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# CONSERVATION PLAN ELEMENT

(Adopted September 27, 2004; Updated February 25, 1008)

## INTRODUCTION

The purpose of a conservation plan element is to establish policy planning goals concerning the conservation and preservation of natural resources and to ensure that those goals and the characteristics of the natural resources themselves are taken into consideration in making planning and land use decisions. This update of Harding's Conservation Plan fulfills this purpose by continuing its long-standing tradition of focusing Harding's planning on the conservation and preservation of its high quality of natural resources as one of its central planning goals.

The township's overall goal of protecting its natural environment has remained a constant in its planning policies over a long period of time. The 1972 Comprehensive Master Plan reflected the goals of protecting environmental resources and preserving the township's established rural character. In 1980 the State Development Guide Plan, prepared by the Division of State and Regional Planning in the NJ Department of Community Affairs, recognized most of Harding as a *Conservation Area*. The New Jersey State Development and Redevelopment Plan, first adopted by the State Planning Commission in 1992 and readopted in 2001, designated virtually all of Harding as an *Environmentally Sensitive Planning Area* (Planning Area 5). These designations were reflective of the importance of water resources and the presence of the Great Swamp Wildlife Refuge in Harding.<sup>1</sup>

Recent years have seen dramatic improvements in our ability to measure the impacts of development on water resources, allowing the township to determine whether its land use policies will be consistent with these goals in the long term, when the township is fully developed. This is part of a broadly based effort on regional, state and federal levels to protect high quality water resources. This heightened focus on water resources in the Harding area began in 1989 when NJDEP Commissioner Daggett signed Administrative Order No. 51 raising concerns about the effects of urbanization in the Great Swamp watershed and on its water resources. Since then, there has been increasing emphasis on the importance of Harding's water resources to the township, region, state and indeed the nation. That focus comes from state agencies (NJDEP and State Planning Commission), regional groups (watershed associations, Ten Towns Committee and Highlands Task Force) and township residents.

Our ability to predict the impact of development on these important natural resources has also dramatically improved. These improvements have led to the conclusion that previous township policies intended to protect environmental resources will not, in the long run, have the desired and previously expected effect. This update results from these changes.

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<sup>1</sup> State Development and Redevelopment Plan, Delineation Criteria for PA-5, March 1, 2001, p. 216.

## CONSERVATION OBJECTIVES

The following objectives should be taken into consideration in the formulation of all of Harding Township's planning policies:

1. **Protect the quality and quantity of water resources in the township.** The high quality of Harding's groundwater and surface water resources are of critical importance to the township, region and state and should be protected from degradation. This objective is the overriding concern of this plan.
2. **Protect the environmental quality of the Great Swamp National Wildlife Refuge.** Harding's uniquely close relationship with the Refuge imposes a special responsibility for protecting the Refuge from the direct and indirect effects of development.
3. **Promote sustainable levels of development.** Development densities and intensities should be consistent with the ability of the natural resources to sustain them without compromising the environmental goals of this plan.
4. **Preserve woodlands and specimen trees.** Harding contains significant woodlands and specimen trees that should be preserved because they contribute importantly to environmental quality and the rural character of the township.
5. **Create and preserve greenway corridors especially along streams of high water quality.** Corridors of natural vegetation should be promoted, especially along streams, because they are vital to their environmental quality. They protect streams, which are especially sensitive to the effects of development and provide wildlife with healthier habitats.
6. **Control deer overpopulation.** Deer overpopulation should be reduced because it is harmful to environmental quality over the long run due to its destructive impact on natural vegetation.
7. **Control the introduction and spread of invasive plant species.** Aggressively spreading plant species that are not native to Harding should be controlled to minimize damage to native species and to the native ecology in general.

## SIGNIFICANT EVENTS IN CONSERVATION

Harding has a history of conservation planning spanning nearly half a century. An even longer time span is evident recognizing the establishment of Morristown National Historical Park in the 1930s as an early step in open space preservation. Over the last 25 years there has been increasing local, regional and statewide concern about damage to environmental resources and the consequences of suburban sprawl.

Following are the significant events relating to conservation planning in Harding, commencing with the creation of the Great Swamp National Wildlife Refuge and leading up to the adoption of this updated Conservation Plan element.

