

# Stormwater Management Plan

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Lebanon Township  
Hunterdon County, New Jersey

*March 2005*  
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*Prepared by:*  
*Lebanon Township Planning Board*  
*With assistance from:*  
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## **Introduction**

This Municipal Stormwater Management Plan (MSWMP) documents the strategy for Lebanon Township to address stormwater-related impacts. The creation of this plan is required by N.J.A.C. 7:14A-25 Municipal Stormwater Regulations. This plan contains all of the required elements described in N.J.A.C. 7:8 Stormwater Management Rules. The plan addresses groundwater recharge, stormwater quantity, and stormwater quality impacts by incorporating stormwater design and performance standards for new major development, defined as projects that disturb one or more acre of land. These standards are intended to minimize the adverse impact of stormwater runoff on water quality and water quantity and the loss of groundwater recharge that provides baseflow in receiving water bodies. The plan describes long-term operation and maintenance measures for existing and future stormwater facilities.

A “build-out” analysis has been included in this plan based upon existing zoning and land available for development. The plan also addresses the review and update of existing ordinances, the Township Master Plan, and other planning documents to allow for project designs that include low impact development techniques. The final component of this plan is a mitigation strategy for when a variance or exemption of the design and performance standards is sought. As part of the mitigation section of the stormwater plan, specific stormwater management measures will be identified on an annual basis to lessen the impact of existing development.

## **Goals**

The goals of this MSWMP are to:

- reduce flood damage, including damage to life and property;
- minimize, to the extent practical, any increase in stormwater runoff from any new development;
- reduce soil erosion from any development or construction project;
- assure the adequacy of existing and proposed culverts and bridges, and other in-stream structures;
- maintain groundwater recharge;
- prevent, to the greatest extent feasible, an increase in nonpoint pollution;
- maintain the integrity of stream channels for their biological functions, as well as for drainage;

- minimize pollutants in stormwater runoff from new and existing development to restore, enhance, and maintain the chemical, physical, and biological integrity of the waters of the state, to protect public health, to safeguard fish and aquatic life and scenic and ecological values, and to enhance the domestic, municipal, recreational, industrial, and other uses of water; and
- protect public safety through the proper design and operation of stormwater basins.

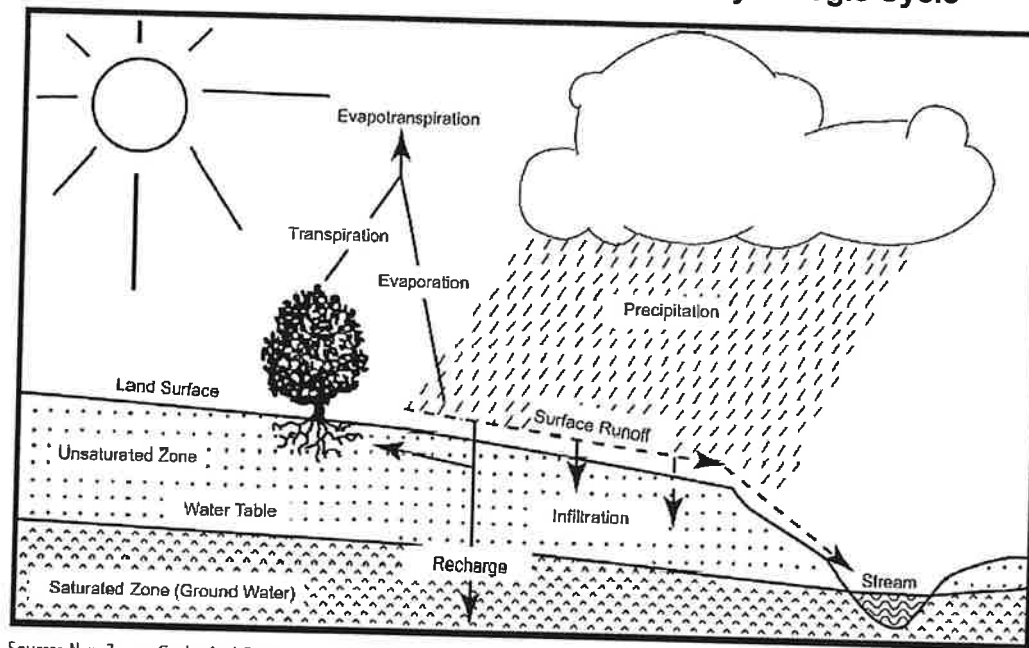
To achieve these goals, this plan outlines specific stormwater design and performance standards for new development. Additionally, the plan proposes stormwater management controls to address impacts from existing development. Preventative and corrective maintenance strategies are included in the plan to ensure long-term effectiveness of stormwater management facilities. The plan also outlines safety standards for stormwater infrastructure to be implemented to protect public safety.

### **Stormwater Discussion**

Land development can dramatically alter the hydrologic cycle (See Figure 1) of a site and, ultimately, an entire watershed. Prior to development, native vegetation can either directly intercept precipitation or draw that portion that has infiltrated into the ground and return it to the atmosphere through evapotranspiration. Development can remove this beneficial vegetation and replace it with lawn or impervious cover, reducing the site's evapotranspiration and infiltration rates. Clearing and grading a site can remove depressions that store rainfall. Construction activities may also compact the soil and diminish its infiltration ability, resulting in increased volumes and rates of stormwater runoff from the site. Impervious areas that are connected to each other through gutters, channels, and storm sewers can transport runoff more quickly than natural areas. This shortening of the transport or travel time quickens the rainfall-runoff response of the drainage area, causing flow in downstream waterways to peak faster and higher than natural conditions. These increases can create new and aggravate existing downstream flooding and erosion problems and increase the quantity of sediment in the channel.

