City of Los Angeles
Low Impact Development (LID)

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Bureau of Sanitation
City of Los Angeles

- LID Overview
- LID Prescriptive Method
- LID for Large Scale Development
- GRASS
Background

- LID Ordinance Adopted: Nov 11, 2011
- LID Ordinance Effective: May 12, 2012

Requirements:

Expanded on the exiting Standard Urban Mitigation Plan (SUSMP) requirements of capturing the greater of either 85th percentile or ¾ inch storm event by incorporating LID practices and standards.

Residential (4 units or less):
- Projects must chose from prescriptive list of BMPs

All other developments:
- Similar to SUSMP requirements
85th Percentile
Screening Criteria

- Hillside Grading Areas
- Earthquake Induced Liquefaction Areas
- Building and Safety Infiltration Information Bulletin
Low Impact Development [LID] Road Map for Residents and Developers.

The Road to LID Starts Here:

Project is:
- GREATER than 500 SQ FT?
  - YES: I must COMPLY with LID.
  - NO: I am EXEMPT from LID.

- ALL OTHER Developments, e.g., Commercial, Industrial, Automotive, and Residential.
- 2500 SQ FT. or MORE and IN AN ESA*
- 2500 SQ FT. or MORE and IN AN ESA*

Capture & Manage
100% of “q”-inch storm event of required area*

- For alterations less than 50% of the existing impervious surface, only incremental development shall comply with LID.

Implement LID Best Management Practices (BMPs).
1. Infiltrate
2. Capture and Use
3. High efficiency Bio-Filtration/Retention System BMP

5 BMP EXAMPLES are not limited to...
1. Rain Barrels
   and/or...
2. Permeable Pavement
   and/or...
3. Planter Boxes
   and/or...
4. Rain Gardens
   and/or...
5. Dry Wells
   and/or...

You have SUCCESSFULLY COMPLIED with the LID ordinance.
Rain Barrels capture runoff from roof downspouts during storms and temporarily store that runoff for later use. They are low-cost, effective, and easily maintained devices that can be sized for a specific volume of water. Retained water may be used for garden watering and other outdoor non-potable uses. Rain barrel storage can reduce the amount of stormwater pollutants that are picked up and conveyed to local streams and the ocean. In addition, harvested water conserves precious City-supplied potable water and, if directed to impervious surfaces, can recharge groundwater. Rain barrels are typically made of heavy duty plastic and can range in size from the standard 55 gallons to more than 80 gallons.

**How many rain barrels do I need?**

The number of rain barrels required to capture runoff from a given roof or impervious area is shown in the following table.

<table>
<thead>
<tr>
<th>Roof or Impervious Area (sq.ft.)</th>
<th>Number of 55 Gallon Rain Barrels*</th>
</tr>
</thead>
<tbody>
<tr>
<td>500 - 1,000</td>
<td>4 **</td>
</tr>
<tr>
<td>1,001 - 1,500</td>
<td>8 ***</td>
</tr>
</tbody>
</table>

* Or equivalent capture using larger rain barrels.
** Minimum landscape area for 4 rain barrels shall be 200 square feet and the minimum landscape area for 8 rain barrels shall be 400 square feet.

**Are Rain Barrels Feasible at My Residence?**

Rain barrels are appropriate where the following site characteristics are present:

- Roof areas with downspouts are required.
- A level, firm surface for support of the rain barrel(s) is required. Rain barrels should only be elevated with solid construction materials and kept away from retaining walls as a full 55-gallon rain barrel will weigh over 400 lbs.
- An area where the captured water can be used is required to be present within a reasonable distance from the rain barrel(s).
- Design of an appropriate area for overflow from the barrel is necessary. For sites within, immediately adjacent to, or discharging to an environmentally sensitive area, use the LTO Manual for applicable criteria.
Permeable pavers

Incidental Rainfall

Roof Runoff
Planter Boxes function as soil and plant-based filtration devices that remove pollutants through a variety of physical, biological, and chemical treatment processes. The components normally consist of a ponding area, mulch layer, planting soils, plantings, drainage layer, and an outlet drain. As stormwater passes down through the planting soil, pollutants are filtered by the soil and plants.

Planter boxes at residential locations should be placed beneath rain gutter downspouts, or they may be placed directly beneath roof drip lines where rain gutters are not present so as to directly capture runoff from the roof. The overflow outlet should discharge away from the building to ensure water does not percolate into footings or foundations. Planter boxes can be designed as a single linear trough or a series of "pots" of various shapes and sizes.