**1960:** The Great Swamp National Wildlife Refuge is created; about half of its 7,300 acres are located within Harding Township.

**1968:** The Harding Township Environmental Commission is created with an original focus to undertake research and studies documenting the township's natural resources.

**1976:** The first Natural Resources Inventory is prepared by the Environmental Commission to serve as a resource for the township's Planning Board, Board of Adjustment and Township Committee.

**1980:** The State Development Guide Plan designates most of Harding as a *Conservation Area*.

**1984:** NJDEP sponsors a major environmental study of the Great Swamp (Great Swamp Hydrology Study), which finds that development in its tributary drainage basin is damaging its sensitive ecosystem.

**1989:** NJDEP Commissioner Daggett signs Administrative Order # 51 creating the Great Swamp Watershed Advisory Committee, which in 1993 publishes a comprehensive report on the threats to the ecology of the Great Swamp, especially from upstream development in municipalities within the watershed.

**1990:** A new Conservation Plan is adopted by the Planning Board. This continued the long-standing commitment to conservation planning reflected in the Conservation Plan elements of the 1972 and 1984 Master Plans. Also in 1990, the Harding Land Trust is formed by local citizens as a nonprofit organization to acquire, by gift, bequest or purchase, real property or easements for conservation purposes. By 2004, the Trust acquires an interest in hundreds of acres of land in strategic locations around the township, contributing significantly to Harding's rural character, environmental protection, through a program of proactive open space preservation.

**1992:** The New Jersey State Development and Redevelopment Plan is first adopted. Most of Harding is designated in the *Environmentally Sensitive Planning Area* reflecting its low intensity development pattern, high quality water resources, and position relative to the Great Swamp.

**1995:** The Ten Towns Great Swamp Watershed Committee is created by inter-municipal agreement as an advisory body made up of representatives of municipalities in the Great Swamp watershed. Its mandate is to recommend land use policies designed to protect the fragile environment of the Great Swamp, especially land use policies affecting stormwater runoff from upstream communities in the watershed.

**1996:** Harding voters pass a non-binding referendum recommending that the Township Committee establish an Open Space Trust Fund through dedicated tax revenues to finance the acquisition of land and easements for the preservation of open space. In establishing the fund, the Township Committee firmly commits the township to a permanent open space preservation program and stewardship role in protecting the township's environmental resources. By 2004, the township considers a second increase in the open space tax to further enhance the potential funds available for land acquisition.

**1997:** Almost all of Harding Township<sup>2</sup> is designated a *Special Area* by the New Jersey Site Improvement Advisory Board. This permits the use of special residential site improvement standards more compatible with Harding's rural development pattern, to reduce impervious coverage, and to help lessen the impact of development on the Great Swamp.

**2003:** An updated Environmental Resources Inventory is adopted by the Planning Board as a component of the Master Plan. It documents the importance and sensitivity of the township's water and other natural resources.

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<sup>2</sup> The portion of Harding within the Great Swamp Watershed, which includes almost the entire township, was included in the Special Area designation.

**2004:** A carrying capacity analysis of Harding's soils is conducted. The study recommends low-density development in areas where on-site wastewater disposal systems are required and suggests an examination of the township's zoning to ensure that its planning policies promote sustainable development. Also in 2004, the New Jersey Legislature enacts the Highlands Water Protection and Planning Act, which establishes a core *preservation area* buffered by a *planning area* and broad new land use policies intended to protect the state's critical water resources. Under the legislation, Harding is designated within the *planning area* of the Highlands Region.

## PROTECTION OF WATER RESOURCES

### The Great Swamp

The Great Swamp National Wildlife Refuge is a 7,700-acre area administered by the US Department of Interior. Over 3,600 acres of the Refuge are included in the National Wilderness Preservation System. About 3,600 acres of the Refuge is located within Harding Township. The value of the Great Swamp as a wildlife refuge is greatly dependent upon the quality of water flowing into it. Land use and development in the watershed have direct and significant impact on the Refuge. Harding, in particular, has a special responsibility to protect the Refuge since so much of it lies within the township and because Harding comprises a significant portion of the Great Swamp watershed.