Filtration of runoff and removal of pollutants by surface and channel vegetation is eliminated by storm sewers that discharge runoff directly into a stream. Increases in impervious area can also decrease opportunities for infiltration which, in turn, reduces stream base flow and groundwater recharge. Reduced base flows and increased peak flows produce greater fluctuations between normal and storm flow rates, which can increase channel erosion. Reduced base flows can also negatively impact the hydrology of adjacent wetlands and the health of biological communities that depend on base flows. Finally, erosion and sedimentation can destroy habitat from which some species cannot adapt.

Figure 1: Groundwater Recharge in the Hydrologic Cycle



Source: New Jersey Geological Survey Report GSR-32.

In addition to increases in runoff peaks, volumes, and loss of groundwater recharge, land development often results in the accumulation of pollutants on the land surface that runoff can mobilize and transport to streams. New impervious surfaces and cleared areas created by development can accumulate a variety of pollutants from the atmosphere, fertilizers, animal wastes, and leakage and wear from vehicles. Pollutants can include metals, suspended solids, hydrocarbons, pathogens, and nutrients.

In addition to increased pollutant loading, land development can adversely affect water quality and stream biota in more subtle ways. For example, stormwater falling on impervious surfaces or stored in detention or retention basins can become heated and raise the temperature of the downstream waterway, adversely affecting cold water fish species such as trout. Development can remove trees along stream banks that normally provide shading, stabilization, and leaf litter that falls into streams and becomes food for the aquatic community.

### **Background**

The Township encompasses a 31.85 square mile area in Hunterdon County, New Jersey. As with many Hunterdon County municipalities, development pressures have increased in recent years. The Township's population rose from 5,679 in 1990 to 5,816 in 2000. This population increase has resulted in construction of new residential development which adds to impervious coverage and changes in the landscape. These changes increase stormwater runoff volumes and pollutant loads to the waterways in the Township. These changes are especially significant given the abundance of C-1 streams and the location of the Township in the Highlands Preservation Area. Figure 2 illustrates

the waterways and the Highlands Preservation Area boundary in the Township. Figure 3 depicts the Township boundary on the USGS quadrangle maps.

The New Jersey Department of Environmental Protection (NJDEP) has established an Ambient Biomonitoring Network (AMNET) to document the health of the state's waterways. There are over 800 AMNET sites throughout the state of New Jersey. These sites are sampled for benthic macroinvertebrates by NJDEP on a five-year cycle. Streams are classified as non-impaired, moderately impaired, or severely impaired based on the AMNET data. The data is used to generate a New Jersey Impairment Score (NJIS), which is based on a number of biometrics related to benthic macroinvertebrate community dynamics. The Musconetcong and Raritan River Watersheds divide Lebanon Township. Twenty percent of Lebanon Township is in the Upper Delaware Watershed Management area, while the remaining 80% is in the North and South Branch Raritan Watershed Management Area. North of this divide, surface water, and most likely groundwater, flow towards the Musconetcong River. South of the divide, water flows towards the South Branch of the Raritan River and tributaries. The 1993 AMNET reports no impairment to streams in the Township. However, the 1998 report showed one station (AN0072) on Jaynes Brook (Musconetcong River) having moderate impairment. The 1998 habitat score for the Township also demonstrate that station AN0316 on the Raritan River and station AN0319 on Spruce Run had a rating of sub-optimal habitat.

A total maximum daily load (TMDL) is the amount of a pollutant that can be accepted by a water body without causing an exceedance of water quality standards or interfering with the ability to use a water body for one or more of its designated uses. The allowable load is allocated to the various sources of the pollutant, such as stormwater and wastewater discharges, which require an NJPDES permit to discharge, and nonpoint source, which includes Stormwater runoff from agricultural areas and residential areas, along with a margin of safety. Provisions may also be made for future sources in the form of reserve capacity. An implementation plan is developed to identify how the various sources will be reduced to the designated allocations. Implementation strategies may include improved stormwater treatment plants, adoption of ordinances, reforestation of stream corridors, retrofitting stormwater systems, and other best management practices (BMPs).

The New Jersey Integrated Water Quality Monitoring and Assessment Report (305(b) and 303(d)) (Integrated List) is required by the federal Clean Water Act to be prepared biennially and is a valuable source of water quality information. This combined report presents the extent to which New Jersey waters are attaining water quality standards, and identifies waters that are impaired. Sublist 5 of the Integrated List constitutes the list of waters impaired or threatened by pollutants, for which one or more TMDLs are needed.

In addition to water quality problems, the Township has exhibited some problems relating to flooding and stream bank erosion. Some of the culverts associated with road crossings in the Township are undersized. During severe storm events, these undersized culverts do not have adequate capacity, thereby causing a backwater effect and flooding upstream.

