

**DRAFT – FOR CONSIDERATION AT THE JUNE 5, 2008  
MEETING OF THE HIGHLANDS COUNCIL**

**Carbonate Rock Program**

**Issue Overview**

The term karst describes a distinctive topography that indicates dissolution of underlying carbonate rocks (such as limestone and dolomite) by surface water or ground water over time. This dissolution process causes surface depressions and the development of such features as sinkholes, sinking streams, enlarged bedrock fractures, caves, and underground streams. Sinking streams and sinkholes direct surface water runoff into karst aquifers with little or no attenuation of any transported contaminants. In addition to ground water concerns, communities in karst areas must contend with safety concerns as sinkholes can have damaging effects to large manmade objects.

Understanding the relevant land use concerns in carbonate rock areas can facilitate planning and site design measures that may accommodate economically feasible development while avoiding health, safety and environmental risks. The Carbonate Rock Program seeks to map areas that are underlain by carbonate rocks to define Carbonate Rock Areas in the Highlands Region and to map those subwatersheds that drain directly to Carbonate Rock Areas. Then, through project review, applications for development in Carbonate Rock Areas shall be required to conduct geotechnical investigations to locate any potential karst features, and those in contributing subwatersheds must ensure that their projects will not contaminate ground waters in the Carbonate Rock Areas. Local development reviews and Highlands Project Reviews shall ensure that all potential hazards to public health and safety, structures and ground water quality are fully addressed and mitigated in the construction plans and subsequent approval process, with the maximum emphasis on nonstructural measures, including, but not limited to, avoidance of modifications to the karst features. These project reviews will facilitate the Council's maintenance of a karst feature inventory for the Highlands Region.

**Program Summary**

Implementation of a Carbonate Rock Program is necessary to address the potential problems that are common to karst areas. The program is not intended to restrict development yields, but rather to provide for the adoption of a site assessment and design process for karst areas that allows applicants, municipalities, counties, and the Council to identify any karst concerns at a site and to incorporate appropriate design features in order to minimize future sinkhole (or other karst feature) formation, damage to development, and the potential for ground water contamination.

The Highlands Council has utilized existing New Jersey Geologic Survey and United States Geological Survey data to map those areas of the Highlands Region that are underlain by carbonate rocks. These areas collectively are referred to as the Carbonate Rock Area. Since changes in the quantity, quality, and rate of discharge of surface water runoff from upslope lands can impair ground water resources in the Carbonate Rock Area, lands that drain surface water into the Area will be delineated by the Council using LiDAR topographic analyses or other topographic data where LiDAR data are not available. Development ordinances will be adopted by municipalities and counties within affected land areas that will serve to protect public health and safety from potential hazards

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**RMP Policies and  
Objectives Addressed**

common to karst areas.

**Policy 1K1.** To map and make readily available to the public areas of the Highlands Region that are underlain by carbonate rocks to define a Carbonate Rock Area.

**Policy 1K2.** To identify and delineate through local development review and Highlands Project Review land areas that drain surface water into the Carbonate Rock Area, as changes in the quantity, quality and rate of discharge of surface water runoff from upslope lands can impair ground water resources in the Carbonate Rock Area.

**Policy 1K3.** To establish and maintain inventories of karst features and subwatersheds that drain directly to Carbonate Rock Areas in the Highlands Region.

**Policy 1K4.** To ensure through Plan Conformance that municipalities in, or within subwatersheds draining directly to, the Carbonate Rock Area protect public health and safety and the quality of ground waters from inappropriate land uses and pollutant discharges.

**Objective 1K4a.** Identification of critical requirements for development review ordinances to be adopted by municipalities, and for county development review procedures regarding roads and stormwater systems at a minimum, with technical guidance.

**Objective 1K4b.** Applications for site plan or subdivision approval will include a multi-phased geotechnical site investigation (e.g., test borings, test pits, etc.) to locate any potential karst features and potential hazards to public health and safety, structures and ground water quality.

**Objective 1K4c.** Local development reviews and Highlands Project Reviews and requirements shall ensure that all potential hazards to public health and safety, structures and ground water quality, including but not limited to concentrated surface water flows that dissolve carbonate rock, are fully addressed and mitigated in the construction plans and subsequent approval process, with the maximum emphasis on nonstructural measures, including, but not limited to, avoidance of modifications to the karst features.

**Objective 1K4d.** Public works projects, including but not limited to water supply, sewerage, stormwater and transportation facilities, shall be constructed and maintained such that the potential for damage from karst features and the contamination of ground water are avoided.

**Objective 1K4e.** Highlands Project Reviews and requirements and local development reviews (where applicable) shall prohibit new land uses and facilities that constitute unacceptable risks of discharge due to karst topography where karst features have been identified, including but not limited to:

- Underground storage tanks
- Solid waste landfills
- Hazardous waste storage and disposal

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- Hazardous materials storage and handling

**Objective 1K4f.** High priority is given, and state agency coordination will be undertaken, with respect to management and remedial action regarding high risk land uses and facilities where karst features have been identified including, but not limited to:

- Known contaminated sites such as Superfund sites, brownfields, and landfills
- Hazardous waste storage, handling and disposal facilities
- Failing septic systems
- Existing underground storage tanks

**Identification of Critical Requirements for Development Ordinances**

The Highlands Council will identify critical requirements for development ordinances to be adopted by municipalities and counties that have land areas that are within or drain to the Carbonate Rock Area. Given that the best design solution to karst-related problems is dependant upon the actual subsurface conditions below a particular area, the preparation of one-design-fits-all requirements for the Highlands Region is not appropriate. Performance standards provide flexibility regarding the specific actions to be taken to achieve local goals. Municipalities and counties will adopt development ordinances and performance standards that are consistent with the critical requirements identified by the Council.

**Development of Carbonate Rock Area Guidance Manual**

The Highlands Council will develop a technical guidance manual for use by municipalities and counties that have land areas that are within or drain to the Carbonate Rock Area. The guidance will contain requirements for a multi-phased geotechnical study to locate any potential karst features and potential hazards to public health and safety, structures, and ground water quality. The required multi-stage investigation will allow the applicant, as well as the municipality, county and Council, to predict problems and to estimate the associated costs based upon a growing body of knowledge for the area in question. The initial phase of work will be accomplished relatively inexpensively, yet the applicant can develop preliminary costs and evaluate the feasibility of the development. An existing guidance manual, developed by the North Jersey Resource Conservation & Development Council, will be used as one basis for the Council's work. The Council will also provide guidance to municipalities and counties regarding development of strategies with respect to public works projects in lands that are within or drain to the Carbonate Rock Area.

**Establishment and Maintenance of Karst Inventory**

The Highlands Council, working with municipalities and counties during the site plan and subdivision approval process, will establish and maintain inventories of karst features and subwatersheds that drain directly to Carbonate Rock Areas that are found in the Highlands Region.