As early as 1975, a surface water study prepared by graduate students at the University of Pennsylvania concluded that water quality in the Great Swamp watershed was declining as a result of upstream development density and intensity. Flash flooding had already become a problem at sites where more intense urbanization had already intensified runoff. The study states that:

"Water quality for the watershed as a whole has been declining rapidly as revealed by twelve month moving averages since 1963 for chloride, dissolved oxygen, nitrate and ammonia at Millington Gorge. Point sources are numerous. Treated sewage effluent and inappropriately located septic systems are major sources of contamination. Silt, urban runoff and channelization also have impacted the aquatic system. The capacity of some streams flowing through the upland and wilderness area to assimilate waste is already exceeded especially during low flows. In the absence of immediate action to limit density, the decline in water quality will continue and become increasingly irreversible."<sup>3</sup>

In the 1980s the US Fish and Wildlife Service studied the effects of development on the Swamp and determined that:

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<sup>3</sup> Surface Water Resources of the Great Swamp Watershed New Jersey - An Environmental Basis for Planning Growth; David A. Guillaudeu, Eric M. Moye and Stephen B. Syz; University of Pennsylvania, Department of Landscape Architecture and Regional Planning, 1975.

"The (Great Swamp) watershed is being increasingly developed for residential, commercial and industrial purposes. Approximately 1,600 acres of wildlife habitat were lost in the watershed between 1961 and 1980."<sup>4</sup>

In 1984, a hydrology study was prepared by the US Fish and Wildlife Service and Morris County Soil Conservation District with the US Soil Conservation Service assisting, in connection with the master planning process for the Refuge. The study examined the Master Plans of the municipalities comprising the Great Swamp watershed and determined that continued growth as outlined in local Master Plans and zoning would have negative impacts upon the Great Swamp.

"Upstream development has hastened hydrologic changes and water quality degradation in the Swamp. Increased silt loads, higher floods, greater pollution loads, quicker peak flows, and smaller low flow characteristics are common to urbanizing areas. These changes have damaged and continue to impair the ecological vitality of the Swamp throughout the Refuge, especially in the Wilderness Area where there are no water management facilities and little federally-owned buffer zones for construction of facilities to mitigate these effects."<sup>5</sup>

In 1993, the Great Swamp Watershed Advisory Committee issued its Final Report to the NJDEP. It documented the Committee's findings about the impact of upstream development on the Great Swamp and made recommendations for mitigation, including recommendations to the watershed's municipalities to institute land use regulations designed to better protect the Refuge. This led to the creation, in 1995, of the Ten Towns Great Swamp Watershed Committee (the Ten Towns Committee) made up of representatives of the towns in the watershed. Its purpose was to create a Great Swamp Watershed Management Plan (accomplished in 1997) and recommend implementing ordinances. Harding Township has adopted environmental ordinances consistent with the recommendations of the Ten Towns Committee. The water quality of the streams entering the Great Swamp is being monitored by the Great Swamp Watershed Association with the assistance of Harding Township staff.

In 2002, the Ten Towns Committee completed a four-year study<sup>6</sup> that included measuring nitrate levels in five streams during baseflow and stormflow conditions. The results of the study with respect to nitrate concentrations are presented in the table below.<sup>7</sup> Consistent with New Jersey Water Quality Standards the Committee concurred with the mandated anti-degradation policy with respect to Category One waters and recommended a similar policy for other waterways throughout the watershed.

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<sup>4</sup> Final Environmental Impact Statement, Master Plan-Great Swamp National Wildlife Refuge, US Fish and Wildlife Service, 1987.

<sup>5</sup> Hydrology Study, Great Swamp National Wildlife Refuge, US Fish and Wildlife Service, August 1984.

<sup>6</sup> Water Quality Standards for the Great Swamp Watershed; Ten Towns Great Swamp Watershed Management Committee; June 2002.

<sup>7</sup> The table for this section was compiled by Garry Annibal, Harding Township Health Administrator.