These culverts were designed for much different hydrologic conditions (i.e., less impervious area) than presently exist in the Township. As the imperviousness increased in the Township, the peak and volumes of stream flows also increased. The increased amount of water resulted in stream bank erosion, which resulted in unstable areas at roadway/bridge crossings. The imperviousness of the Township has probably decreased groundwater recharge, decreasing base flows in streams during dry weather periods. Lower base flows can have a negative impact on instream habitat during the summer months.

A map of the groundwater recharge areas and Wellhead protection areas is shown in Figure 4.

#### **Design and Performance Standards**

The Township will adopt the design and performance standards for Stormwater management measures as presented in N.J.A.C. 7:8-5 to minimize the adverse impact of stormwater runoff on water quality and water quantity and loss of groundwater recharge in receiving water bodies. The design and performance standards include the language for maintenance of stormwater management measures consistent with the Stormwater management rules at N.J.A.C. 7:8-5.8 Maintenance Requirements, and language for safety standards consistent with N.J.A.C. 7:8-6 Safety Standards for Stormwater Management Basins. The ordinances will be submitted to the county for review and approval within 24 months of the effective date of the Stormwater Management Rules, or February 2, 2006. During construction, Township inspectors will observe the construction of the project to ensure that the stormwater management measures are constructed and function as designed.

#### **Plan Consistency**

The Township is not within a Regional Stormwater Management Planning Area and no TMDLs have been developed for waters within the Township; therefore this plan does not address any regional stormwater management plans (RSWMPs) nor any TMDLs. If any RSWMPs or TMDLs are developed in the future, this Municipal Stormwater Management Plan will be updated for consistency.

The Municipal Stormwater Management Plan is consistent with the Residential Site Improvement Standards (RSIS) at N.J.A.C. 5:21. The municipality will utilize the most current update of the RSIS in the stormwater management review of residential areas. This Municipal Stormwater Management Plan will be updated to be consistent with any future updates to the RSIS.

The Township's Stormwater Management Ordinance requires all new development and redevelopment plans to comply with New Jersey's Soil Erosion and Sediment Control Standards. During construction, Township inspectors will observe on-site soil erosion and

sediment control measures and report any inconsistencies to the local Soil Conservation District.

### **Nonstructural Stormwater Management Strategies**

The Township has reviewed the Master Plan and ordinances (Chapter 17, Land Subdivision, and Chapter 18, Zoning) that might affect stormwater management, and is providing a list of the sections in the Township's land use and zoning ordinances that are to be considered for the incorporation of nonstructural stormwater management strategies. Once the revised ordinances are completed, they will be submitted to Hunterdon County for review and approval within 24 months of the effective date of the Stormwater Management Rules. A copy will be sent to the Department of Environmental Protection at the time of submission to the County.

The Township is entirely within the Highlands Preservation Area. Thus, all development is subject to the 3 percent impervious coverage limitation, and other standards relating to buffers and woodland clearing. These standards address a major component of the nonstructural stormwater management strategies in that impervious services are minimized and the protection of natural drainage features and vegetation is maximized. In addition, land disturbance, including clearing and grading, is minimized.

Chapter 17, Land Subdivision, of the Township Code was reviewed with regard to incorporating nonstructural stormwater management strategies. The analysis of the pertinent provisions is presented below.

*Section 17-6.2e* indicates that all applications for development identify existing and proposed easements, streams, bridges, culverts, drainage ditches, natural water courses, floodplains, ponds and wetlands.

*Section 17-6.3f* indicates that all applications for preliminary approval identify the existing and proposed locations of water courses, bridges, culverts, drain pipes, and any natural features such wooded areas, large trees and rock formations.

*Section 17-6.3i* requires that preliminary plans identify existing and proposed storm drains, drainage ditches and streams within a subdivision, together with the locations, sizes, elevations, grades and capacities of any existing storm drain, drainage ditch or stream or water course to which the proposed facility shall be connected. When stream channel improvements are proposed or required, the plans shall be approved by the NJDEP and Hunterdon County Planning Board.

*Section 17-6.5* requires a geologic investigation in limestone areas to avoid any adverse public health, safety, general welfare or environmental impacts, including impacts to surface and groundwater flows.

*Section 17-6.6* requires an Environmental Inventory Plan with any application for development. The Environmental Inventory Plan requires the identification in plan and

text form of soils' information, geology, flood hazard areas, wetland and wetlands buffers, streams, water bodies, ditches, stream classifications, topography and slopes, tree groupings and individual trees, threatened and endangered plants and animals habitat, historic and cultural resources, and stone rows, bridges and dams.

*Section 17-6.7* requires an aquifer testing and analysis program.

*Section 17-7.3* requires that during construction all existing trees of 10" or greater diameter not within 25' of a foundation or 5' of a paved area be protected; that developed areas shall be cleared of all stumps, litter, rubbish, brush, dead and dying trees, roots, debris, and excess or scrap building materials; that all soils are stabilized; and, that no topsoil is removed.

*Section 17-7.4* indicates that provisions shall be made to collect stormwaters and to retain, detain and recharge stormwater within the development if possible or, if not, to convey the excess portion to rivers and streams, drainage ditches or stormwater conveyors. The stormwater system may include curbs, catch basins, culverts, pipes, stormwater drains, swales, drainage right-of-way, ditches channel improvements, rip rap, retention and detention basins, ground cover, seeding, trees, shrubs, bushes and vegetation. Natural improvements may include shade trees, topsoil, earth removal, borrow and fill, improvements to prevent erosion and landslides, improvements to prevent damage to adjacent property, to protect vistas and to protect existing natural growth.

