Low Impact Development in the Central Coast Region

Robyn Cooper, MS, PE
Fall Creek Engineering Inc.
LID in Central Coast Region

- A few words about LID - Hydrology
- Post Construction Requirements (PCR) in the Central Coast Region
- LID Conformance with Central Coast PCRs
- LID and stormwater beyond the Central Coast PCR
Impervious Surface Effect

Natural Ground Cover
- 40% evapotranspiration
- 10% runoff
- 25% shallow infiltration
- 25% deep infiltration

10%-20% Impervious Surface
- 38% evapotranspiration
- 20% runoff
- 21% shallow infiltration
- 21% deep infiltration

35%-50% Impervious Surface
- 35% evapotranspiration
- 30% runoff
- 20% shallow infiltration
- 15% deep infiltration

75%-100% Impervious Surface
- 30% evapotranspiration
- 55% runoff
- 10% shallow infiltration
- 5% deep infiltration
Impervious Surface Effect

- **Pre-development**
  - Interception
  - Infiltration

- **Post Development**
  - Faster time to peak
  - Higher Volumetric Flow Rate
  - Greater Volume of Runoff

![Figure 1. Hydrographs showing development's impact on runoff.](Q = volumetric flow rate; t = time)
Impervious Surface Effect

- Conventional BMP
  - Reduces Peak
  - Increases time
  - Volume > Pre-development

- LID BMP
  - Reduces Peak
  - Time = Pre-development
  - Volume = Pre-development
Impervious Surface Effect

Pre-Development

Post-Development
PCR in the Central Coast Region

- Resolution R3-2013-0032
- July 12, 2013
- Water Management Zones (WMZ)
- Post-Construction Requirements (PCR)
- Alternative Compliance
- Field Verification of Post Construction Stormwater Control Measures (SCM)
- Operation and Maintenance for Structural SCM
- Reporting Requirements
PCRs in the Central Coast Region

**Watershed Management Zones:**
The urbanized portions of the Central Coast Region are categorized into 10 watershed management zones based on common key watershed processes and receiving water type (creek, marine, nearshore waters, lakes, etc.)

http://www.waterboards.ca.gov/centralcoast/water_issues/programs/stormwater/docs/lid/hydromod_lid_docs/attach_1b_attach_a_wmzs.pdf
PCRs in the Central Coast Region

- **Performance Requirement No 1: Site Design and Runoff Reduction**
  - Projects that create and/or replace ≥ 2,500 square feet of impervious surface
  - Limit disturbance of creeks and natural drainages
  - Minimize compaction of highly permeable soils
  - Limit clearing of native vegetation, minimize building area
  - Minimize impervious surfaces
  - Minimize stormwater runoff
    - Direct roof runoff into cisterns
    - Direct roof/impervious surface runoff into vegetated areas
    - Use permeable surfaces
  - Confirm that project complies with Site Design and Runoff Reduction Performance Requirements

- **Performance Requirement No 2: Water Quality Treatment**
  - Projects that create and/or replace ≥ 5,000 square feet of impervious surface, and dethatched single family homes ≥ 15,000 square feet
  - Treat stormwater runoff to reduce pollutant loads and concentrations using physical, biological, and chemical removal
  - Treat generated runoff using the following:
    - Low Impact Development (LID)
    - Biofiltration Systems
    - Non-retention based treatment systems
  - Stormwater Control Plan
PCRs in the Central Coast Region

- Performance Requirement No 3: Runoff Retention
  - Projects that create or replace ≥ 15,000 square feet of Net Impervious Area, and homes dethatched single family homes ≥ 15,000 square feet
  - In WMZ 1, 2, 5, 6, 8, and 9
  - In WMZ 4, 7, and 10 that overlie designated Groundwater Basins
  - Must meet Runoff Retention Requirements using the LID development standards for optimal management of watershed processes
    - Adjustments
    - Performance Requirements
    - LID Development Standards
    - Technical Infeasibility – no less than 10% of the equivalent Impervious Surface Area to retention based systems
    - Off site mitigation
    - Reporting Requirement
### Table 1: Groundwater Basins in the Central Coast Region by GIS Basin Number (See Map)

<table>
<thead>
<tr>
<th>GIS BASIN NUMBER</th>
<th>GROUNDWATER BASIN NAME</th>
<th>GIS BASIN NUMBER</th>
<th>GROUNDWATER BASIN NAME</th>
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<tbody>
<tr>
<td>1</td>
<td>Carpinteria</td>
<td>35</td>
<td>Peach Tree valley</td>
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<tr>
<td>2</td>
<td>Santa Barbara</td>
<td>36</td>
<td>Hernandez valley</td>
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<tr>
<td>3</td>
<td>Montecito</td>
<td>37</td>
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<tr>
<td>4</td>
<td>Foothill</td>
<td>38</td>
<td>Bitter Water valley</td>
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<tr>
<td>5</td>
<td>Goleta</td>
<td>39</td>
<td>Dry Lake valley</td>
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<tr>
<td>6</td>
<td>Santa Ynez River valley</td>
<td>40</td>
<td>Carmel valley</td>
</tr>
<tr>
<td>7</td>
<td>Santa Ynez River valley</td>
<td>41</td>
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<tr>
<td>8</td>
<td>Lockwood valley</td>
<td>42</td>
<td>San Benito river valley</td>
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<td>9</td>
<td>Mi Potrero area</td>
<td>43</td>
<td>Salinas valley</td>
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<td>10</td>
<td>San Antonio Creek valley</td>
<td>44</td>
<td>Tres Pinos valley</td>
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<td>11</td>
<td>Husna valley</td>
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<td>12</td>
<td>Santa Maria</td>
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<td>Upper Santa Ana valley</td>
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<td>13</td>
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<td>14</td>
<td>Big Spring area</td>
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<td>Rafael valley</td>
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<td>San Luis Obispo valley</td>
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<td>Quien Sabe valley</td>
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<td>Los Osos valley</td>
<td>51</td>
<td>Gilroy-Hollister valley</td>
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<td>18</td>
<td>Rinconada valley</td>
<td>52</td>
<td>Needle Rock point</td>
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<td>19</td>
<td>Pozo valley</td>
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<td>Gilroy-Hollister valley</td>
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<td>Vila valley</td>
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<td>Arroyo de la Cruz valley</td>
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<td>San Carpanito valley</td>
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<td>Santa Cruz Purisima formation</td>
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<td>Arroy Nuevo area</td>
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<td>68</td>
<td>Santa Clara valley</td>
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</tbody>
</table>
PCRs in the Central Coast Region