Stream	Average Baseflow Concentration	Range of Baseflow Concentrations	Average of Stormflow Concentration	Range of Stormflow Concentrations
Black Brook	0.13	<0.01 - 0.42	0.38	0.09 – 1.11
Loantaka Brook	6.67	2.9 – 8.89	1.63	0.69 – 3.36
Great Brook	0.51	0.08 – 0.92	1.01	0.56 – 2.36
Primrose Brook	0.40	0.17 – 0.58	1.06	0.19 – 3.86
Passaic River	0.26	0.04 – 0.68	0.64	0.22 – 1.21

Results are mg/l of nitrate-nitrogen

## NJDEP Surface Water Classification System

Figure 12, Stream Classifications map, illustrates the classification of all streams and surface waters in Harding according to the NJDEP surface water classification system. Approximately 44 miles of streams are present within the township. Of this figure approximately 17 miles (39%) of the aggregate stream length is classified as FW2-NT (C1), 7.2 miles (16%) as FW2-TP (C1), 2.8 miles (6%) as FW2-TP, and 17 miles (39%) as FW2-NT. The Category One classification applies to 55% of aggregate stream length in the Township and all of the streams within the Great Swamp.<sup>8</sup> The majority of streams located within the township are of exceptional environmental value. In particular, the 2002 Ten Towns Committee monitoring report<sup>9</sup> concluded: “both Primrose Brook and the Passaic River have good baseflow water quality and represent baseflow reference conditions for the watershed.” The surface water classifications defined in N.J.A.C. 7:9B follow.<sup>10</sup> In connection with the protection of surface water quality, the Category One waters are of utmost importance.

FW – The general surface water classification applied to fresh waters.

FW1 – Those fresh waters, as designated by N.J.A.C. 7:9B-1.15(h) Table 6, that are to be maintained in their natural state of quality (set aside for posterity) and not subjected to any man-made wastewater discharges or increases in runoff from anthropogenic activities. These waters are set aside for posterity because of their clarity, color, scenic setting, other characteristics of aesthetic value, unique ecological significance, exceptional recreational significance, exceptional water supply significance, or exceptional fisheries resource(s).

FW2 – The general surface water classification applied to those fresh waters that are not designated as FW1 or Pinelands Waters.

NT – Non-trout waters: fresh waters that have not been designated in N.J.A.C. 7:9B-1.15 (b) through (h) as trout production or trout maintenance. These waters are generally not suitable for trout because of their physical, chemical, or biological characteristics, but are suitable for a wide variety of other fish species.

TM – Trout maintenance: waters designated in N.J.A.C. 7:9B-1.15(b) through (g) for the support of trout throughout the year.

<sup>8</sup> Hydrogeologic Evaluation, Nitrate Based Carrying Capacity Assessment, Harding Township, Morris County, NJ, Maser Consulting, March 18, 2004.

<sup>9</sup> Water Quality Standards for the Great Swamp Watershed; Ten Towns Great Swamp Watershed Management Committee; June 2002.

<sup>10</sup> This material is excerpted from: Hydrogeologic Evaluation, Nitrate Based Carrying Capacity Assessment, Harding Township, Morris County, NJ, Maser Consulting, March 18, 2004.

TP – Trout production: N.J.A.C. 7:9B-1.15(b) through (g) for use by trout for spawning or nursery purposes during their first summer.

C1 – Category One waters: those waters designated in the tables N.J.A.C. 7:9B-1.15(c) through (h), for purposes of implementing the antidegradation policies set forth at N.J.A.C. 7:9B-1.5(d), for protection from measurable changes in water quality characteristics because of their clarity, color, scenic setting, other characteristics of aesthetic value, exceptional ecological significance, exceptional recreational significance, exceptional water supply significance, or exceptional fisheries resource(s). These waters may include, but are not limited to:

1. Waters originating wholly within Federal, interstate, State, county, or municipal parks, forests, fish and wildlife lands, and other special holdings that have not been designated as FW1 in N.J.A.C. 7:9B-1.15(h) Table 6;
2. Waters classified in N.J.A.C. 7:9B-1.15(c) through (g) as FW2 trout production waters and their tributaries;
3. Surface waters classified in this subchapter as FW2 trout maintenance or FW2 nontrout that are upstream of waters classified in this subchapter as FW2 trout production;
4. Shellfish waters of exceptional resource value; or
5. Other waters and their tributaries that flow through, or border, Federal, State, county, or municipal parks, forests, fish and wildlife lands, and other special holdings.