Are Planter Boxes Feasible at My Residence?
Planter boxes are appropriate where the following site characteristics are present:
- Roof areas with downspouts, or roof areas without downspouts that drain runoff to impervious surfaces;
- A level, firm surface away from retaining wall structures for support of the planter(s). Planters should only be elevated with solid construction materials.

For sites within, immediately adjacent to, or discharging to an environmentally sensitive area, see the LED Manual for applicable criteria.

How Large Does My Planter Box Need To Be?
The total size of planter(s) necessary to capture runoff from a given roof area is shown in the table to the right. The table assumes a minimum planter depth of 2.5 feet, with 2 feet of soil and 0.5 feet of storage space, or "freeboard" above the soil surface.

<table>
<thead>
<tr>
<th>Roof Area Tributary to Planter Box (sq. ft.)</th>
<th>Total Surface Area of Planter(s) (sq. ft.)</th>
</tr>
</thead>
<tbody>
<tr>
<td>500 - 1,000</td>
<td>32</td>
</tr>
<tr>
<td>1,001 - 1,500</td>
<td>52</td>
</tr>
<tr>
<td>1,501 - 2,000</td>
<td>100</td>
</tr>
<tr>
<td>2,001 - 2,500</td>
<td>168</td>
</tr>
</tbody>
</table>

* Projects adding roof or impervious areas in excess of 2,500 sq. ft. shall add 20 sq. ft. of planter box surface area per every 500 sq. ft. of additional area.
Rain gardens are shallow, landscaped depressions that help capture and infiltrate stormwater. They are effective at reducing runoff and pollutants in urban and suburban areas.

**How Large Does My Rain Garden Need to Be?**

Rain gardens should not exceed 300 square feet, and the contributing impervious area should not be more than 4,000 square feet. A general recommendation for a garden with a 6-inch digging depth is to use the rain garden to approximately 6% of the contributing area. The infiltration rate of water into the soil will affect how the rain garden should be sized. Rain gardens will need to be larger in areas with lower infiltration. The following table can be used as a general guideline:

<table>
<thead>
<tr>
<th>Contributing Area (sq ft)</th>
<th>Rain Garden Area (sq ft)</th>
</tr>
</thead>
<tbody>
<tr>
<td>500 – 700</td>
<td>36</td>
</tr>
<tr>
<td>700 – 900</td>
<td>60</td>
</tr>
<tr>
<td>900 – 1300</td>
<td>12</td>
</tr>
<tr>
<td>1300 – 2000</td>
<td>32</td>
</tr>
<tr>
<td>2000 – 3000</td>
<td>64</td>
</tr>
<tr>
<td>3000 – 4000</td>
<td>104</td>
</tr>
<tr>
<td>4000 – 6000</td>
<td>195</td>
</tr>
</tbody>
</table>

**Are Rain Gardens Feasible at My Residence?**

Rain gardens are appropriate where the following site characteristics are present:

- Edge of site gardens should be installed at least 15 feet from building foundations, 3 feet from public sidewalks, and 1 foot from property lines, and in an area where potential overflow will not run onto neighboring properties. Rain gardens may be placed closer than the above mentioned 15 feet for: 1) a site plan or building permit is approved or 2) a permeable paving is installed to prevent infiltration under these parking areas, and an area has drain piping to the street, or avoided.

- Ground adjacent to the building should slope away at a 2% minimum. The rain garden area should receive full sunlight throughout the days of the year. A downspout or gutter will be required to convey rainwater from a roof onto a rain garden. They also are appropriate where the area is well drained and has a relatively flat soil.

- A street or back yard can work well for a rain garden, but look for areas where the site naturally slopes to the street. Areas where water naturally flows to a pond or stream would not be ideal for a rain garden.

- Areas highlighted in Figure E-1 through E-4 are not ideal for rain gardens and must be approved by the City prior to installation. Areas highlighted in Figure E-3 require site amendments to increase the natural soil infiltration rates.

For sites with an immediately adjacent to, or discharging to, an environmentally sensitive area, see the US Forest for applicable criteria.
SMALL SCALE RESIDENTIAL
DRY WELL FACT SHEET

A dry well is a bored, drilled, or driven shaft or hole designed specifically for the infiltration of stormwater. Simple dry wells may consist of a small excavated pit filled with gravel media, while more advanced dry wells typically consist of a prefabricated storage chamber or perforated pipe segment placed in the ground. These latter types of dry wells offer more storage capacity per unit area since they are not typically filled with media and also conserve land area since they may be buried completely in the ground.

Dry wells are situated to capture runoff from roofs or other impervious areas. They can easily be designed to be directly connected to rain gutter systems to capture runoff from rooftops. Once filled with stormwater, dry wells can accept water at the same rate at which they can dissipate water.

