

DRAFT FOR CONSIDERATION BY THE HIGHLANDS COUNCIL
AT THE JUNE 12, 2008 COUNCIL MEETING

Low Impact Development Program

Issue Overview

The impact of development on natural resources is often the result of regulatory standards in local codes or development practices that result in greater negative impacts than are actually necessary to accommodate the development purposes. Cluster and small lot development may be effective in reducing the total development footprint. However, a wide variety of techniques have been developed in recent decades to reduce the environmental impacts within the building site itself. The design of roads, parking lots and roofs has the ability to reduce environmental impacts. A variety of site development and landscaping techniques also have value in reducing the impacts of development. The Highlands Regional Master Plan recognizes the value of such techniques, commonly referred to as “low impact development” measures. Low impact development or LID techniques are designed to reduce or prevent negative impacts of development and redevelopment particularly as related to resource management, stormwater management, and site design. It should be noted that under the Highlands Act, some LID techniques, such as pervious pavement and green roofs, are defined as impervious surfaces for the purpose of determining impervious surface limitations for development in the Preservation Area.

Program Summary

The Highlands Council will use Plan Conformance, Highlands Project Review, and the development and dissemination of guidance to encourage use of low impact development techniques for all types of development. Low impact development begins with a process that “reads” or analyzes the land first and allows the natural features of the land to guide site design, stormwater management and resource protection. An assortment of low impact development techniques may be utilized to achieve the goal of low impact on the land. These techniques include site design and development, open space and landscaping, water conservation, stormwater management, pervious pavements, green roofs, narrower roads, rain gardens, natural landscaping, rain barrels, re-use basins, curbless roads, swale blocks, and reverse soil compaction.

RMP Policies and Objectives Addressed

Objective 1B2a. Implementation through Plan Conformance of regulations which limit permissible uses within forested lands in High and Moderate Integrity Forest Subwatersheds to maintenance of pre-existing uses and permit minimal removal of woody vegetation from forested lands, subject to an approved Forest Management Plan or development that utilizes low impact development best management practices and an approved forest mitigation plan.

Objective 1B2b. Implementation of regulations through Plan Conformance which allow for redevelopment of previously developed areas and for other compatible uses that minimize losses to forested lands within Low Integrity Forest Subwatersheds in accordance with an approved forest mitigation plan or low impact development best management practices.

Objective 1B3b. Implementation of resource management programs to avoid loss of forests such as low impact development best management practices and mitigation and/or restoration.

Objective 1C2a. Technical guidelines and procedures for development and implementation of low impact development best management practices to

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protect, enhance and restore forest resources.

Objective 1D4f. Implement a Stream Corridor Protection/Restoration plan and Low Impact Development Best Management Practices for any development activity proposed within a Highlands Open Water buffer.

Objective 1D5c. Implement Low Impact Development Best Management Practices for any development activity proposed within a Riparian Area, which minimize both alterations of natural vegetation and increases in impervious area, and provide for mitigation through restoration of impaired Riparian Areas in the same HUC14 subwatershed.

Objective 1D6c. Require, where land disturbance is otherwise permitted, that low impact development best management practices are followed to minimize any potential for habitat or water quality impairment.

Objective 1D7b. Require, where land disturbance is otherwise permitted, that low impact development best management practices are followed to minimize any potential for habitat or water quality impairment.

Objective 1F4a. Implementation of performance standards through local development review and Highlands Project Review requiring all development to employ low impact development best management practices and avoid disturbance of a critical habitat feature whenever possible and to promote avoidance and minimize impact when disturbance is unavoidable.

Objective 2D3a. Implement, through local development review and Highlands Project Review, low impact development or other best management practices to minimize the need for engineered recharge methods for the purpose of complying with N.J.A.C. 7:8 (Stormwater Management Rules).

Policy 2D9. To develop technical guidelines and procedures for low impact development, engineering and other appropriate best management practices to protect, restore and enhance Prime Ground Water Recharge Areas.