## **Protection of Surface Water Quality**

Pollutants from specific sources discharged directly into a waterway are known as “point source” pollutants and, depending upon the amount of discharge, are regulated by the state under the New Jersey Pollutant Discharge Elimination System (NJPDES) permit program. An example of this source of regulated activity is the Woodland Avenue Sewage Treatment Plant, which discharges into the Loantaka Brook in Morris Township. While there may not be a large number of regulated point source discharges within Harding, the township is concerned about the long-term negative impacts on discharges to waterways that lead to the Great Swamp.

“Nonpoint” sources of pollution are a major source of concern in Harding. These include stormwater runoff from paved or other impervious areas, which contain a variety of pollutants, older buildings that are not fitted with roof drain dry wells, construction sites causing soil erosion, pesticides and fertilizers from residential lawns, and nitrate loading from septic systems. These sources of pollution are difficult to control and add to the degradation of stream water quality.

Changing patterns of development in the township are increasing the impacts on surface water quality from nonpoint sources of pollution. Traditionally in Harding, very large dwellings were located on very large properties with substantial areas left in their natural state. This helped to mitigate the impact of development on water resources. Increasingly, very large homes are being constructed on relatively modest sized lots with extensive site improvements and high maintenance landscaping. This has increased the relative intensity of development, and the potential for nonpoint sources of pollution.

The protection of the quality of Harding’s surface waters has been a primary focus of Harding’s planning for decades and should continue to be so. The township’s land use and development regulations should continue to be designed to protect the water quality of all streams to ensure

that there will be no degradation as future development continues to occur. Under the Special Area designation approved by the state, the township has implemented an ordinance that requires a “no net increase” in the rate of flow or volume of stormwater to achieve these goals and mitigate stormwater impacts.

## **Protection of Groundwater Quality: Carrying Capacity Analysis**

About 75% of Harding’s citizens are dependent upon individual wells, but most of the township is located within Triassic basalt, shale and sandstone geologic formations, which have low water bearing capabilities. In addition, all of Harding is located within the aquifer recharge zone of the Buried Valley Aquifer system, where rainfall replenishes the groundwater. In 1980 the Administrator of the U.S. Department of Environmental Protection determined under the provisions of the Safe Drinking Water Act that the Buried Valley Aquifer system was a "sole source aquifer" because the aquifer, “if contaminated would create a significant hazard to public health.”

For these reasons, the protection of groundwater quality is an important planning goal for Harding. The intensity and density of development in the township directly affects its groundwater quality because its citizens are also largely dependent upon individual septic systems for wastewater disposal. Every septic disposal system degrades groundwater quality to some extent, even when functioning properly. The impact of each individual system is small, but collectively they can have significant impacts if the density of development is greater than the ability of the land to dilute contaminants to safe levels.

The New Jersey State Development and Redevelopment Plan (State Plan) recommends the use of capacity-based analyses in making land use decisions in areas such as Harding that are designated as environmentally sensitive. The State Plan defines *capacity analysis* as “determining and evaluating the capacity of natural, infrastructure, social, and fiscal, systems to define the carrying capacity for existing development and future growth of a community or region.” It defines *carrying capacity* as “the optimum demand for system sustainability or the maximum demand a system can support without serious compromise or collapse.”<sup>11</sup> In 2003 the township was awarded a “Smart Growth Grant” from the Association of New Jersey Environmental Commissions to undertake a carrying capacity analysis of the soils in areas dependent upon septic systems. Maser Consulting Engineers undertook the analysis utilizing the model described below.

The carrying capacity of an area dependent upon individual sewage disposal systems and private wells can be assessed by utilizing a “nitrate dilution model.” In 1978 the Trela-Douglas Nitrate Dilution Model<sup>12</sup> was developed to assess the impact of septic system discharges on groundwater in the Pinelands and it has been used for such evaluations throughout New Jersey since that time. The model uses nitrate levels in groundwater as the key indicator of overall quality and predicts

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<sup>11</sup> New Jersey State Development and Redevelopment Plan, pp. 318-319.

<sup>12</sup> “Soils, Septic Systems and Carrying Capacity in the New Jersey Pine Barrens,” First Annual Pine Barrens Research Conference, Atlantic City, New Jersey, Trela, J.J., and Douglas, L.A., May 22, 1978.



nitrate levels for any given amount of development on a regional basis based upon septic system discharges. Regulatory programs designed to prevent groundwater pollution from septic tank effluent frequently use nitrate concentrations in groundwater as an indicator of overall groundwater quality and as a measure of compliance due to the predominantly anthropogenic sources of nitrate.

