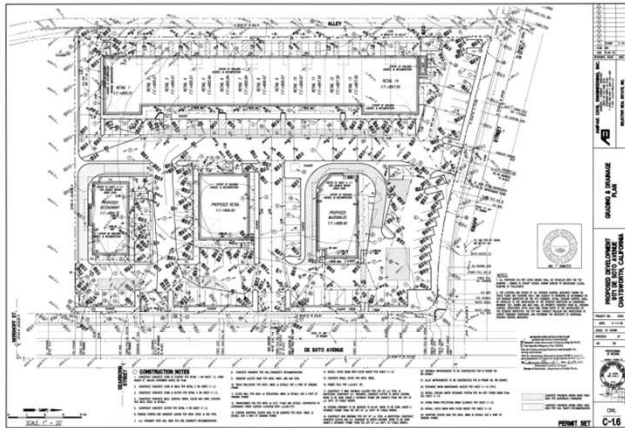
2002

2012

2014

Low Impact Development
Ordinance passed – more stringent
than Regional Board Requirements
Now ALL new residential projects
and non-residential projects that
create additional impervious area
required to comply
Can retain first ¾" rain event if not
apply water conservation measures

LID Project Categories



Small Scale Residential

Four units or less

Pick Two BMPs

Non-Residential

All other development
500 SF vs. 10,000 SF impervious area

2500 SF in Significant Ecological Area

Residence disturbing 1 acre and 10,000 impervious area

Non-Residential Implementation

Infiltration of Vm

Capture and Use of Vm

Biofiltration of 1.5 times Vm

Stormwater Retention – Solutions from La Basin



**Single Family
Residence
Requirements –
Pick Two!**

Disconnect
Impervious
Surfaces

2 Drought
Tolerant Trees
and a Smart
Irrigation
Controller

Dry Well

Porous pavement

Stormwater Retention – Solutions from La Basin



Single Family Residence Requirements – Pick Two!

Staff Picks:

- Disconnect Impervious Surfaces
- 2 Drought Tolerant Trees and a Smart Irrigation Controller

Why? Virtually no
maintenance, how its built
is how it stays and how it
functions.
A true no-brainer.

Stormwater Retention – Solutions from La Basin



Both paved areas and roof drainage diverted with
cross slopes to pervious front landscaping

Guidelines To Implementation Techniques - Small Scale Residential

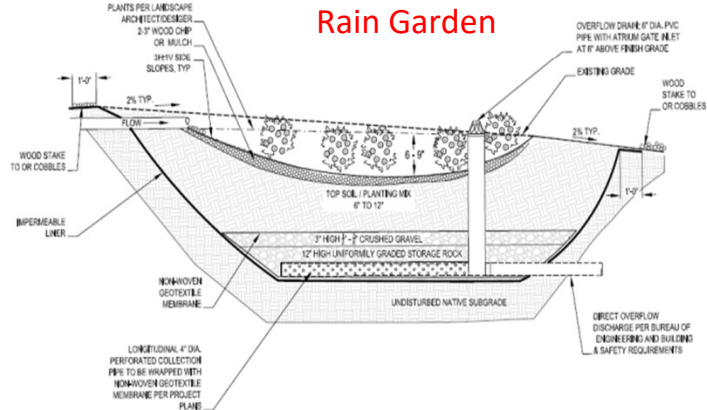


Prescriptive Method - No report or calculations

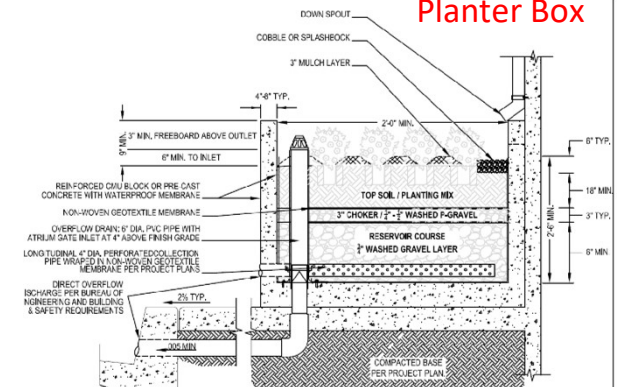
1. Rain Barrels or Tanks
 - Placement Guidelines – evenly distributed
 - Sizing : 200 gallons (4 50 gallon tanks)
2. Rain Garden (lined & Unlined)
 - Design Guidelines (Lined or Unlined)
 - Sizing: 200 Gallons
3. Planter Box
 - Design Guidelines - 10 Ln ft, 2.5' depth,
 - 2' wide, evenly distributed
 - Sizing: 200 Gallons



Rain Garden



Planter Box



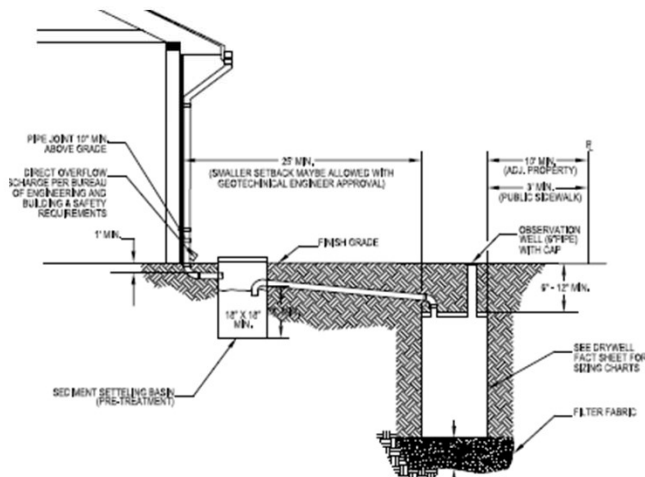
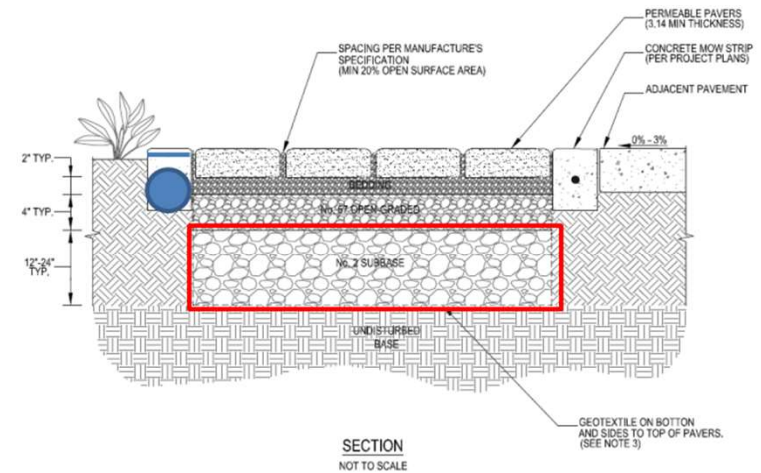
Rain barrels

Guidelines To Implementation Techniques - Small Scale Residential



Prescriptive Method - No report or calculations (Cont.)

4. Porous Pavement (incidental & retention)
 - Design Guidelines for concentrated flow
 - Sizing
5. Dry Well
 - Design Guidelines - feasibility, setback requirements, minimum soils permeability
 - Sizing: 200 gallons



Sample Design Calculations For Large Scale Development



LA City Planning and Land Development Handbook for LID 2016

• Appendix F – Sample Design Calculations

FLOW RATE AND VOLUME CALCULATION EXAMPLE

Volume must be calculated for each tributary area to size each BMP.