*Section 17-8.5* requires drainage and conservation easements where a subdivision is traversed by a water course, drainageway, channel or stream, or where it is desirable to preserve other areas because of soil conditions, rock outcroppings, tree masses, wildlife habitat, vistas, or other significant horticultural, environmental or natural features. Such easements shall provide that no trees, shrubs, topsoil, sand, gravel or minerals shall be removed; and, that no buildings shall be erected and no fill permitted.

*Section 17-8.7* references Chapter 15 concerning floodplains, which permits no development in floodways and no development in 100-year floodplains without a variance.

*Section 17-8.9* establishes stream corridor protection standards, which require a 100' stream corridor buffer around any stream and floodplain with a drainage area of 50 acres or more, and incorporates slopes of 15% or greater where contiguous to the buffer.

Chapter 18, Zoning, of the Township Code was reviewed with regard to incorporating nonstructural stormwater management strategies. The analysis of the pertinent provisions is presented below.

*Section 18-3.4f* provides standards for the development of areas with steep slopes (15% or greater). It requires no disturbance of slopes 25% or greater, and the disturbance of no



more than 15% of slopes in the 15-25% category. In addition, development must occur on the portion of the tract with slopes of less than 15%.

*Sections 18-3.13 and 3.14* provide development standards for open lands subdivisions, cluster subdivisions and lot averaging subdivisions. These standards seek to concentrate development in order to preserve undisturbed at least 65% of a tract, and to foster the following objectives: retention of large contiguous farmland areas; retention of large contiguous prime forested areas; stream corridor and wetlands preservation; steep slope protection; overall site design; reduction of impervious coverage; and, sensitivity to the site's natural features, topography and relationship to open lands on neighboring parcels.

*Section 18-5.6* provides design standards and standards for site improvements for site plans. This section addresses standards for the grading, improvement and construction of roads or driveways and for any required walkways, curbs, gutters, lights, drainage, sewage facilities and any other required improvements.

*Section 18-6.3h* addresses landscaping, paving and drainage for nonresidential parking areas, and indicates that parking areas shall be suitably landscaped with natural landscaping to minimize noise, glare and other nuisance characteristics, as well as to enhance the aesthetics, environment and ecology of the site and surrounding area.

Following the adoption of this plan element and the preparation of ordinances to implement the plan, the Township will review the above provisions in order to address any changes occasioned by the standards contained in NJAC 7:8-5.3(b).

#### **Land Use/Build-out Analysis**

A detailed land use analysis for the Township was conducted. Figure 5 illustrates the existing land use in the Township based on 1995/97 GIS information from NJDEP and illustrates the HUC14s within the Township. The Township zoning map is shown in Figure 6 and illustrates the constrained lands within the Township. The build-out calculations for impervious cover are shown in Table 1. As expected when developing agricultural and forest lands, the build-out of these two HUC14s will result in a significant increase in impervious surfaces.

Table 1 also presents the pollutant loading coefficients by land cover and at full build out.

#### **Mitigation Plans**

A mitigation plan is required to grant a variance or exemption from the design and performance standards of Lebanon Township's municipal stormwater management plan. The mitigation requirements offer a hierarchy of options that are intended to offset the effect on groundwater recharge, stormwater quantity control, and/or stormwater quality control that was created by granting the variance or exemption. Lebanon Township requires applicants that are seeking a variance or exemption from the design and

performance standards of the municipal stormwater management plan to refer to the current list of mitigation projects that would qualify as candidates to be included in the applicant's proposed mitigation plan.

At least annually, the Lebanon Township Environmental Commission in conjunction with the Township Engineer shall develop a list of mitigation projects throughout the Township that may be used by applicants seeking a variance or exemption from the design and performance standards of Lebanon Township's municipal stormwater management plan.

The list prepared by the Environmental Commission in conjunction with the Township Engineer is intended to provide the desired hierarchy of projects for each of the 3 elements of the design and performance standards of Lebanon Township's municipal stormwater management plan. Specifically, the list will include mitigation projects for groundwater recharge, mitigation projects for stormwater quantity control and mitigation projects for stormwater quality control.

It is anticipated that mitigation projects will primarily be sited at municipally owned properties and schools. The mitigation project list will provide information on each project, including size of the project, permit requirements, land ownership, and estimated project costs (i.e., permitting fees, engineering costs, construction costs, and maintenance costs).

The current list of available mitigation projects will be maintained at the Lebanon Township Municipal Building and will be available to the applicant upon request.

If a suitable site cannot be located in the same drainage area as the proposed development, the mitigation project may provide mitigation that is not the same as the impacts for which the variance or exemption is sought, but that addresses the same issue. For example, if a variance is given because the 80 percent TSS requirement is not met, the selected project may address water quality impacts due to a fecal impairment from livestock or wild life. In addition, since some of the HUC 14s in the Township are small, mitigation may also occur in an adjacent HUC 14.