Objective 2G5b. Require low impact development and other best management practices standards for stormwater management to minimize the discharge of stormwater-entrained pollutants to ground and surface waters.

Objective 2G6a. Develop technical guidelines and procedures for low impact development and best management practices to protect ground and surface water quality.

Policy 2G7. To promote the implementation of low impact development standards and best management practices to protect the quality of ground and surface water quality.

Policy 6N1. To establish smart growth and low impact development (LID) principles for use within the Highlands Region to guide and control development and redevelopment throughout the Highlands Region.

Objective 6N1a. Conservation development standards which protect natural resources, environmentally sensitive areas, open space and agricultural lands, and enhance community character.

Objective 6N1d. Minimum requirements for water conservation measures in site

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layout and structures, including but not limited to water efficient landscaping (including use of native and drought-tolerant plant species), rain collection systems, use of gray water, and water-efficient landscape irrigation.

Objective 6N1e. Minimum requirements for use of micro-climate conditions to maximize solar gain for winter heating and minimize solar gain during high temperature summer conditions.

Objective 6N1f. Minimum requirements for re-use and recycling of building materials when development involves demolition.

Objective 6N1g. Minimum requirements that all development include energy efficient features in site layouts and all structures.

Objective 6N1h. Design roadway improvements to have minimum impacts on Highlands resources by assessing alternative designs regarding drainage, impervious cover, native vegetation, and other “green street” considerations.

Policy 6N2. To require municipalities to adopt low impact development standards to protect the natural hydrologic features of the land.

Objective 6N2a. Implementation of on-site stormwater management features that maintain, restore and enhance the pre-existing natural drainage patterns of the site.

Objective 6N2b. Limitations on the amount of impervious cover allowed on a site as a means to protect and increase stormwater infiltration and reduce stormwater runoff.

Objective 6N2c. Minimum requirements for site-specific hydrologic studies during local development review and Highlands Project Review which identify the velocity, volume and pattern of water flow into, through, and off of the parcel proposed for development.

Objective 6N2e. Minimum requirements for use of grass channels, dry swales, wet swales, infiltration basins, bio-swales and water gardens, green roofs, and other low impact approaches to attenuate and control stormwater and provide multiple environmental benefits.

Policy 6N3. To require through Plan Conformance that municipalities and counties adopt low impact development practices to minimize land disturbance during construction activities.

Objective 6N3a. Local development review programs which require a site specific analysis of environmental features and constraints of the property proposed for development as a basis for determining compliance with sustainable design requirements.

Objective 6N3b. Limitation of site disturbance, clearing and grading to the minimum necessary to make reasonable use of the designated building envelope for the development parcel.

Policy 6N4. To require through Plan Conformance that municipalities and counties adopt low impact development best management practices where disturbance of Highlands resources is proposed, including but not limited to steep slopes, forest resources, critical habitats, open water and riparian areas, and

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**Site Design and
Development**

Prime Ground Water Recharge Areas.

Objective 6N4a. Identification of Highlands resources as an early step in site planning in order to avoid disturbance, in conformance with the Regional Master Plan.

Objective 6N5a. Minimum requirements for the use of low impact development and sustainable design practices to support affordable maintenance of housing, particularly affordable housing. **Objective 8D1a.** Municipal and county master plans and development regulations which permit the establishment of home occupations, small business incubator programs and innovative technologies that promote compact design, native species landscaping, low impact development, energy efficiency and resource conservation in support of comprehensive RMP goals.

Development and redevelopment projects must begin with an “existing features and site analysis plan” which identifies and maps all critical environmental features, all water bodies, all historic, cultural, archaeological and scenic features, all existing structures, all topographic features, and all significant physical features. The details shall be submitted as part of site plan and subdivision application packages and shall be added as elements of the relevant municipal checklists.