PROJECT NAME: Commercial Site (Intersection of Western Ave & Washington Blvd)

Provide proposed project characteristics

A_{Total}	<u>1.15 Acres</u>
Type of Development	<u>Commercial</u>
Flow Path Length	<u>200 ft</u>
Flow Path Slope	<u>.01 (1%)</u>
% of Project Impervious	<u>87 %</u>
Predominate Soil Type #	<u>13</u>
Design Storm*	<u>85th percentile</u>

****Projects are required to use the larger of the Stormwater Quality Design Storm.***

- The volume of runoff produced from a 0.75 inch (or 0.0625 ft) storm event, or***
- The 85th percentile, 24-hr runoff event at this location = 1.1 inch (or 0.91 ft)***

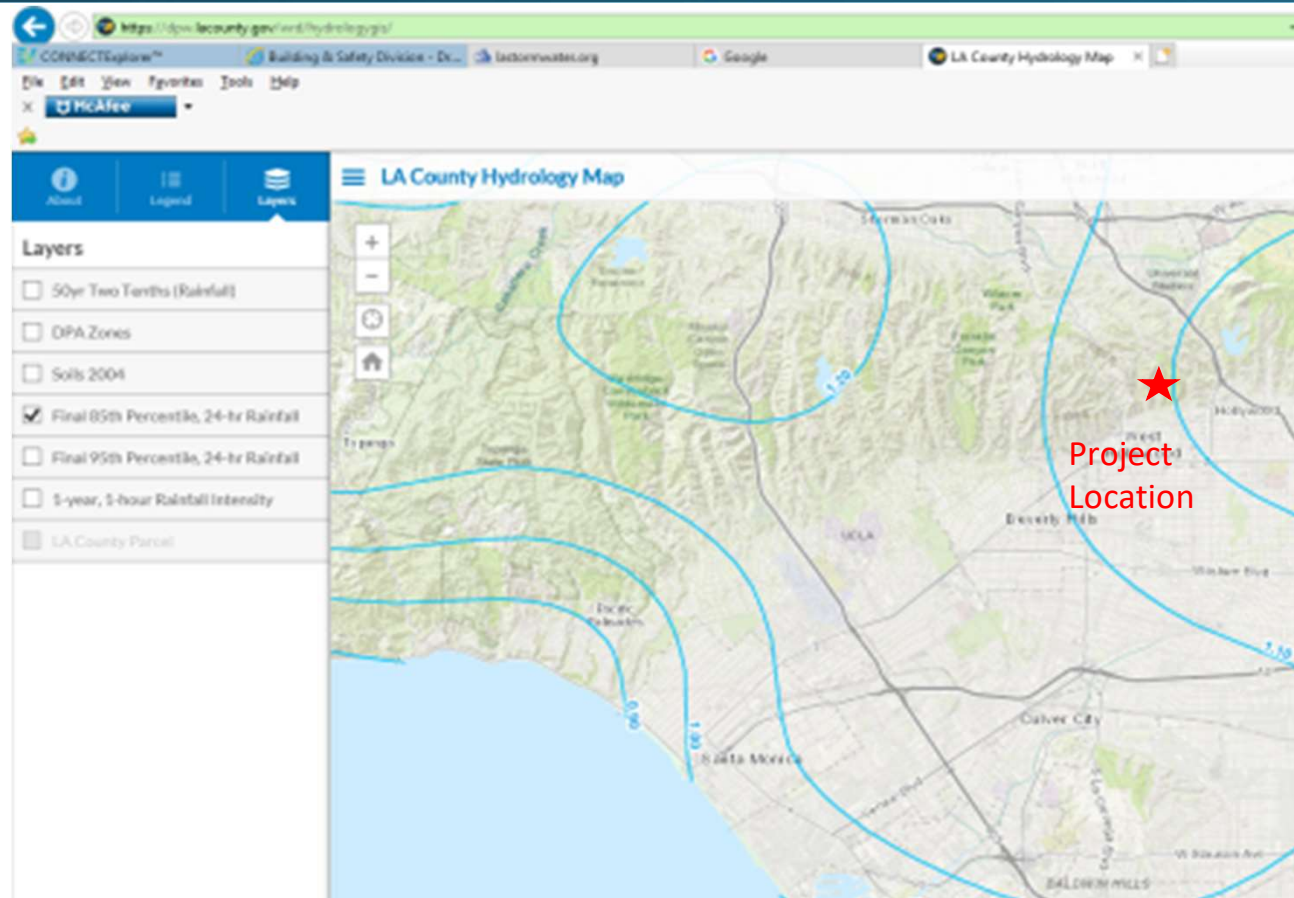
Refer to LA County Hydrology GIS Map
<http://dpw.lacounty.gov/wrd/hydrologygis/>

Sample Design Calculations For Large Scale Development



LA City Planning and Land Development Handbook for LID 2016

- LA County Hydrology Map - <https://dpw.lacounty.gov/wrd/hydrologygis/>



Sample Design Calculations For Large Scale Development



LA City Planning and Land Development Handbook for LID 2016

• LA County Hydrology Map - <https://dpw.lacounty.gov/wrd/hydrologygis/>

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Refer to LA County Hydrology GIS Map
<http://dpw.lacounty.gov/wrd/hydrologygis/>

Review And Approval Process Towards Building Permit Small Scale



LOW IMPACT DEVELOPMENT (LID) CHECKLIST SMALL SCALE RESIDENTIAL (4 UNITS OR LESS)

Fee (QC 720): \$206
Includes 3% surcharge

WPD Project Plan Checker:
Counter: 213-482-7066

PCIS# _____

The following is a list of outstanding items that are required in order for the project to be approved by the WPD for compliance with the stormwater runoff requirements:

- Complete the Project Summary Clearance Form (**Reverse side**)
- Chose from prescriptive list of BMP options (Appendix E) and size adequately by tributary area.
- Provide Hydrology Calculation (**Vm**) of mitigated stormwater runoff for each sub drainage area and provide adequate BMP for mitigation. Provide summary table on plans.
- Show **on architectural site plan** location and size of BMP(s) to scale. Provide dimensions, reference to detail, include inlet and outlet invert elevations.
 - Identify vegetated landscape areas **on plans**. Identify all hardscape areas **on plans**.
- Show **on plans** detail drawings (w/size & model) of the BMP device(s).
- Show **on roof plans** roof drainage layout and connection(s) to treatment system(s).
- Show **on architectural elevation plans(s)** the down spouts / roof drains and BMP device(s) drawn to scale.
- Fill out and provide Stormwater BMP Verification Form on plans.
- Provide Stormwater Observation Report Form on plans.
- Stencil at all drainage inlets (i.e. catch basins, trench drains). Stencil requirements shall be noted **on plans**.
- Obtain infiltration system approval letter from Building & Safety, Grading Division (include soil report and percolation test). Include copy of Approval Letter **on plans**.
- Obtain stormwater use approval from County of Los Angeles, Department of Public Health. Provide approval letter on Plans.
- Submit completed Covenant & Agreement (C&A) Form with Operation and Maintenance (O&M) Plan for approval and signature prior to County recordation. Provide 8.5"x11" Plot Plan showing location and size of each BMP(s). Submit Supplemental C&A. Submit Termination C&A.
- Submit letter of authority/grant deed for the individual(s) signing the Covenant and Agreement.
- Provide one (1) set of full size plans for first time review; two (2) sets of full size plans at the **FINAL SIGN OFF. Engineer's wet stamp and signature is required for projects over 2,500 SF of impervious area.**
- Return marked up plans with resubmittal.
- Others:** _____

Project Summary Clearance Form			
Permit Application #	_____ - _____ - _____	BMP4 - Type	
Development Type:	Redevelopment? (Y N) / Liquefaction? (Y N)	BMP4 - Quantity	
	ESA? (Y N) / Hillside Grading Area? (Y N)	BMP4 - Size	
APN #		Contact Person	
Development Address		Phone #	
Zip Code		Email	
Watershed (Circle one)	Ballona - LA River - Dominguez Channel - Harbor - Santa Monica Bay	Owner	
Development Impervious Area (Acre)		Owner Phone #	
Development Pervious Area (Acre)		Date Submitted	/ /
V _m	_____ FT ³ Or _____ Gal.	WPD Staff	
BMP1 - Type		Office (circle one)	Figueroa - Van Nuys - West LA - Harbor
BMP1 - Quantity		List All Other Permit Applications Stormwater Clearance:	
BMP1 - Size			
BMP2 - Type			
BMP2 - Quantity			
BMP2 - Size			
BMP3 - Type			
BMP3 - Quantity			
BMP3 - Size			

And Approval Process Towards Building Permit Large Scale



LID Report : Project description and scope of work; existing and proposed drainage; hydrology calculations; feasibility discussions of implementation techniques; BMP type, and size; summary table; AND most IMPORTANTLY supporting documents

Plans: LID elements shall be part of the permit set:

- Architect – Site plans identifying all pervious and impervious areas; location of BMPs; size and dimensions. Roof and elevation plans shall show DS and connection to the BMP
- Civil – Grading and drainage plans showing BMPs, size and dimensions, POC, inverts, depths, and over flow connection to the street, BMP details...
- Plumbing – Show all drainage (AD, RD, DS, PD, DD...) and how they are routed to each BMP or POC with reference, and simplify in riser diagrams.
- Landscape – Location of cistern system with reference to POCs, landscape area served by the cistern, drip irrigation network , LA County Health approval letter

LOW IMPACT DEVELOPMENT (LID) CHECKLIST ALL OTHER DEVELOPMENT PROJECTS



	Regular	Expedite (add)
Fee:	\$ 721 (QC 721) _____	\$357 (QC 719) = \$ 1,081.50 _____
Fee:	\$ 824 (QC 714) _____	\$408 (QC 717) = \$ 1,236 _____
Fee:	\$ 1,030 (QC 715) _____	\$510 (QC 718) = \$ 1,545 _____
Other:	_____	
Includes 3% surcharge fee		

Your WPD Project Plan Checker: _____

Counter: 213-482-7066 Office: 213-485- _____

PCIS# _____

The following is a list of outstanding items that are required in order for the project to be approved by the WPD for compliance with the stormwater runoff requirements:

- Complete the Project Summary Clearance Form (Reverse side).
- Provide treatment train BMP to pre-treat and infiltrate/retain/reuse the first 0.75-inch 85th percentile rain event as required by the City of Los Angeles' LID Ordinance and the Regional Board NPDES permit.
- Provide soil report addressing infiltration feasibility (include percolation test). Obtain approval from Building and Safety, Grading Division on the location of the proposed infiltration system, and include a copy of approval **on plans**.
- Show **on plans** detail drawings (w/size & model) of the BMP device(s) including inlet and outlet elevations.
- Show **on plans** roof drainage layout and connection(s) to treatment system(s). Include riser diagram.
- Submit completed Covenant & Agreement (C&A) Form with Operation and Maintenance (O&M) Plan for approval and signature prior to County recordation. Provide 8.5"x11" Plot Plan showing location and size of each BMP(s). Terminate old C&A.
- Submit letter of authority for the individual(s) signing the Covenant and Agreement (original copy).
- Stencil at all drainage inlets (i.e. catch basins, trench drains). Stencil requirements shall be noted **on plans**.
- Label Trash Enclosures and show detail **on plans**.
- Identify Vegetated areas **on plans**. Add a note "All slopes must be vegetated" **on plans**.
- Provide Hydrology Calculation to determine the volume (Vm) and/or flow rate (Qpm) of mitigated Stormwater runoff for each treatment system of a sub-drainage area. Show selected BMP type and size.
- Provide one (1) set of full size plans for first time review; three (3) sets at the final SIGNOFF, with Engineer's wet stamp and signature.
- Obtain infiltration approval from the Upper Los Angeles Watermaster.
- Obtain stormwater use approval from County of Los Angeles, Department of Public Health.
- Return marked up plans and large scale plan check correction sheet with resubmittal.
- Others: _____

For additional information: www.lastormwater.org/green-la/low-impact-development/lid-documents/

Inspection Checklists

- Learn as you go
- Ensure Consistency
- Built-In Training material

Permit No.: _____
 Address: _____
 Date: _____
 Inspector: _____

Construction Meeting review:

- Provide and review checklist with contractor
- Approved LID plans
- Plan check engineer contact information
- Verify dimensions and location
- Discuss process of field changes to plans

Field Items:

- Site features match plans (paving and landscaping existing and proposed match)
- Verify number, sizing, and location drainage devices (inlets, catch basins, pipes, etc.) to Location of BMP match plans
- Number of BMPs match plans
- Dimension of BMP matches plans
- Accuracy of survey to verifying invert, TOG, BOG, location of BMP, and required setbacks and structure specific to each BMP (see below)
- Water Tech Certification – infiltration BMPs only

CISTERN SYSTEM (RAINWATER HARVEST)				

Site area: _____				
Subground: _____				
Capacity or Pump _____				
Water re-use (circle one)				
	PASS	PASS	PASS	

_____ (TD, CB, etc.) _____ (inlet system(s))				
_____ (the cistern)				

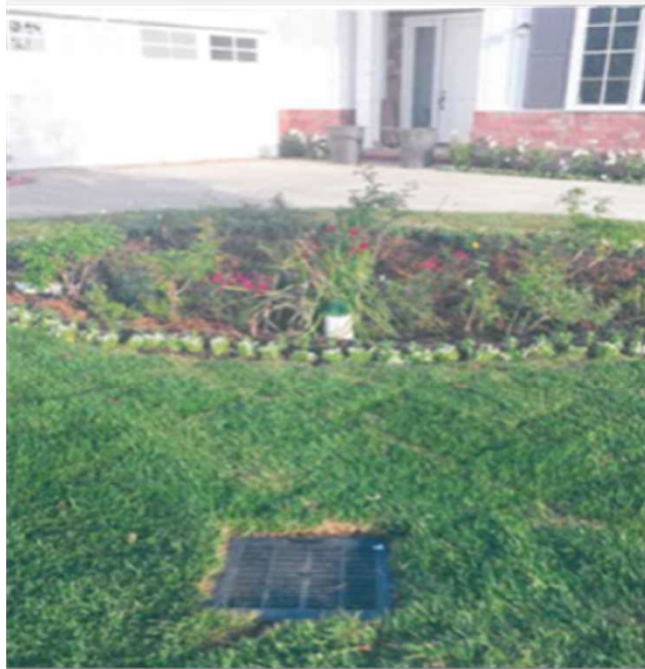
Stormwater Retention - Final Field Approval



Submittals

Photos throughout construction

Certification from civil or contractor



STORMWATER OBSERVATION REPORT FORM (Residential ≥ 5 units & All other Development)



LOW IMPACT DEVELOPMENT

IN THE EVENT THAT THE APPROVED STORMWATER BMP CANNOT BE BUILT PER PLANS (OR ANY MODIFICATION), CONSULT WITH BUREAU OF SANITATION STAFF PRIOR TO ANY PLAN MODIFICATIONS. FAILURE TO DO SO MAY DELAY OBTAINING A FINAL APPROVAL AND CERTIFICATE OF OCCUPANCY (C OF O).

STORMWATER OBSERVATION means the visual observation of the stormwater related Best Management Practices (BMPs) for conformance with the approved LID Plan at significant construction stages and a completion of the project. Stormwater observation does not include or waive the responsibility for the inspections required by Section 108 or other sections of the City of Los Angeles Building Code.

STORMWATER OBSERVATION must be performed by the engineer or architect responsible for the approved LID Plan or designated staff in their employment. As part of the observation, provide photos of the BMPs taken during various construction phases.

STORMWATER OBSERVATION REPORT must be signed and stamped (see below) by the engineer or architect responsible for the approved LID Plan and submitted to the city prior to the issuance to the certificate of occupancy. **PRIOR TO CERTIFICATE OF OCCUPANCY (C OF O), SOB FORM, PRINTED PHOTOS OF THE BMPs TAKEN DURING VARIOUS CONSTRUCTION PHASES AND APPROVED STAMPED PLANS BY THE BUREAU OF SANITATION MUST BE SUBMITTED TO THE PUBLIC COUNTER FOR STAFF APPROVAL.**

