Overview of Low-Impact Development Methods

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Photo’s courtesy of Dr Bill Walsh, DAR
Photo’s courtesy of Malama Maunalua
Watershed health related to impervious surface coverage

Relationship between stormwater imperviousness and stormwater runoff co-efficient

This graph shows that as the percentage of watershed imperviousness increases, the volumetric runoff coefficient increases as well.

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Graph courtesy of www.cwp.org
What is Low Impact Development (LID)?

More sustainable land development pattern that results from a site-planning process that:

- ID’s critical natural resources & determines appropriate building envelopes
- Incorporates BMP’s that preserve the natural hydrology of the land
The LID Approach

LID Site Planning
- Define Development Envelope
- Reduce/Minimize total site Impervious Areas
- Disconnect Impervious Areas
- Modify/Intensify Drainage Flow Paths

LID Public Outreach Program
- Define public outreach program objectives
- Identify target audience
- Develop outreach materials
- Distribute outreach materials

LID Hydrologic Analysis
- Delineate watershed and micro-watershed areas
- Define design storm
- Define modeling techniques
- Evaluate pre-development conditions and develop baseline measures
- Evaluate site planning benefits and compare to baseline
- Evaluate integrated management practices (IMPs)
- Evaluate supplemental needs

LID Erosion and Sediment Control
- Planning
- Scheduling of operations
- Soil erosion control
- Sediment control
- Maintenance

LID Integrated Management Practices
- Define hydrologic control
- Evaluate site constraints
- Screen the IMPs
- Evaluate most likely IMPs
- Select IMPs
- Incorporate additional controls if necessary

Figure 1-3. Major components of the LID approach

LID planning process

Done in conjunction with design & layout of stormwater and wastewater infrastructure in attaining management and land use goals.
LID planning: 3 step process

- Avoid Impacts – preserve natural features
- Reduce impacts – reduce impervious cover
- Manage Impacts – stormwater management
Better Site Design

- The first step is to avoid or minimize disturbance by preserving natural areas or strategically locating development based on resource areas and site constraints.
- Resources can include drinking water supply areas, rivers, wetlands, sensitive habitat areas and scenic views.
- Constraints include poor soils that cannot support septic systems and steep slopes which make construction difficult and expensive.
- Mapping these areas results in “building envelopes,” areas which can support development economically and ecologically.
Better site design cont.

• Step 2:
The second step is to minimize the impact of land alteration by reducing impervious areas.

• Step 3
For impervious areas, alternative and “natural systems” stormwater management techniques are chosen.
Avoid Impacts

- Preserve undisturbed areas
- Preserve buffers
- Reduce clearing & grading
- Locate sites in less sensitive areas
- Open space residential design
4-step planning process

The process begins with determining how many lots could be developed under conventional zoning; this is the base yield of the property. From that point, the plan development process follows four basic steps:
1. Identify Conservation Value Areas on the site such as wetlands, significant trees or tracts of forest, habitat, cultural resources or buffer zones. Remove these from the “developable area”.
2. Place houses in the remaining area in a way that would maximize residents enjoyment of these areas by providing access to open space and preserving views.
3. Align roads and trails on the site to provide pedestrian and vehicle access.
4. Draw lot lines around the homes.
LID planning: 3 step process

- Avoid Impacts – preserve natural features
- **Reduce impacts** – reduce impervious cover
- Manage Impacts – stormwater management
Reduce roadway
Reduce side-walks & driveways
Reduce cul-de-sac's
Reduce Building Footprint
Cluster development

4. Draw lot lines around the homes.
Reduce Carparks
LID planning: 3 step process

- Avoid Impacts – preserve natural features
- Reduce impacts – reduce impervious cover
- Manage Impacts – stormwater management
Manage Stormwater

Utilize natural features and control source of stormwater:

- Vegetated buffer strips
- Open vegetated swales/channels
- Bioretention and rain gardens
- Infiltration
- Rooftop runoff mitigation
- Tree planting
Rooftop runoff and storm water planters
Rain gardens
Stormwater Best Management Practices (BMP’s)

- Prevent, reduce or treat run-off
- Highly specific to location
- Basic BMP concepts:
  - Slow runoff
  - Avoid direct connections
  - Ensure regular maintenance
  - Enforcement and education
Erosion and Sediment Control:

Scheduling

- Schedule earth moving and grading activities to expose minimum amount of area possible for shortest amount of time.
- Schedule land disturbance activities during the dry seasons or periods.
# Comparison of Conventional Versus LID Construction Costs

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<tr>
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<th>Med. Density Residential</th>
<th>Low Density Residential</th>
<th>Shopping Center</th>
<th>Office Park</th>
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<td>Conv. Design</td>
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<td>Percent Savings</td>
<td>20%</td>
<td>12%</td>
<td>5%</td>
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Low Impact Design Tools

- Low Impact Development Center http://www.lowimpactdevelopment.org/
Polluted Runoff Tools

- Center for Watershed Protection
  http://www.cwp.org/
- Stormwater Center
  http://www.stormwatercenter.net
- International Stormwater Best Management Practices Database
  http://www.bmpdatabase.org/
Outreach Toolbox

- EPA Non-point Source Toolbox
  http://www.epa.gov/nps/toolbox/
- Hawaii’s Coral Reef Outreach Network
  http://www.hawaiireef.net/
- Non-point Education for Municipal Officials
  http://web.uconn.edu/nemo
Mahalo!
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