Development and redevelopment projects shall follow the prescribed conservation design planning process:

1. Existing features and site analysis plan;
2. Sub-regional context evaluation – identify the physical and social character of the surrounding areas (including across municipal and county borders);
3. Select open space conservation areas based on the information gathered in the first two steps, and provide connections to the surrounding areas or plan for future connections if a dedicated open space system does not currently exist in the adjacent areas;
4. Lay out building lots and incorporate green design techniques for stormwater management, site design, and resource protection.
5. Establish the development yield – residential, retail, office, commercial, community facilities – and match to water and sewer availability.
6. Cross-reference with Highlands resource standards, lake management, critical habitat, wellhead protection, etc.

Site design should take advantage of the features and characteristics of the site to improve or retain development amenities through incorporation of natural and other existing features, and should also incorporate opportunities for resource efficiencies. Orienting buildings for solar gain, designing landscape plantings to control micro-climate, and employing energy and resource efficiency all aid in reducing impacts of development.

Development and redevelopment project proposals must include a solar and wind analysis to gauge microclimate conditions. Following are guidelines for managing microclimate on-site:

- Orient the majority of windows to optimize daylighting and heat gain during the winter season

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- Orient thermal mass (materials that absorb, store and conduct heat) and insulation to take advantage of southern exposure while blocking north winds
- Orient buildings to the south to maximize solar gain
- Provide tree canopy cover and reduce hardscape for areas with high summer solar exposure
- Orient open space to maximize winter solar exposure
- Site taller buildings to minimize shadows on open spaces and other buildings
- Provide opportunities for vegetated screening, awnings, overhangs, and adjustable shade structures on buildings with high summer solar exposure
- Use roof-top gardens to reduce solar gain and insulate in winter

Development and redevelopment project proposals shall include a site preparation plan that allows clearing and grading only within the construction envelope, which includes the building and roadway footprints and a minimum area for construction equipment maneuvering. Reverse soil compaction should be considered and utilized to mitigate the effects of construction activity.

Development and redevelopment projects shall incorporate energy-efficient technology into new and rehabilitated structures and shall provide for the re-use and recycling of building materials.

- Disassemble existing buildings (deconstruction) rather than demolishing and either re-use materials or sell them into the re-use market.
- Re-use salvaged materials where possible.
- Provide on-site bins and/or dedicated space to facilitate the sorting and re-use of scrap materials.

Open Space and Landscaping

Conforming municipalities may adopt open space development ordinances for development and redevelopment projects. The open space requirements should be tailored to the Land Use Capability Map Zones and local zoning implementing these zones and, where feasible, should have at least 50% of the land area dedicated to some form of open space and otherwise as close to 50% as appropriate for the zone. Open space land may include, but is not limited to, active recreation, passive recreation, gardens, naturalized areas (including natural stormwater techniques such as naturalized swales), trail systems, and critical environmental areas such as steep slopes, habitat lands, wetlands, water bodies, riparian corridors, and forests. Development applicants may purchase adjacent or nearby lands to dedicate toward the 50% open space requirement.

A landscape plan shall be submitted with each project which incorporates native, drought-tolerant, disease-resistant plant species and does not include invasive plant species. Natural landscaping shall be considered for use when feasible (see below).

Water Conservation

Water conservation is a primary goal within the Highlands Region. Efficient utilization of Highlands water resources will effectively extend the available water supply. Consuming less water overall and only using fresh water for potable uses are strategies for effective water conservation. Low flow plumbing fixtures, re-

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using water, and proper maintenance of water delivery systems contribute to conservation efforts.

Development and redevelopment projects shall incorporate water conservation strategies wherever feasible. Potable water shall not be dedicated for non-potable uses, i.e., landscape irrigation and toilet flushing. Any new landscape irrigation system shall utilize rain gauges or moisture sensors to limit watering of lawns. The *Efficient Use of Water Program* has additional details regarding this requirement.

**Stormwater
Management**

Stormwater management shall be designed to employ a “design with nature” approach, as defined in the New Jersey Stormwater Best Management Practices Manual, prepared by the Department of Environmental Protection, Division of Watershed Management. Stormwater shall be managed in a decentralized manner and shall utilize low impact mechanisms wherever feasible.