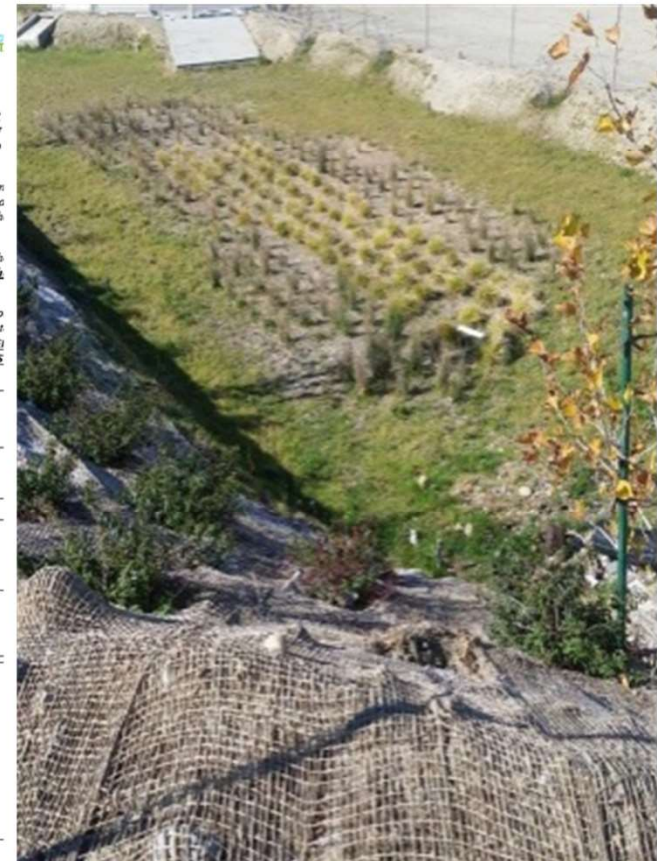
Project Address:	Building Permit No.:
Name of Engineer/Architect responsible for the approved LID Plan:	Phone Number:
List all BMPs installed as part of the project; Coordinates of the most significant (or typical) BMPs:	
BMP Type: _____ # of units: _____	BMP Type: _____ # of units: _____
Lat: _____ ; Long: _____	Lat: _____ ; Long: _____
Ex: Lat: 34.04152; Long: -118.25962 (5 sig digits)	
BMP Type: _____ # of units: _____	BMP Type: _____ # of units: _____
Lat: _____ ; Long: _____	Lat: _____ ; Long: _____

I DECLARE THAT THE FOLLOWING STATEMENTS ARE TRUE TO THE BEST OF MY KNOWLEDGE:

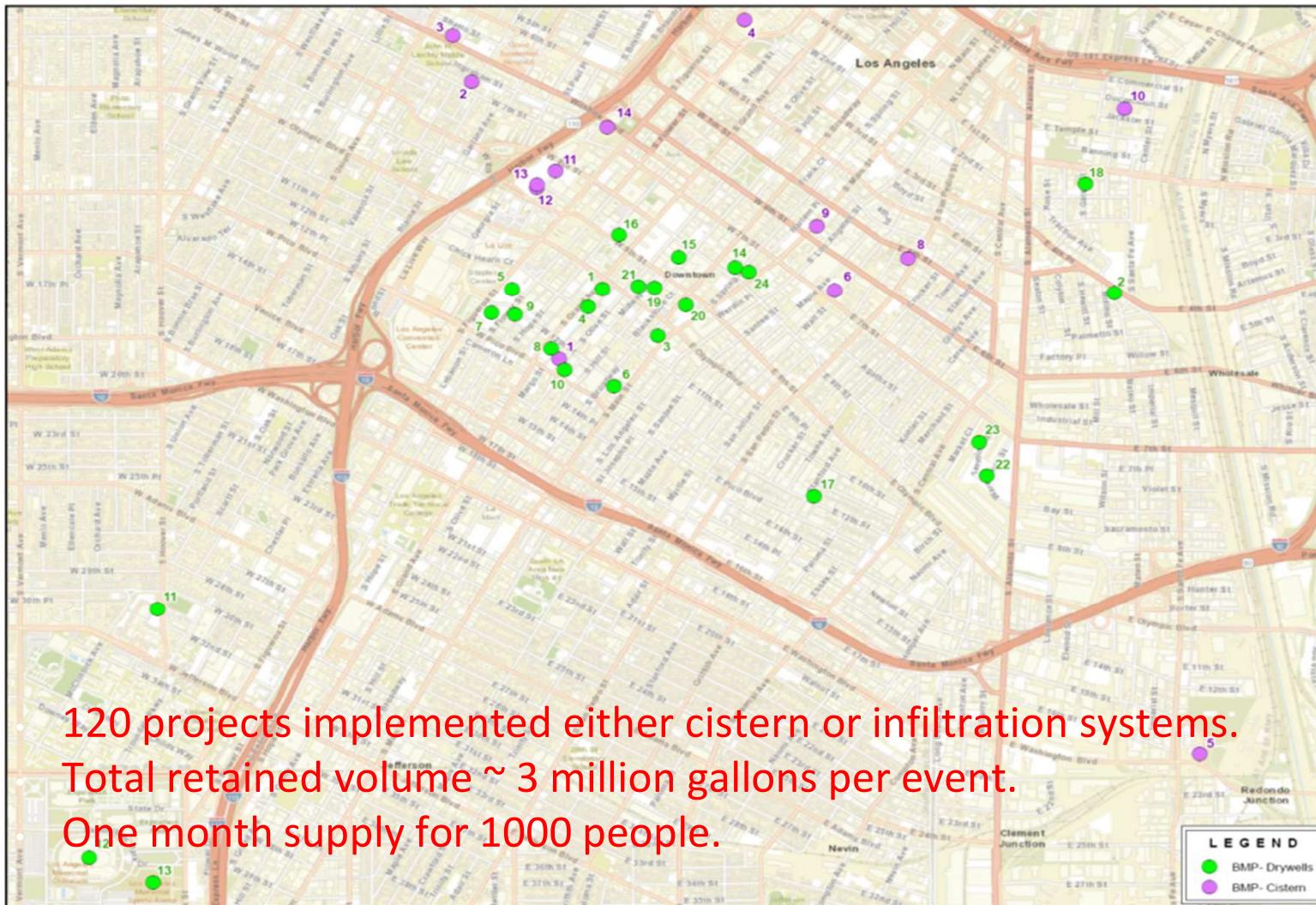
1. I am the engineer or architect responsible for the approved LID Plan, and;
2. I, or designated staff under my responsible charge, has performed the required site visits at each significant construction stage and at the completion to verify that the Best Management Practices (BMPs) as shown on approved plans have been constructed and installed in accordance with the approved LID Plan.

Wet Stamp of Engineer or Architect

Signature _____ Date _____



How Did DTLA Do?



120 projects implemented either cistern or infiltration systems.

Total retained volume ~ 3 million gallons per event.

One month supply for 1000 people.

How Did DTLA Do?



Metropolis: Mixed use development on 6 acres.

Combination of biofiltration, and cistern systems for cooling tower operation and landscape irrigation.

Total storage volume over 130K gallons



Wilshire Grand - 74 story mixed use building on 2.7 acres.

50K gallons cistern system designed to capture stormwater, then use treated volume in the cooling tower operation



Ocean Wide Plaza: 1-49 story building and 2-40 story buildings on 4 acres.

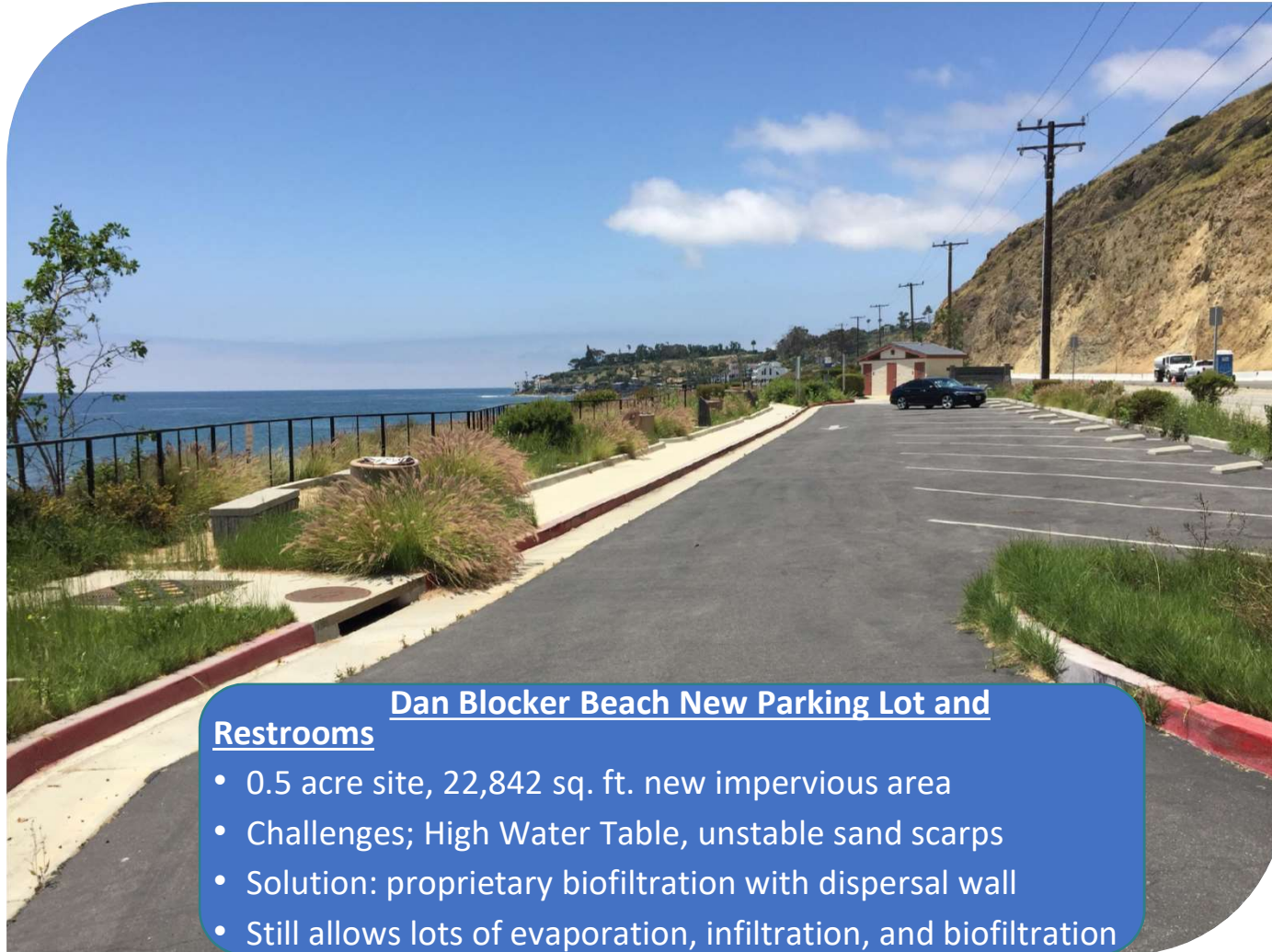
Dry well system designed to infiltrate/ retain over 100K gallons