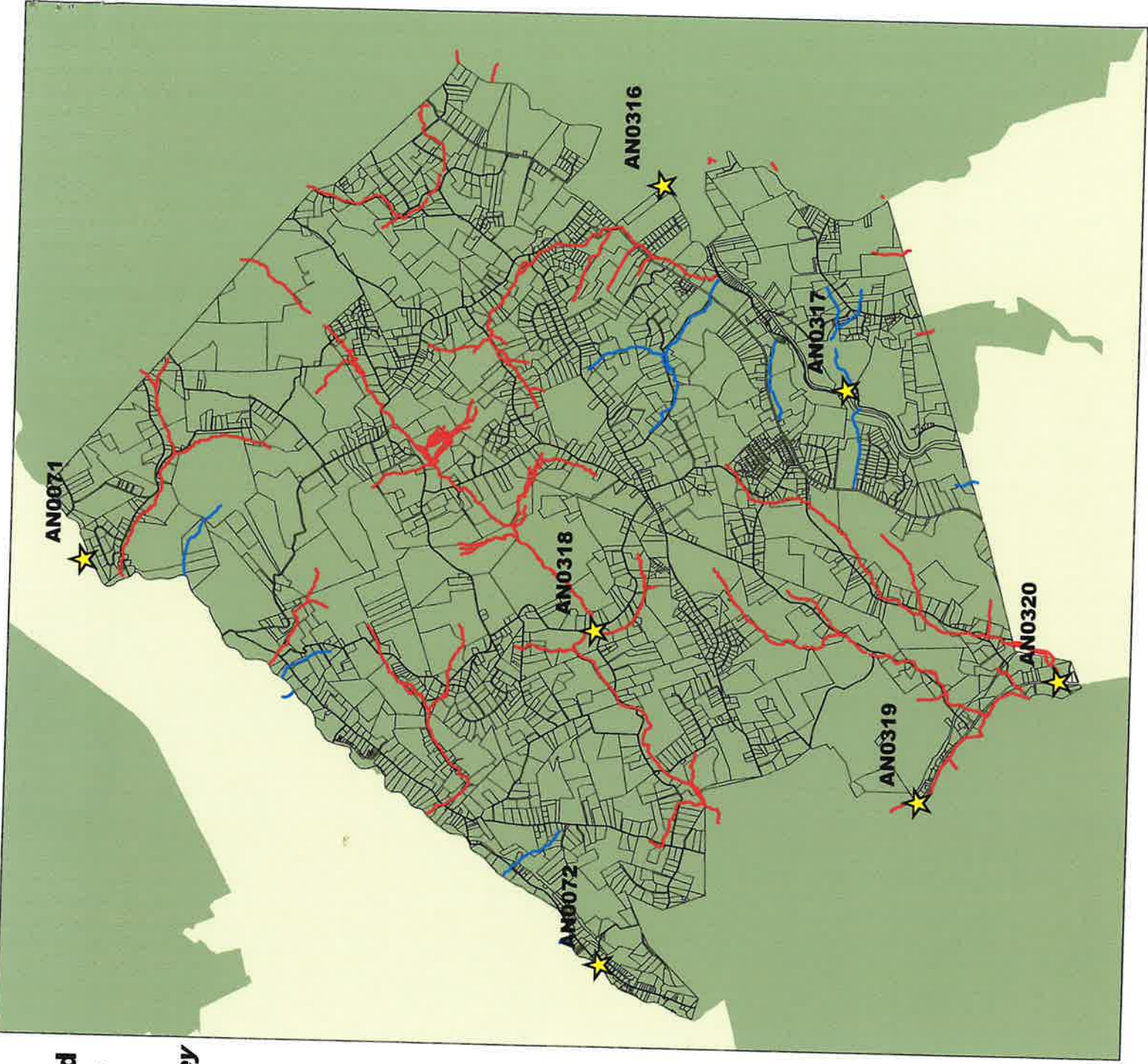
The municipality may allow a developer to provide funding or partial funding to the municipality for an environmental enhancement project that has been identified on the Lebanon Township Mitigation Project list, or towards the development of a Regional Stormwater Management Plan. The funding must be equal to or greater than the cost to implement the mitigation project, including costs associated with purchasing the property or easement for mitigation, and the cost associated with the long-term maintenance requirements of the mitigation measure.