Development and redevelopment projects shall be required, to the maximum extent feasible, to meet a performance standard of 80% on-site stormwater capture for average annual precipitation.

Pervious Pavements

Most pavement surfaces are designed to be impervious, serving to block the infiltration of precipitation to the ground below. Pervious pavement is designed to maintain or increase infiltration without damage to the transportation surface or to public safety. Pervious pavements range from pervious asphalt and concrete to gravel drive surfaces with a retainer to hold the gravel in place and prevent compaction that would reduce infiltration. The use of pervious asphalt and concrete on low-volume roads and parking lots may assist in reducing the impact of development. For individual home paving, pervious pavers of various types and gravel driveways may reduce the imperviousness of buildings and parking.

Pervious pavement is useful in all community character districts and all areas and zones. They work least well on high traffic volume roads. Paving systems that permit grass to grow within the paved area or require little underlying engineering are generally suitable for residential drives or infrequently used parking areas. Pervious pavement techniques have been proven to work in climates with winter freezes, such as New Jersey. Local site plan and subdivision regulations should be modified to allow and/or encourage the use of pervious paving materials and overall reduction in the amount of impervious materials.

Green Roofs

Like most pavement, roofs are designed to be impervious. Unlike pavement, pervious roofs are not acceptable. However, a technique known as green roofs is commonly used in Europe and frequently in this country. Green roofs use a combination of live plants and soil to create a stormwater management facility on roof tops. Green roofs are designed to hold water and provide for evapotranspiration and cleaning action, reducing the need for additional detention and pollutant reduction. They are installed on generally flat roofs where the roof can hold a significant amount of water and release it slowly. While there are some additional costs in installation, there are important energy savings that should offset the costs through energy savings and increased longevity of roof materials because they would not be subjected to extreme heat or cold or intensive sunlight.

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Green roofs should be considered as a low impact development technique for use on new non-residential development anywhere in the Highlands. Large buildings with roofs over 20,000 square feet may be the most appropriate for green roofs, but all non-residential development can implement this technique since few have a real need for sloped roofs. The rooftops of apartment buildings should also be considered as appropriate locations for green roofs. The technique can be used in both development and redevelopment. The use on steeper roofs is more difficult, and so for most residential units green roofs will not prove to be a practical technique, though building codes should allow for green roofs in low density zones.

The zoning or building codes should be modified to encourage green roofs on specific classes of buildings or land uses. Projects which do not include a green roof should be required to demonstrate use of other methods whereby stormwater is captured and utilized on-site.

Narrower Roads

The Highlands has a large number of cul-de-sac roads that cannot easily be connected due to topographic and geological conditions. Often these streets serve a small number of residences and lots are large enough that parking does not occur on the street. Narrower roads may be appropriate in these types of neighborhoods.

Local zoning or subdivision regulations should provide for narrower roads, where appropriate. The Highlands Council will develop recommendations for adoption into the Residential Site Improvement Standards (RSIS) to implement this concept, which will simultaneously reduce runoff, save land, protect environmental resources and reduce development costs.

Rain Gardens

Rain gardens are small, specifically designed, vegetated depressional areas typically used to store and recharge rain from a residential roof or driveway runoff, acting like a small retention facility. Rain gardens utilize native plants to intercept runoff from rooftops and adjacent impervious surfaces, allowing infiltration and recharge of ground water. The vegetated soil layer is underlain by gravel or small rock in a manner that ensures proper drainage so that ponding does not occur. Rain gardens can be used primarily for single-family dwellings or two- or three-family dwellings.

All development and redevelopment projects should utilize rain gardens whenever feasible. Local site plan and subdivision applications should require rain gardens as part of the landscape plan submission. Where a rain garden is not feasible, the application should demonstrate an alternative method for capturing and recharging rainwater on-site. A useful publication prepared by The Native Plant Society of New Jersey, "The Rain Garden Manual for New Jersey," provides a "how to" guide for constructing a rain garden. Rain gardens may be designed for any size lot.