LAFC is a 22K seats soccer stadium on ~20 acres site.

Retains and infiltrates over 400K gallons through the implementation of 7 dry wells and 2 unlined vegetated swales

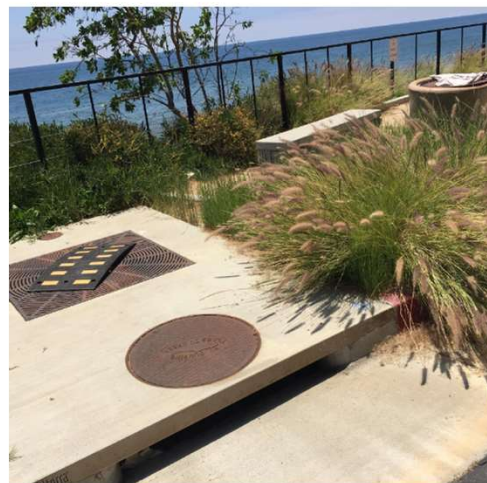
Biofiltration - Beach Solution on Pacific Coast Hwy



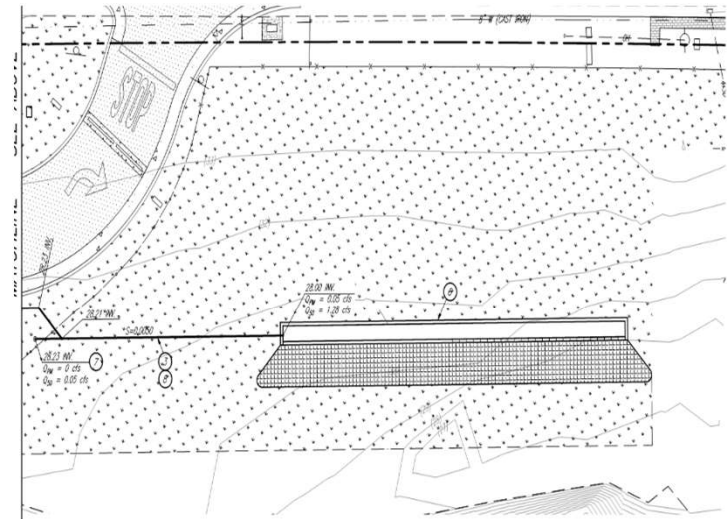
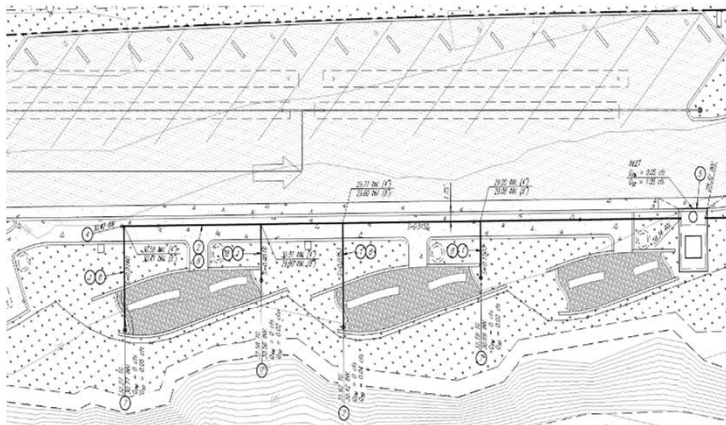
Dan Blocker Beach New Parking Lot and Restrooms

- 0.5 acre site, 22,842 sq. ft. new impervious area
- Challenges; High Water Table, unstable sand scarps
- Solution: proprietary biofiltration with dispersal wall
- Still allows lots of evaporation, infiltration, and biofiltration

Biofiltration - Beach Solution on Pacific Coast Hwy



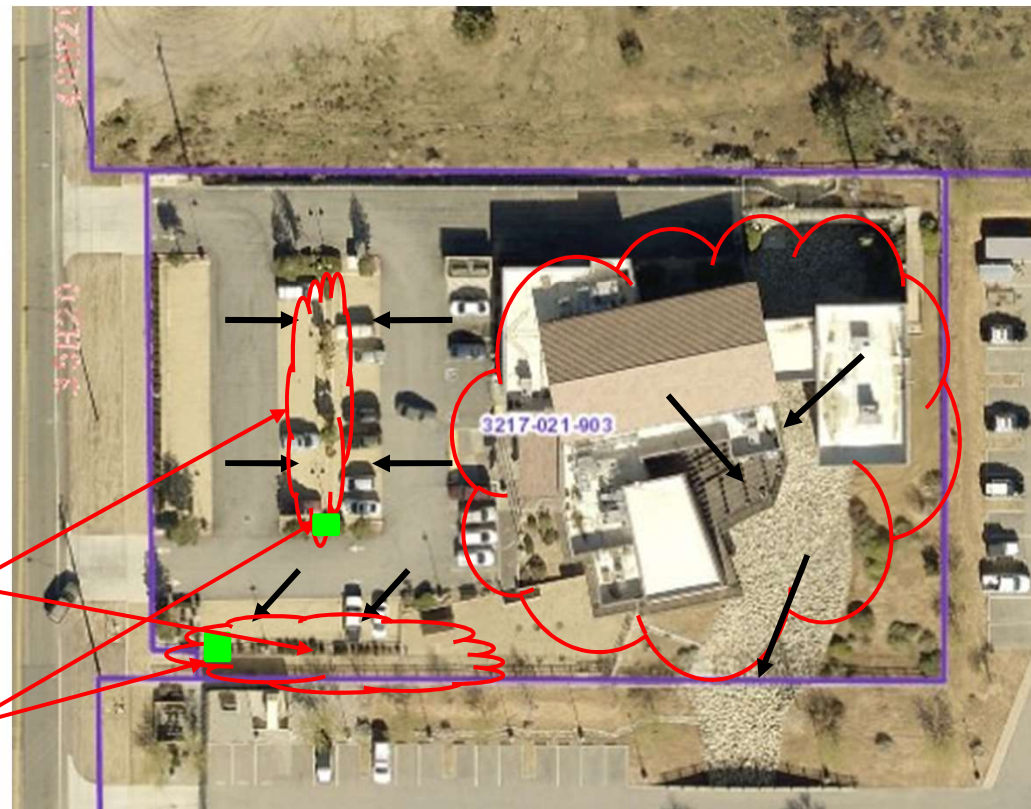
Stormwater Retention - Beach Solution on PCH