Table 1: Build Out Calculations per HUC 14 by Zone

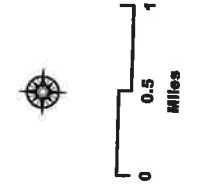
HUC 14	Zone	Build-Out Zoning	Acres per zones	Existing Impervious (%)	Existing Impervious (Acres)*	Undeveloped Constrained (Acres)**	Undeveloped Unconstrained (Acres)**	Allowable Impervious per Highlands Act 3% (Acres)	TP (lbs/acre/year)	TP (lbs/year)	TN (lbs/acre/year)	TN (lbs/year)	TSS (lbs/acre/year)	TSS (lbs/year)
2030105010060	Industrial (I)	Industrial	351.37	17.3	60.93	17.72	272.71	8.18	1.5	12.27	16	130.90	200	1636.26
	One-Family Residential (R-1 1/2)	Rural Residential	60.35	71.4	43.06	0	17.29	0.52	0.6	0.31	5	2.59	100	51.87
	Rural Residential (Rural Residential (R-3))	Rural Residential	46.87	30.3	14.18	0	32.69	0.98	0.6	0.59	5	4.90	100	98.07
	Rural Agricultural (R-5)	Rural Residential	351.44	24.4	85.83	9.75	255.85	7.68	0.6	4.61	5	38.38	100	767.55
	Resource Conservation (RC)	Rural Residential	731.91	8.8	64.69	65.49	601.73	18.05	0.6	10.83	5	90.26	100	1805.19
<b>Total</b>			<b>1541.94</b>	<b>17.4</b>	<b>268.7</b>	<b>92.96</b>	<b>1180.28</b>	<b>35.41</b>		<b>28.61</b>		<b>267.03</b>		<b>4358.94</b>
2030105010070	Neighborhood Business (B-1)	Commercial	27.49	72.9	20.03	0	7.47	0.22	2.1	0.47	22	4.93	200	44.82
	One-Family Residential (R-1 1/2)	Rural Residential	465.04	61.8	287.41	2.69	174.93	5.25	0.6	3.15	5	26.24	100	524.79
	One-Family Residential (R-15)	Rural Residential	56.51	90.9	51.36	0	5.14	0.15	0.6	0.09	5	0.77	100	15.42
	Rural Residential (Rural Residential (R-3))	Rural Residential	996.05	23.6	235.49	11.58	748.99	22.47	0.6	13.48	5	112.35	100	2246.97
	Rural Agricultural (R-5)	Rural Residential	1024.73	23.4	239.76	37.93	747.04	22.41	0.6	13.45	5	112.06	100	2241.12
<b>Total</b>			<b>1719.39</b>	<b>10.2</b>	<b>175.86</b>	<b>42.87</b>	<b>1500.65</b>	<b>45.02</b>		<b>27.01</b>		<b>225.10</b>		<b>4501.95</b>
2030105010090	One-Family Residential (R-1 1/2)	Rural Residential	17.71	79.1	14.01	0	3.7	0.11	0.6	0.07	5	0.56	100	11.1
	Rural Residential (R-3)	Rural Residential	18.86	53.6	10.11	0	8.75	0.26	0.6	0.16	5	1.31	100	26.25
	Resource Conservation (RC)	Rural Residential	195.03	15.8	30.83	2.12	162.08	4.86	0.6	2.92	5	24.31	100	486.24
<b>Total</b>			<b>231.6</b>	<b>23.7</b>	<b>54.95</b>	<b>2.12</b>	<b>174.53</b>	<b>5.24</b>		<b>3.14</b>		<b>26.18</b>		<b>523.59</b>
2030105020010	Neighborhood Business (B-1)	Commercial	9.55	60.0	5.73	2.25	1.57	0.05	2.1	0.10	22	1.04	200	9.42
	One-Family Residential (R-1 1/2)	Rural Residential	497.03	54.4	270.63	9.76	216.64	6.50	0.6	3.90	5	32.50	100	649.92
	Rural Residential (R-3)	Rural Residential	255.79	30.9	79.01	10.59	166.2	4.99	0.6	2.99	5	24.93	100	498.6
	Rural Agricultural (R-5)	Rural Residential	722.23	18.4	133.09	86.74	502.39	15.07	0.6	9.04	5	75.36	100	1507.17
	Resource Conservation (RC)	Rural Residential	4,397.12	7.6	336.34	626.16	3434.63	103.04	0.6	61.82	5	515.19	100	10303.89
<b>Total</b>			<b>5,881.72</b>	<b>14.0</b>	<b>824.8</b>	<b>735.5</b>	<b>4321.42</b>	<b>129.64</b>		<b>77.86</b>		<b>649.02</b>		<b>12969.00</b>
2030105020020	Neighborhood Business (B-1)	Commercial	6.43	16.0	1.03	0	5.41	0.16	2.1	0.34	22	3.57	200	32.46
	Highway Business (B-2)	Commercial	136.86	45.7	62.51	5.88	68.48	2.05	2.1	4.31	22	45.20	200	410.88
	Industrial (I)	Industrial	68.28	5.0	3.42	0	64.86	1.95	1.5	2.92	16	31.13	200	389.16
	One-Family Residential (R-1 1/2)	Rural Residential	134.74	56.7	76.34	2.9	55.5	1.67	0.6	1.00	5	8.33	100	166.5
	Rural Residential (R-3)	Rural Residential	3.37	73.3	2.47	0	0.91	0.03	0.6	0.02	5	0.14	100	2.73
	Rural Agricultural (R-5)	Rural Residential	3.78	100.0	3.78	0	0	0.00	0.6	0.00	5	0.00	100	0
	Resource Conservation (RC)	Rural Residential	1305.9	10.0	130.41	57.82	1117.67	33.53	0.6	20.12	5	167.65	100	3353.01