- **Performance Requirement No 4: Peak Management**
  - Projects that create or replace ≥ 22,500 square feet of Net Impervious Area
  - In WMZ 1, 2, 3, 6, and 9
  - Manage Peak Stormwater and Runoff Retention Performance Requirements
    - Post development peak flows shall not exceed pre-project peak flows for the 2- through 10- hear storm events
  - Reporting Requirements
    - Water Quality Treatment
    - Runoff Retention
    - Peak Management

- **Performance Requirement No 5: Special Circumstances**
  - Based on certain site conditions and/or receiving water conditions
  - Exempts a Regulated Project from Runoff Retention or Peak Management Performance Requirements where the Performance Requirements would be ineffective to maintain or restore beneficial uses of receiving waters.
  - Must still comply with Water Quality Treatment Performance Requirements
LID – Retention Methods

- **Dry Swale**

![Diagram of a dry swale](image1)

![Photo of a dry swale](image2)
LID – Pervious Surfaces

- Pavers

- Pervious Concrete
LID – Structural - Infiltration

- Infiltration Chambers
- Infiltration Trenches
- Infiltration Pits
LID – Structural Water Quality

- **Vortex Separator**
  - Improves Water Quality
  - Removes:
    - Sediment
    - Oil/Grease
    - Heavy Metals
  - Removal Efficiency

- **Maintenance**
  - Inspect Spring and Fall
  - Cleaning Site Dependent
LID - Bioretention
Beyond the PCRs

- LID and Stormwater Design beyond post construction requirements – WHY??
  - Restore natural hydrology
  - Improve water quality
  - Recharge groundwater
  - Stormwater Reuse

www.mobileranger.com
LID Beyond the PCRs – Polo Grounds

- Polo Grounds Park, Aptos, CA

- Located in Primary Groundwater Recharge Zone
  - Santa Cruz Purisima Formation Highlands Groundwater Basin
  - Key water supply aquifer for the mid-Santa Cruz County area and the Soquel Creek Water District

Source: Google Maps

Project Design: 2009
Project Construction: 2011
LID Beyond the PCRs – Polo Grounds

- **Design Criteria**
  - Provides treatment and deep infiltration
  - Cost Effective
  - Limited Maintenance Requirements

- **Selected LID Features**
  - Bioretention Swales
  - Deep Infiltration Basins
    (Gravel Seepage Pits)

- **Hydrologic and Hydraulic Design**
  - Capture 90% to 95% of Storm Events
LID Beyond the PCRs – Polo Grounds

Existing Site and Drainage System
LID Beyond the PCRs – Polo Grounds

Polo West
LID Beyond the PCRs – Polo Grounds

Polo East
LID Beyond the PCRs – Polo Grounds

Polo West Hydraulic Profile

Polo East Hydraulic Profile

Typical Gravel Seepage Pit
LID Beyond the PCRs – Polo Grounds

LID Beyond the PCRs – Polo Grounds

(2010)  

(2014)
LID Beyond the PCRs – Monterey/PG

- Conceptual Plan
- Improve quality of stormwater discharged into Area of Special Biological Significance (ASBS)
- CA Oceans Plan and Marine Management Areas Improvement Act convey special protections to ASBS in CA
- Divert wet and dry weather flows into an upgraded stormwater system
Project Goals:

- Achieve a 90 percent reduction in pollutant loading
- Conserve potable water by utilizing dry and wet weather flows as a source of non-potable water for irrigation
- Implement LID/BMPs to comply with Special Protections and NPDES requirements
- Design a system that allows for future expansion or LID/BMPs
LID Beyond the PCRs – Monterey/PG

Design Includes

- Water storage – desynchronize flow
- LID/Green Street infrastructure
- Upgraded conveyance system
- New stormwater treatment facility
- Storage to allow for water use during periods of irrigation requirements
LID Beyond the PCRs – Monterey/PG

- **Engineering Design**
  - Calculated Peak Runoff Rates
  - Creation of a computer model to route stormwater through system
  - Estimate reclaimed water demands
    - Elementary School (4.6 AFY)
    - Community Park (3.5 AFY)
    - Golf Course/Cemetery (273 AFY)
  - Quantify storage requirements (~1M gallons)
  - Estimate Offsets
    - Meet demands at School and Park
    - Decrease demand at Golf Course/Cemetery
Thank you.