Stormwater Retention - Agua Dulce Library – Desert Solution



Stormwater Retention - Agua Dulce Library – Desert Solution



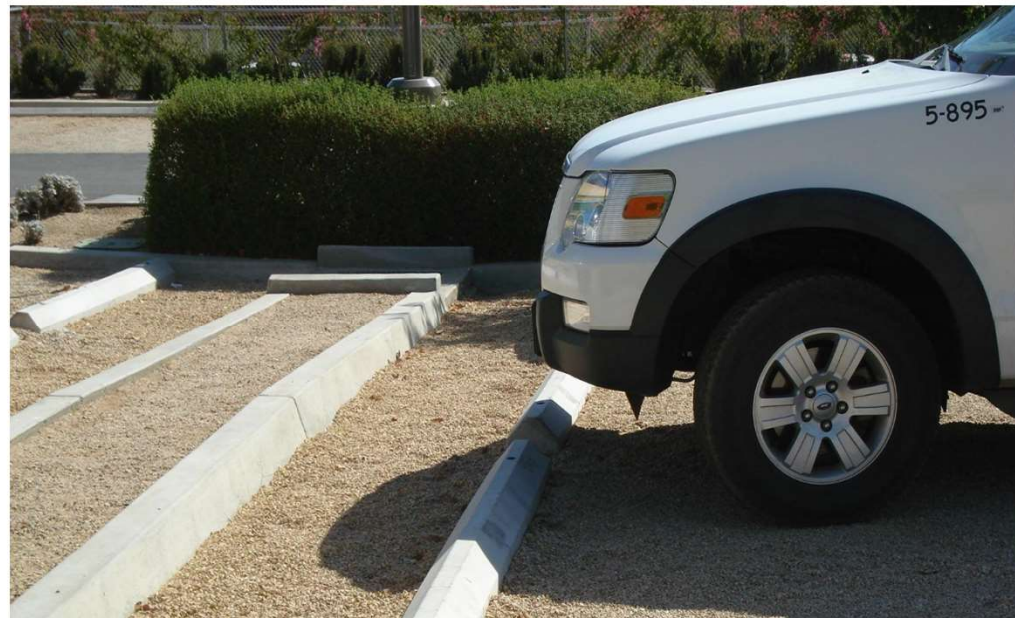
Infiltration areas -
allowed ponding

Overflow catch basins
to storm drain system

Flow direction



Stormwater Retention - Acton Agua Dulce Library



Rainwater Harvest - Pacific Palisades Village



Pacific Palisades Village Shopping Plaza and Parking Lot

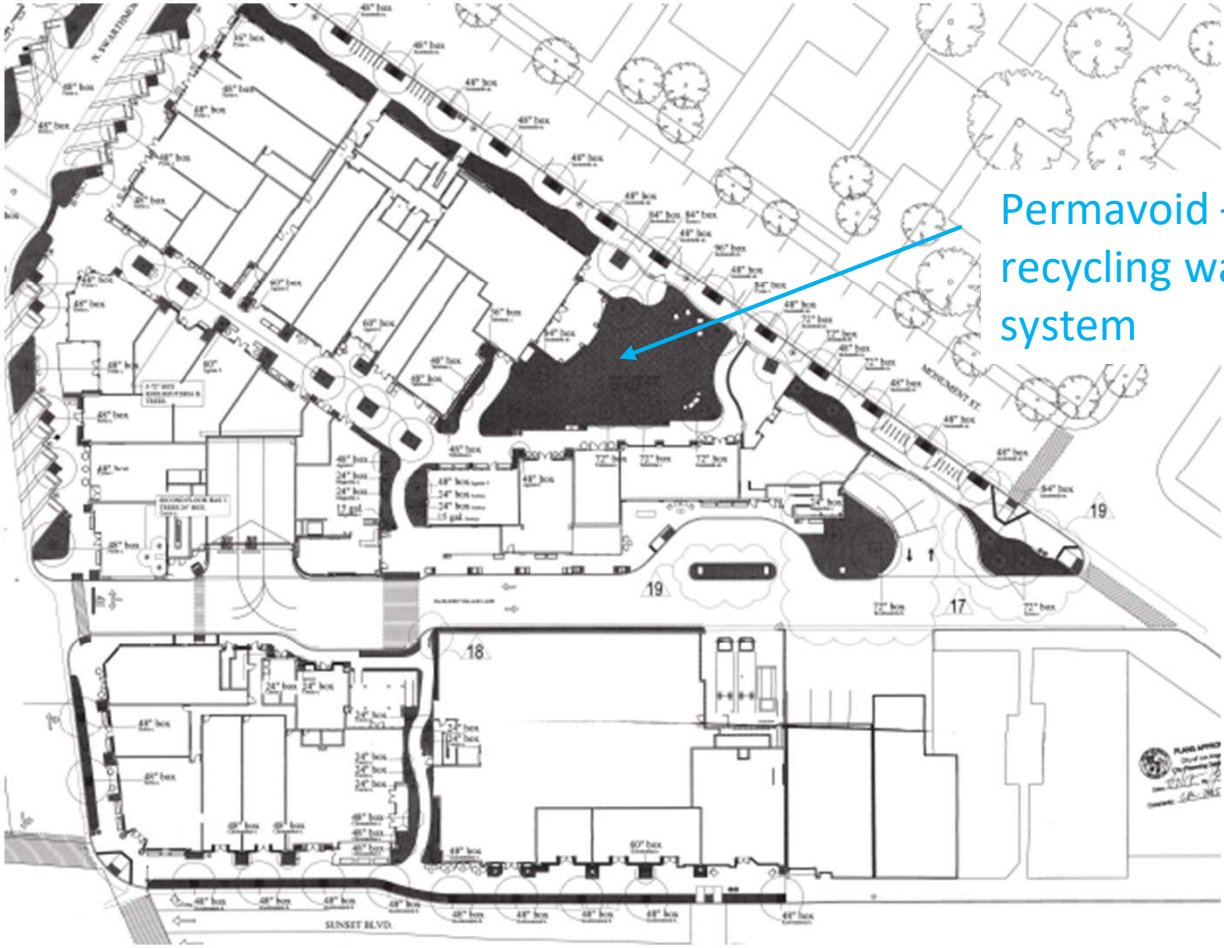
- 3.42 acre site, 138,085 sq. ft. new impervious area. With 10,890 sq. ft. landscaping
- Challenges; Large project with multiple tributary areas
- Solution: 52,000 gallons retained through use of cisterns and permavoid system
- Still allows lots of evaporation, infiltration, and biofiltration