<b>Total</b>			<b>1659.36</b>	<b>16.9</b>	<b>279.95</b>	<b>66.6</b>	<b>1312.82</b>	<b>39.38</b>		<b>28.71</b>		<b>256.01</b>		<b>4354.74</b>
2030105020040	Neighborhood Business (B-1)	Commercial	24.57	67.0	16.46	0	8.11	0.24	2.1	0.51	22	5.35	200	48.66
	Highway Business (B-2)	Commercial	75.27	33.5	25.23	26.91	23.13	0.69	2.1	1.46	22	15.27	200	138.78
	One-Family Residential (R-1 1/2)	Rural Residential	150.11	48.8	73.24	24.11	52.76	1.58	0.6	0.95	5	7.91	100	158.28
	One-Family Residential (R-15)	Rural Residential	209.26	10.6	22.23	0.86	9.27	0.28	0.6	0.17	5	1.39	100	27.81
	Rural Residential (R-3)	Rural Residential	32.36	178.8	57.86	2.33	149.08	4.47	0.6	2.68	5	22.36	100	447.24
	Rural Agricultural (R-5)	Rural Residential	59.19	29.0	17.16	0	42.03	1.26	0.6	0.76	5	6.30	100	126.09
	Resource Conservation (RC)	Rural Residential	959.39	8.5	81.93	90.48	786.98	23.61	0.6	14.17	5	118.05	100	2360.94
<b>Total</b>			<b>1510.15</b>	<b>19.5</b>	<b>294.11</b>	<b>144.69</b>	<b>1071.36</b>	<b>32.14</b>		<b>20.69</b>		<b>176.64</b>		<b>3307.80</b>
2030105020050	One-Family Residential (R-1 1/2)	Rural Residential	13.95	87.7	12.23	0	1.72	0.05	0.6	0.03	5	0.26	100	5.16
	Resource Conservation (RC)	Rural Residential	240.17	23.9	57.39	24.83	157.94	4.74	0.6	2.84	5	23.69	100	473.82
<b>Total</b>			<b>254.12</b>	<b>27.4</b>	<b>69.62</b>	<b>24.83</b>	<b>159.66</b>	<b>4.79</b>		<b>2.87</b>		<b>23.95</b>		<b>478.98</b>
2030105050080	One-Family Residential (R-1 1/2)	Rural Residential	25.27	60.5	15.29	0	9.98	0.30	0.6	0.18	5	1.50	100	29.94
	Resource Conservation (RC)	Rural Residential	157.73	7.5	11.85	17.2	128.68	3.86	0.6	2.32	5	19.30	100	386.04
<b>Total</b>			<b>183</b>	<b>14.8</b>	<b>27.15</b>	<b>17.2</b>	<b>138.65</b>	<b>4.16</b>		<b>2.50</b>		<b>20.80</b>		<b>415.98</b>
2040105160020	Neighborhood Business (B-1)	Commercial	8.89	20.8	1.85	2.3	4.75	0.14	2.1	0.30	22	3.14	200	28.5
	One-Family Residential (R-1 1/2)	Rural Residential	246.56	38.0	93.7	3.99	148.88	4.47	0.6	2.68	5	22.33	100	446.64
	Rural Residential (R-3)	Rural Residential	171.37	17.7	30.36	15.62	125.4	3.76	0.6	2.26	5	18.81	100	376.2
	Rural Agricultural (R-5)	Rural Residential	341.22	15.2	51.8	26.6	262.81	7.88	0.6	4.73	5	39.42	100	788.43
	Resource Conservation (RC)	Rural Residential	3249.83	5.8	187.68	388.7	2673.45	80.20	0.6	48.12	5	401.02	100	8020.35
<b>Total</b>			<b>4017.87</b>	<b>9.1</b>	<b>365.38</b>	<b>437.2</b>	<b>3215.29</b>	<b>96.46</b>		<b>58.09</b>		<b>484.72</b>		<b>9660.12</b>
2040105160030	Neighborhood Business (B-1)	Commercial	26.77	70.7	18.93	6.78	1.07	0.03	2.1	0.07	22	0.71	200	6.42
	One-Family Residential (R-1 1/2)	Rural Residential	116.58	53.2	62.03	7.65	46.9	1.41	0.6	0.84	5	7.04	100	140.7
	Rural Agricultural (R-5)	Rural Residential	190.23	21.9	41.64	17.34	131.25	3.94	0.6	2.36	5	19.69	100	393.75
	Resource Conservation (RC)	Rural Residential	278.26	6.1	16.92	3.33	258.01	7.74	0.6	4.64	5	38.70	100	774.03
<b>Total</b>			<b>611.84</b>	<b>22.8</b>	<b>139.52</b>	<b>35.09</b>	<b>437.22</b>	<b>13.12</b>		<b>7.92</b>		<b>66.13</b>		<b>1314.90</b>
2040105160040	One-Family Residential (R-1 1/2)	Rural Residential	16.08	50.2	8.07	0	8.01	0.24	0.6	0.14	5	1.20	100	24.03
	Rural Residential (R-3)	Rural Residential	32.05	39.9	12.8	0	19.25	0.58	0.6	0.35	5	2.89	100	57.75
	Rural Agricultural (R-5)	Rural Residential	28.8	38.8	11.17	0	17.63	0.53	0.6	0.32	5	2.64	100	52.89
	Resource Conservation (RC)	Rural Residential	0.84	4.8	0.04	0	0.79	0.02	0.6	0.01	5	0.12	100	2.37
<b>Total</b>			<b>77.77</b>	<b>41.2</b>	<b>32.08</b>	<b>0</b>	<b>45.69</b>	<b>1.37</b>		<b>0.82</b>		<b>6.85</b>		<b>137.04</b>
<b>TOTAL</b>					<b>3,366.17</b>	<b>1,651.27</b>	<b>15,241.14</b>	<b>457.23</b>		<b>288.85</b>		<b>2458.77</b>		<b>47096.16</b>