In 1993 the New Jersey Geological Survey (NJGS) published *A Method for Evaluating Ground-Water-Recharge Areas in New Jersey*<sup>13</sup> to estimate groundwater recharge based on climate, soils and land uses. The Trela-Douglas Nitrate Dilution Model has been adapted by the NJGS to incorporate the recharge method. Version 5 of the model, drafted by the NJGS in 2002, is known as *A Recharge-Based Nitrate Dilution Model for New Jersey*.

Key to the use of the model is establishing a target nitrate level. As a result of the potential health impacts of excess nitrate in drinking water (e.g. methemoglobinemia) the US Environmental Protection Agency has set a maximum contaminant level of 10 mg/l for nitrate in potable water supplies. Similarly, the NJDEP has instituted nitrate groundwater quality criteria of 10 mg/l for class IIA aquifers such as those underlying the township. Because this level results in public health hazards, it is important to set the nitrate target for the model at an appropriate lower level to avoid groundwater degradation that could result in public health risks. The general statewide target used by NJDEP is 5.2 mg/l. However, it is reasonable to adjust the target in areas containing sensitive environmental resources and existing high quality water resources such as those in Harding in view of the NJDEP's antidegradation policies for Category One waters.

A target nitrate level of 2.0 mg/l was recommended by Maser Consulting in its carrying capacity analysis as an appropriate level for Harding Township in consideration of its high quality water resources, its location with respect to the Great Swamp and its goals to protect water quality. This is the same standard that NJDEP applies to the surface waters of the New Jersey Pinelands. The Maser report states:

NJDEP recommends that the selection of a target nitrate concentration should be a function of relevant water resource policies and standards and, furthermore, that this selection should include a "safety factor" to account for the limiting assumptions within the Version 5 Model...A target nitrate concentration of 2.0 mg/l was selected for use in the nitrate dilution calculations. This decision was based on the exceptional value of the surface waters located within the Township and the Township's desire to protect both surface water and groundwater.<sup>14</sup>

The Harding Township Health Department has concurred with the target nitrate level of 2.0 mg/l in connection with the carrying capacity analysis, based on the high quality of streams in Harding and the anti-degradation policy recommended by the Ten Towns Committee and NJDEP for Category One waters.

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<sup>13</sup> New Jersey Geological Survey Report GSR-32, *A Method for Evaluating Ground-Water-Recharge Areas in New Jersey*, Emmanuel G. Charles et al., 1993.

<sup>14</sup> Hydrogeologic Evaluation, Nitrate Based Carrying Capacity Assessment, Harding Township, Morris County, NJ, Maser Consulting, March 18, 2004.

The Nitrate Dilution Model is intended to be used as a tool in making land use planning decisions in communities that are dependent upon both groundwater and septic systems. Appropriate levels of development can be established consistent with the goal of protecting groundwater quality. The target of 2.0 mg/l is an appropriate target nitrate level for Harding because:

- Harding is immediately upstream of the Great Swamp National Wildlife Refuge and includes within its boundaries about half of the land area of the Refuge.
- 55% of the aggregate stream length in the township and almost all of the streams in the Great Swamp are categorized as Category One waters. These streams are of exceptional quality and should not be degraded. The goal of “no net increase in pollutant loadings and stormwater flows” recommended by the Ten Towns Committee and endorsed by NJDEP in 1993 is reasonable and attainable.
- Harding is included within Planning Area 5, the environmentally sensitive planning area, by the State Planning Commission.
- Harding is located in the planning area of the Highlands region and is also in the recharge zone of the Buried Valley Aquifer. Water resources in this area are of critical importance to the state and special care must be exercised with regard to land use and development policies to avoid contamination of the groundwater supplies upon which so many people depend.
- Harding has had a long-standing public policy to avoid the degradation of its surface and ground water resources.

The results of the carrying capacity analysis are displayed in Figure 13, Nitrate Dilution-Based Carrying Capacity Analysis, prepared by Maser Consulting Engineers. It indicates that target densities in the township range from 3.5 to 4.2 acres per septic system in the areas analyzed.<sup>15</sup> This is the carrying capacity of the land in Harding to support septic systems so as to avoid future potential detrimental impacts from septic system discharges.