Rainwater Harvest - Pacific Palisades Village



Roof drainage to
landscaping/permavoid system

Rainwater Harvest - Pacific Palisades Village



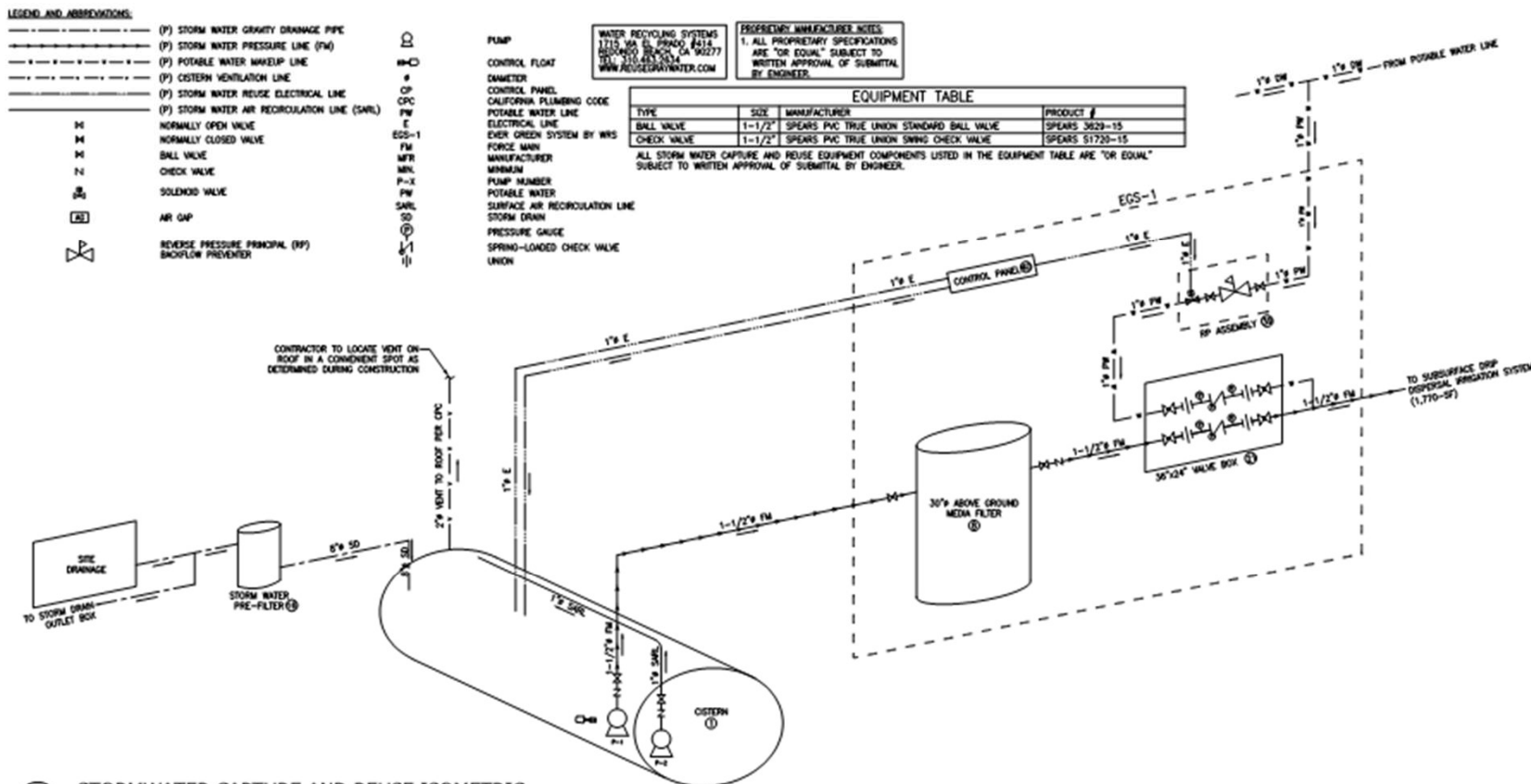
Permavoid -
recycling water
system

Rainwater Harvest - Pacific Palisades Village



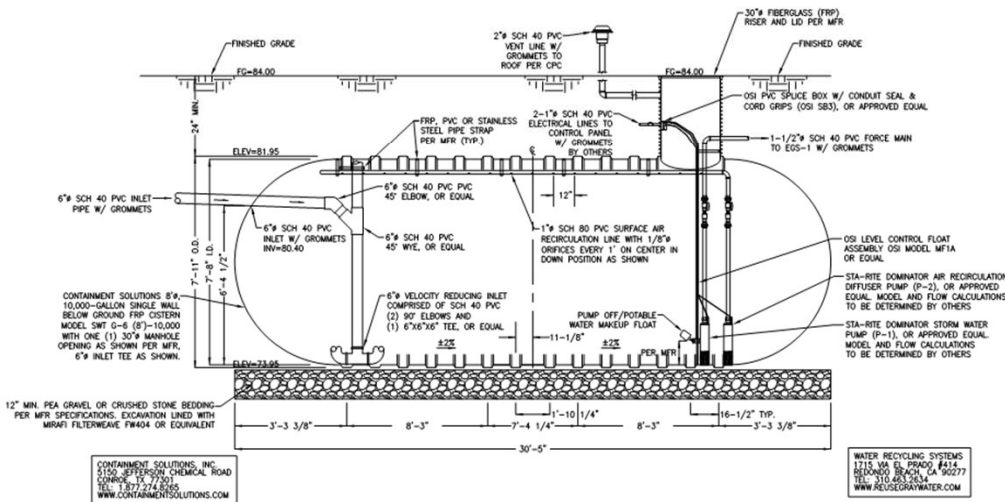
Peripheral Roof drainage to cistern system

Rainwater Harvest - Pacific Palisades Village



1 STORMWATER CAPTURE AND REUSE ISOMETRIC

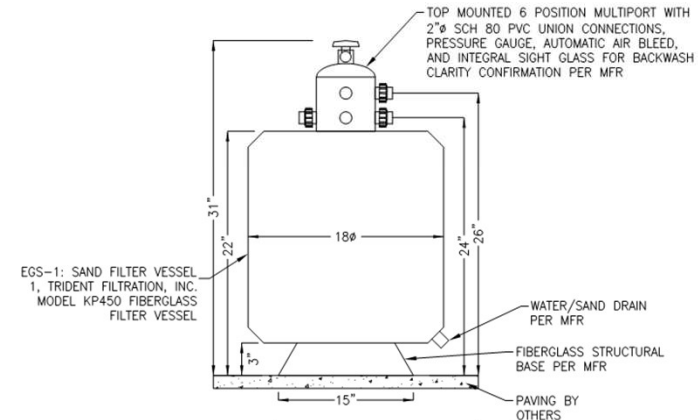
Rainwater Harvest - Pacific Palisades Village



CONTAINMENT SOLUTIONS, INC.
5150 JEFFERSON CHEMICAL ROAD
CONROE, TX 77381
TEL: 1.877.274.8265
WWW.CONTAINMENTSOLUTIONS.COM

WATER RECYCLING SYSTEMS
1715 VIA EL PRADO #414
REDONDO BEACH, CA 90277
TEL: 310.463.2634
WWW.REUSEGRAYWATER.COM

- CISTERN NOTES:**
1. CONTRACTOR SHALL FOLLOW TANK MANUFACTURER'S INSTALLATION INSTRUCTIONS. FOR COMPLETE DESIGN AND PRODUCT INFORMATION CONTACT CONTAINMENT SOLUTIONS OR WATER RECYCLING SYSTEMS.
 2. ALL MANHOLES SHALL BE GAS AND WATER TIGHT.
 3. THE MAXIMUM BURIAL DEPTH IS 7' OF EARTH COVER OVER THE TOP OF THE TANK PER MANUFACTURER. FOR DEEPER BURIAL DEPTHS CONTACT MANUFACTURER.
 4. REFER TO TANK NOTES PER DETAIL 3 THIS SHEET.
 5. TANK SHALL BE PERMANENTLY MARKED WITH THE FOLLOWING, "RAIN WATER REUSE SYSTEM, CAUTION-UNSAFE WATER."
 6. FLOAT AND CONTROL PANEL WIRING SUBMITTALS SHALL BE PROVIDED BY THE CONTRACTOR TO THE SYSTEM DESIGNER PRIOR TO COMMENCEMENT OF ELECTRICAL WORK.



TRIDENT FILTRATION, INC.
4270 PROMENADE WAY SUITE D
MARINA DEL RAY, CA 90290
TEL: 310.577.7060
WWW.TRIDENTFILTRATION.COM

WATER RECYCLING SYSTEMS
1715 VIA EL PRADO #414
REDONDO BEACH, CA 90277
TEL: 310.463.2634
WWW.REUSEGRAYWATER.COM

- NOTES:**
1. CONTRACTOR SHALL FOLLOW FILTER VESSEL MANUFACTURER'S INSTALLATION INSTRUCTIONS. FOR COMPLETE DESIGN AND PRODUCT INFORMATION CONTACT TRIDENT FILTRATION, INC. OR WATER RECYCLING SYSTEMS.
 2. THE FILTER VESSEL SHOULD BE PLACED ON A LEVEL CONCRETE SLAB, VERY FIRM GROUND, OR EQUIVALENT. POSITION THE FILTER SO THAT THE PIPING CONNECTIONS, CONTROL VALVE, ARE CONVENIENT AND ACCESSIBLE FOR OPERATION AND SERVICE.
 3. LOADING THE FILTER VESSEL WITH MEDIA SHALL BE PERFORMED IN ACCORDANCE WITH THE MFR SPECIFICATIONS.
 4. ALL CONNECTIONS TO FILTER VESSEL SHALL BE WATERTIGHT PER MFR.
 5. THE FILTER VESSEL OPERATES UNDER HIGH PRESSURE, PRIOR TO SERVICING FILTER VESSEL, TURN PUMP OFF TO PREVENT DAMAGE TO THE SYSTEM.