Is a Dry Well Feasible at My Residence?
Dry wells are appropriate where the following site characteristics are present:
- Roof areas with downspouts or other impervious areas are required.
- Sites must have soils suitable for infiltration, with a minimum saturated hydraulic conductivity of 0.3 m/hr.
- Edge of dry wells should be installed at least 25 feet from building foundations.
- 10 feet from property lines and an overflow drain pipe to the street is required.

Dry wells may be located closer than the above mentioned criteria provided a geotechnical report is submitted and approved by LADBS.
- Do not site rain gardens above septic systems.
- An overflow area that drains to the street is required.

For sites within, immediately adjacent to, or discharges to an environmentally sensitive

How Large Does My Dry Well Need To Be?
A dry well should be sized to capture the runoff produced from the design storm over the connected impervious area, with account taken for any gravel or fill material that is used. This will ensure the capture and infiltration of the design storm volume. The following table should be used as minimum sizing guidance for dry wells:

<table>
<thead>
<tr>
<th>Contributing Area (M²)</th>
<th>Dry Well Volume - Without Fill (gallons)</th>
<th>Dry Well Volume - Including Gravel Fill (gallons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>200 - 1000</td>
<td>325</td>
<td>600</td>
</tr>
<tr>
<td>1001 - 1500</td>
<td>400</td>
<td>1,000</td>
</tr>
<tr>
<td>1501 - 2000</td>
<td>550</td>
<td>1,400</td>
</tr>
<tr>
<td>2001 - 2500*</td>
<td>700</td>
<td>1,800</td>
</tr>
</tbody>
</table>

*Projects adding roof or impervious areas in excess of 2,000 sq. ft. add 100 gallons of dry well volume.
All Other Developments (commercial, industrial, etc.)

Prior to LID, implemented under SUSMP

- Maximize each option in priority order.

**Infiltration**
- Infiltration Trenches
- Infiltration Basins
- Dry Wells
- Permeable Pavement
- Underground Detention Chambers

**Capture and Use**
- Cisterns
- Rain Tanks

**High Efficiency Bio-filtration**
- Biofiltration (Flow thru Planters)
- Bioinfiltration
- Vegetated Swales
Infiltration Galleries

• Infiltration Trenches
• Infiltration Basins
• Dry Wells
• Permeable Pavement
• Underground Detention Chambers

HIGH EFFICIENCY BIOFILTRATION
CAPTURE & USE
INfiltration

Infiltration Trenches
Porous Pavement
Dry well
Infiltration Galleries
Permeable Pavers
**BENEFITS**

- Meet LID Requirements
- Reduce Runoff
- Improve Stormwater Quality
- Recharge Aquifers
- Retain open space

*Underground Infiltration Chambers*

*Underground Dry Wells*
• Capture & Use Cisterns (above/below ground) with Irrigation

Aboveground Storage

Underground Cistern

Drip Irrigation
Wilshire Grand
Mixed Use (Commercial / Hotel)

50,000-gallon cisterns store both rainwater and air-conditioner condensate, which will then used in cooling towers.

**BENEFITS**
- Meet LID Requirements
- Reduce Runoff
- Improve Stormwater Quality
- LEED Credits
- Stormwater Quality
- Stormwater Quantity
- Water Efficient Landscaping
- Water Use Reduction
• Biofiltration (Flow thru Planter Boxes)
• Vegetated Swales

Planter Boxes
Bioinfiltration
Vegetated Swale
Biofiltration

717 W. 9th St
34 story high Rise Residential Building

**BENEFITS**

- Meets LID Requirements
- Reduce Runoff
- Improve Stormwater Quality
- Higher rental values
- Creates open community space
Greenways to Rivers Arterial Stormwater System

- A multifunctional greenway system
- Addresses park poverty
- Captures storm water through a variety of BMPs
Regional Green Networks

- **PRIORITY 1**
  - Grid of greenways
  - Major attractions
  - Spaced 5 miles apart

- **PRIORITY 2**
  - 2-3 mile grid
  - Connect remaining corridors

The Green Network bridges current pedestrian greenway gaps. **Priority One** provides major connections throughout the Upper Los Angeles River watershed. **Priority Two** connects distinct opportunities to the Priority One network. The five classes determine functions of Infiltration, Capture & Reuse as well as Osmothink through a variety of LID BMPs.
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Additional Information:
 www.facebook.com/lastormwaterprogram
 www.youtube.com/user/lastormwaterprogram
 www.lastormwater.org/blog/

Mission Statement:
“To Protect the Beneficial Uses of Receiving Waters, while Complying with All Pollution Abatement Regulations”