Zoning density is the most important public policy planning tool affecting the future quality of groundwater. This is especially true in Harding where many of the soils pose constraints to on-site septic development. In addition, there are areas in Harding where development densities already exceed those recommended by the carrying capacity analysis, as the villages and other higher density areas were developed long ago. According to the Harding Township Engineer:

The long term concentration of nitrates from conventional septic systems in groundwater depends upon the population density of an area and the annual groundwater recharge. Thus, if the quality of the water that forms the base flow in our streams is to be protected from degradation, the population density must be controlled. Based on the recent Maser Consultants study, it appears that a population density associated with 3-acre lots is not consistent with the goal of “no net increase” of water pollution established by the NJDEP for the Great Swamp Watershed. Although Harding Township has responded to this challenge by adopting an ordinance to control pollution from stormwater, until recently there has been little effort to

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<sup>15</sup> Areas with hydric soils (soils occasionally or perpetually saturated with water) and sewer service were not analyzed, as the Nitrate Dilution Model does not apply to these areas.

control pollution resulting from the nominal operation of septic systems. This is essential if it is the township's objective to reach, or even approach, the "no net increase" goal.<sup>16</sup>

Based on all of the above, the township's land use policies should require large lot sizes in less dense areas sufficient to mitigate potential contamination from nitrate loading, but also from leakage, as well as from other impacts of development such as surface runoff and pesticides.

## **PROTECTION OF CRITICAL AREAS & NATURAL RESOURCES**

The protection of critical areas is an important planning goal for the township. Critical areas are those containing special environmental importance and/or sensitivity. They include stream corridors, flood plains, freshwater wetlands and steeply sloping terrain, as well as natural resources such as specimen trees, woodlands and meadows. The protection of these areas is important when development is proposed to mitigate soil erosion and maintain the high quality of the township's surface waters, as well as to maintain natural habitat for indigenous wildlife.

### **Open Space Preservation**

The preservation of open space through outright acquisition or easements is an important part of the township's overall strategy to fulfill the goals of this plan. The Open Space Plan element establishes the overall policies for open space acquisition in Harding.

Funding for open space acquisition is available from a variety of sources including local (Harding Open Space Trust Fund), county (open space and agricultural preservation funds) and the state (Green Acres Program) government as well as nonprofit conservation groups. Federal funding for expansion of the National Park and the Wildlife Refuge requires congressional authorization. With limited resources and high property values, it is increasingly important to leverage funding and utilize creative methods to achieve open space preservation goals. Harding has been particularly successful in partnering with open space organizations and foundations to achieve open space preservation objectives. Creative approaches including the leveraging of funds from a variety of sources and establishing and maintaining partnerships will be of increasing importance to open space acquisition in the future as property values continue to rise.

Generally, the acquisition of land for open space should give priority to lands containing areas of critical environmental importance or those containing natural resources of special significance. In setting priorities for open space acquisition, the township should consider land that:

- Protects, enhances or restores ecosystems, aquifers, stream corridors, or other water resources.
- Preserves Harding's rural heritage such as scenic vistas or landscapes, historic structures and bridle paths.

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<sup>16</sup> Memorandum dated May 14, 2004 from Robert H. Fox, PE to Marshall Bartlett, Chairman, Harding Township Planning Board.

- Complements existing open space.
- Serves as valuable wildlife habitat including forests and meadows.
- Establishes or contributes to a system of greenways.
- Should be acquired because development would have a substantial deleterious impact on the character of the township.

## **Steep Slope Protection**

The slope of the land is an important determinant of the impact of development on the environment, especially upon water resources. A high degree of slope increases the amount and speed of stormwater runoff, which then increases the amount of soil erosion while decreasing groundwater recharge. The water quality of nearby streams is impacted by increases in sediments and other pollutants. The natural pattern of stream flows is altered by increasing flows during storm events but decreasing them at other times. These alterations are very damaging to the natural health of the stream and in the extreme can make them little more than drainage ditches.