2 CISTERN DETAIL

Scale: N.T.S

3 EGS-1: ABOVE GROUND SAND FILTER VESSEL DETAIL

Scale: N.T.S

Dos and Don'ts



Instead of . . .

Putting the drain at the bottom of the swale invert

No ponding, no detention time

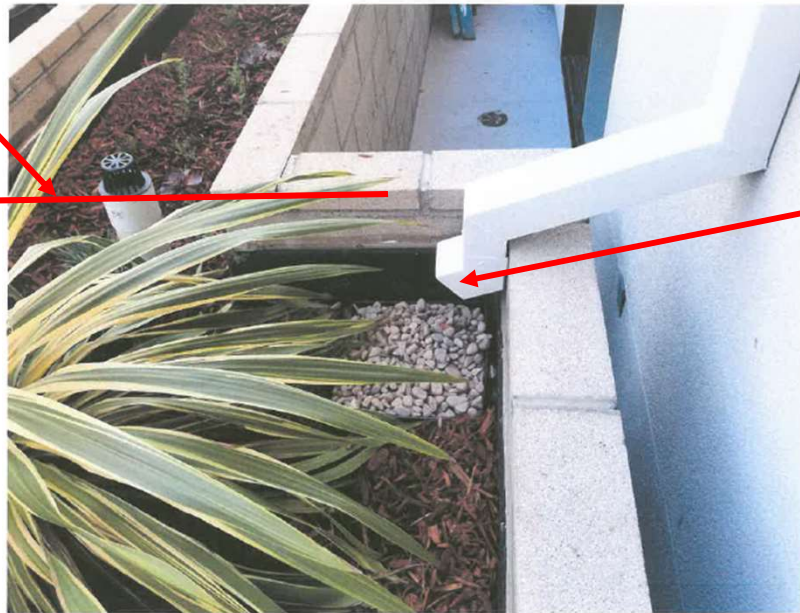


Dos and Don'ts



Do . . .

Put the drain inlet 12" or higher to allow ponding



Open connection for vector control :-)

Dos and Don'ts



Instead of . . .

Planters higher than parking lot

no chance for infiltration or biofiltration



Dos and Don'ts



Do . . .

Drain parking lot to landscaped planters



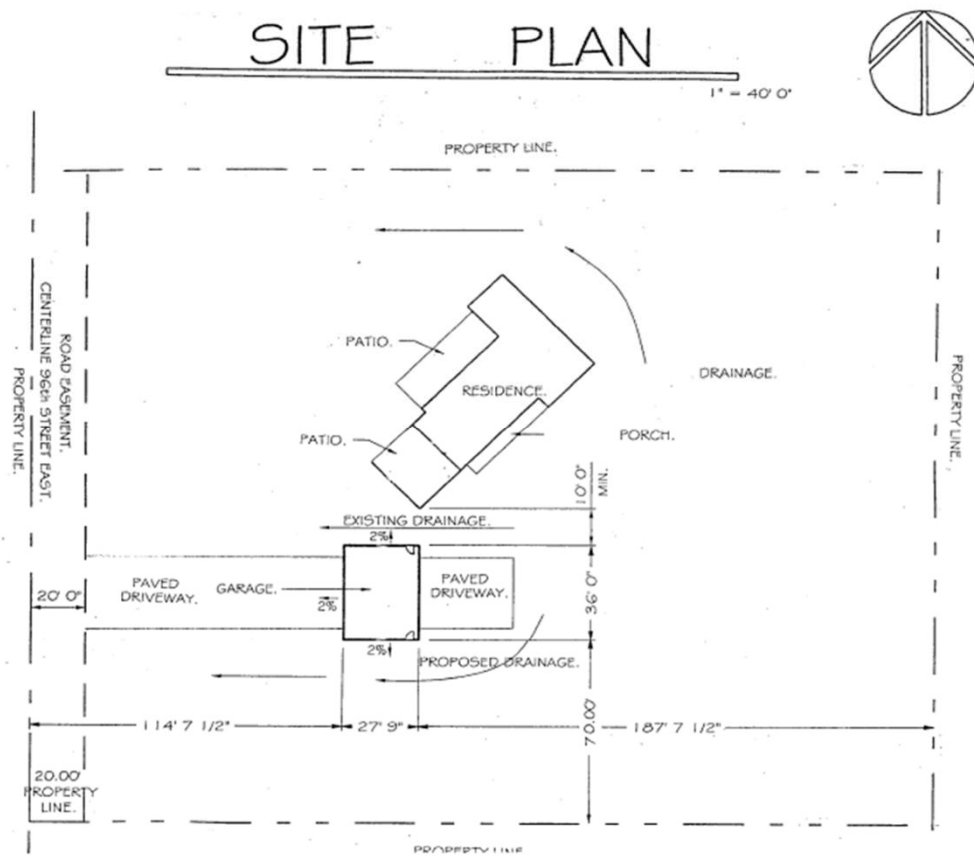
Lower planter below parking lot for infiltration

Dos and Don'ts



Instead of . . .

Draining entire lot directly to the street

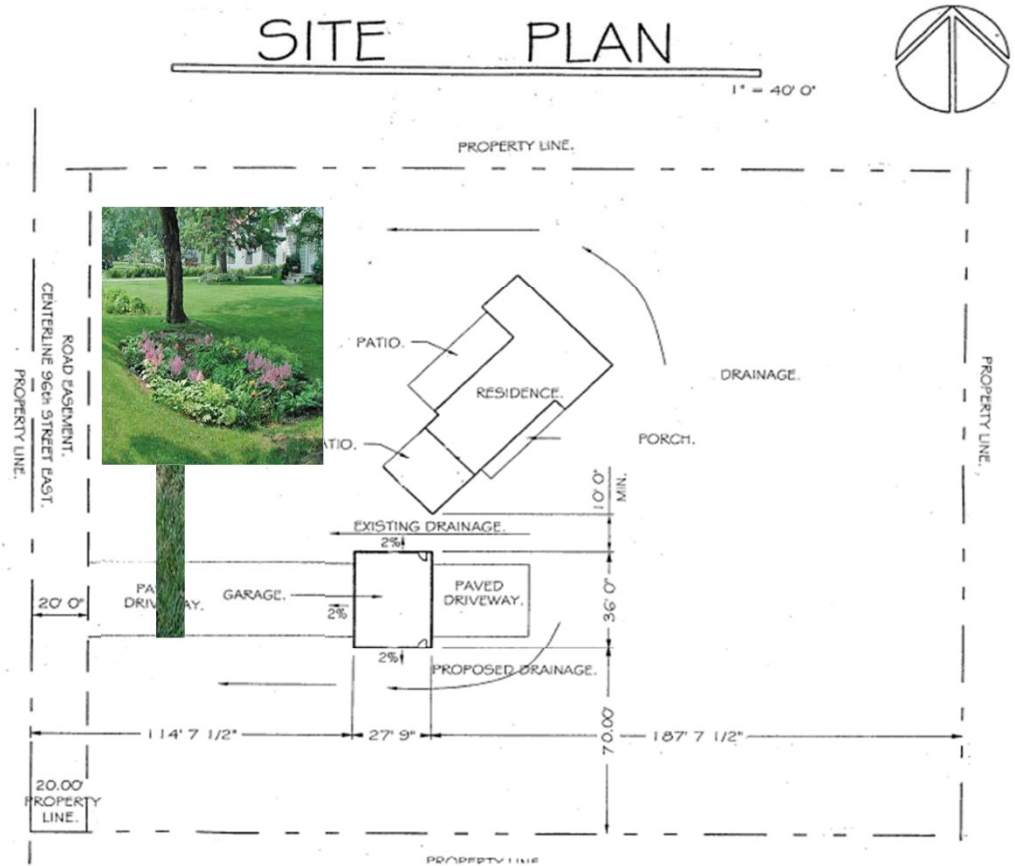


Dos and Don'ts



Do . . .

retrofit a grass or concrete swale and divert water to rain garden - while still maintaining site drainage



Flash Drive Documents and Links



DOCUMENTS:

- LA County LID Forms and Publications – Includes Samples
- LA County Hydrocalc Program - Flows and Volume Calculator
- LA City LID Manual
- LA County LID Standards Manual
- LACBC Stormwater Inspection Checklists

LINKS:

- LA County Hydrology Map
- LA County LID Website

Thank You!



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