Natural Landscaping

The average house or office building sits on a lot that is maintained as a lawn, and campus style office parks are situated within acres of manicured lawn. These lawn areas are compacted surfaces, limiting recharge to ground water, and for residential lawns often receive regular pesticide and nutrient applications.

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Natural areas of meadow or forest facilitate recharge, decrease stormwater runoff, and do not contribute chemicals to the environment. Replanting lawn areas with natural vegetation increases ground water recharge, reduces runoff and the flow of pollutants across the landscape.

Converting lawn areas to natural landscaping may help mitigate existing stormwater runoff problems as well as reducing maintenance costs.

Local planning and development programs should require that new development and redevelopment incorporate natural landscaping into their landscape plans wherever feasible. The Highlands Council will develop an educational program to encourage property owners to retrofit existing lawns, potentially including an annual awards program recognizing the best new landscaping and the best restoration landscaping of existing property to enhance the program.

Rain Barrels

Rain barrels and cisterns are rainwater storage facilities which save rainwater for future lawn and garden watering and other non-potable uses. The collection of rainwater reduces the use of potable water supplies and helps control stormwater runoff. Rain barrels are generally located at grade and have no mechanical systems, while cisterns are larger, may be above or below grade and often use pumps to increase flow.

Rain barrels may be used by single-family or smaller residential developments. They may also be effective for small nonresidential properties that have a lawn or planting area to maintain. Rain barrels and cisterns should be included as part of a low impact development and water conservation strategy where feasible. Proper design and maintenance will prevent standing water from becoming a breeding source for mosquitoes.

Re-Use Basins

The re-use basin is a retention basin that is designed to not only serve stormwater management objectives, but also store irrigation water. It is a multipurpose stormwater management facility that is designed to reduce consumptive water use for landscaping.

Re-use basins may be appropriate for use in large office parks, golf courses and campus style developments which have extensive lawn areas. Use of stormwater for irrigation and other non-potable uses would serve as a water conservation strategy. Where retention basins are proposed as part of a site plan or subdivision stormwater management plan, applicants should be required to design them for re-use purposes.

Curbless Roads

Curbs hold water on roads until it can be funneled into an engineered stormwater system. If water drains off the road into lawns or natural areas even when there is a storm sewer system, a portion of the stormwater is held on site for recharge. Time of concentration for stormwater runoff is reduced, which can reduce stormwater management costs.

This technique is most useful in residential development; in commercial and many other nonresidential areas, there generally is insufficient natural landscape or lawn area to handle the water. However, where there are extensive lawns in nonresidential areas, this technique may also be used.

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Site plan and subdivision regulations should provide for road crown and other standards that make a curbless road drain. A key part of this technique is to have reinforced shoulders, by installing base material several feet beyond the pavement. The regulations may need to identify areas where this is unsuited due to topography or require its use with other techniques. An alternative technique that may be used in more densely developed areas is the curb cut, which leads to a small sand infiltration area next to the road surface.

Swale Blocks

Swale blocks are small check dams in ditches or swales designed to slow runoff, allowing for greater recharge and cleaning and reduced peak runoff. Swale blocks may be used in road side ditches, swales or, where regulations permit, ephemeral streams.

Local site plan and subdivision regulations should set forth areas where these should be used and the thresholds for using them. Terrain which is very flat or very steep may not be appropriate locations.

**Reverse Soil
Compaction**

During the process of development, even open spaces are compacted, greatly reducing the soil's capability to recharge and slow runoff. Grading, equipment movement and temporary storage all result in compaction. Tilling the land that will be planted in lawns or other landscaped areas enhances the ability to function efficiently.

All lawn areas and open spaces that are being revegetated should be required to have reverse compaction. The graded areas should be tilled prior to replacing top soil and again after top soil is spread to achieve maximum results. Subdivision regulations should require this of all such areas containing more than 3,000 square feet per lot or pervious area.