A reduction of groundwater recharge is especially characteristic of the development of steeply sloping areas because of the increase in the speed and amount of runoff. This adversely impacts both the quantity of groundwater and, just as importantly, groundwater quality. Groundwater quality is impacted because quality is directly dependent upon the amount of recharge to dilute pollutants, both those naturally occurring but most importantly in Harding's case, man-made pollutants from septic discharges.

Land disturbance in steeply sloping areas should be limited as a general principle because adverse environmental effects are inevitable. Where it must occur, special construction methods and care must be taken to minimize soil loss, damage to vegetation, and maintenance of pre-existing natural drainage patterns, to the extent possible. Most of the land northwest of Route 202 is characterized by steep slopes. This area is also the headwaters area for a number of high quality streams. Special care for the protection of these headwaters should be a focus of planning concern for the township.

## **Stream Corridor Protection**

The streams that crisscross the township eventually lead to the Great Swamp. The state regulates development in areas identified as freshwater wetlands and requires special permits for stream crossings. Although recent state regulations stipulate new setback limitations along Category One streams, there is no state regulation of the land uses along other streams.

Consistent with state planning policies for environmentally sensitive areas, the township has established land use standards protecting stream corridors from the negative effects of development. The standards include setback requirements for new structures and limitations on the removal of vegetation. Conservation easements are required to be established along wetlands and waterways as part of the subdivision and site plan review process, consistent with the goals and objectives of this Master Plan to provide lasting protection for these important water resources.

## **Tree Protection**

The preservation of trees and hedgerows is important to maintaining the rural character of the township and to environmental protection. The indiscriminate clearing of undeveloped acreage and excessive tree removal on developed private property contribute to soil erosion, the loss of wildlife habitat, and the degradation of air and water quality. The preservation of buffer areas along perimeter property lines and the preparation and implementation of landscape plans in connection with new development are measures that support the rural preservation and environmental protection goals of this Master Plan. The Shade Tree Advisory Committee assists and advises township departments, boards and commissions in matters relating to landscape plantings and native vegetation on public lands and private property under review by appropriate boards.

## **Critical Habitats**

Harding Township has developed over the years in a predominantly low-density residential pattern that has maintained its great variety of floral and fauna communities. This, together with the large public land holdings, has served to insulate the township from the great suburban pattern of growth which has characterized much of the surrounding region. Figure 11, Critical Areas map, at the end of the Environmental Resources Inventory (ERI) depicts areas with habitats utilized by federal and state endangered species, as well as areas of special concern and suitable habitat.

Primrose Brook connects Jockey Hollow and the Great Swamp. The maintenance of stream and forest corridors between the two reservations will promote the continuance of the township's most unique wildlife habitats. In addition, buffers along Loantaka Brook, Great Brook, Silver Brook, and Pine Brook will ensure the continued high quality of these unique habitat areas. This is particularly important in connection with Great Brook and Pine Brook, which are directly linked to the Great Swamp.

Recent development in Harding, however, has taken place in a more intensive fashion as more subdivisions have been developed with large homes, extensive impervious coverage, and formal landscaped areas. Land use planning policies should promote the goal of preserving wildlife habitats, especially in corridors that reduce the effect of creating isolated pockets. It is important that land use planning decisions are made so as to mitigate the negative impacts that can result from unchecked growth, for once destroyed, wildlife habitats and unique areas of vegetation may be impossible to retrieve. The primary land use planning strategy recommended in this plan for avoiding these impacts is low densities of permitted development.

Major applications for development should be accompanied by an Environmental Impact Statement that includes measures to avoid impacting ecologically significant areas and, if this is not possible, measures which will lessen and offset unavoidable adverse impacts so that there is no net loss of habitat value. Examples of mitigating measures include establishing limits of disturbance to protect existing trees and wooded areas, replenishing disturbed vegetation with

indigenous species, and establishing conservation easements to maintain buffers along stream corridors and wetland areas. The protection of the critical areas located in Harding is especially important because of the township's intimate relationship with the Great Swamp.

## **Control of Nuisance Species**

The ERI documents the threat of deer overpopulation and of invasive plants to environmental quality in Harding in general and to critical habitats in particular. The great variety and significance of Harding's vegetative resources, particularly in critical habitats, should be protected against these threats. Efforts by the township to control deer over-population and the introduction of invasive plants, particularly those listed in the ERI, should be supported.

## **Energy Conservation** (Reserved)

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