\* Urban Areas  
 \*\*Wetlands and Water  
 \*\*\*Agriculture, Forest and Barren Lands

**Figure 2**  
**Surface Water Quality and**  
**Highlands Area Boundary**  
*Township of Lebanon*  
*Hunterdon County, New Jersey*  
**March 2005**



- Legend**
- Category 1 - Trout Production
  - Trout Maintenance
  - Highlands Planning Area
  - Highlands Preservation Area
  - ★ AMNET Biological Monitoring Location



**Data Sources:**  
**Hunterdon County Division of GIS**  
**NJDEP**

This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been NJDEP verified and is not State-authorized.

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**Figure 3**

**USGS Topographic Map**

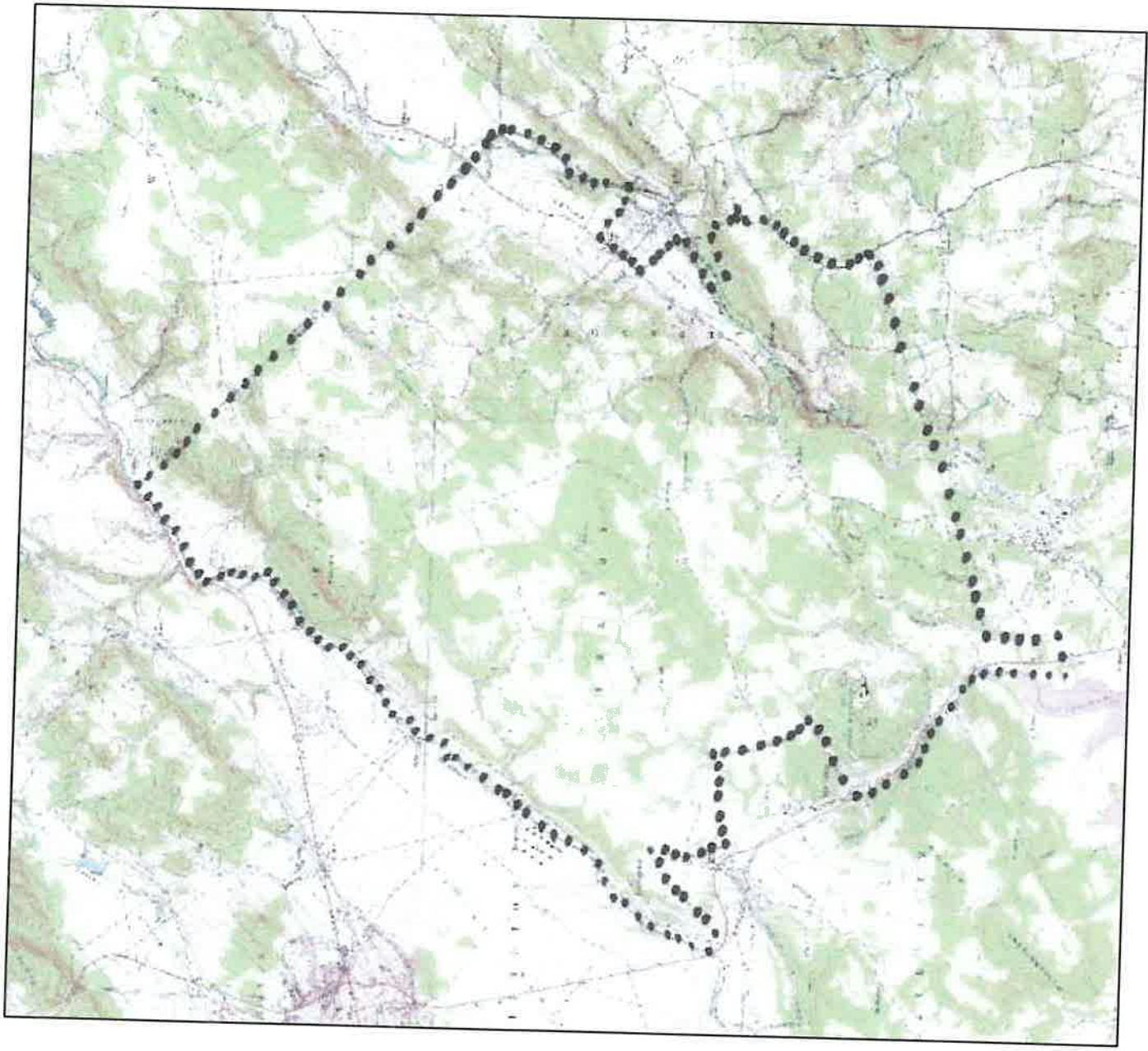
**Lebanon Township  
Hunterdon County, New  
Jersey**

**March 2005**



**Data Sources:  
USGS**

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ASSOCIATES, INC.**  
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**Figure 4**  
**Groundwater Recharge Rates**  
**and Well Head Protection Areas**  
**Township of Lebanon**  
**Hunterdon County, New Jersey**  
**March 2005**

- Legend**
- ★ Public Wells
  - Well Tier**
  - ▨ 1: 2 yrs Time of Travel
  - ▩ 2: 5 yrs Time of Travel
  - ⊙ 3: 12 yrs Time of Travel

**Recharge Rates**

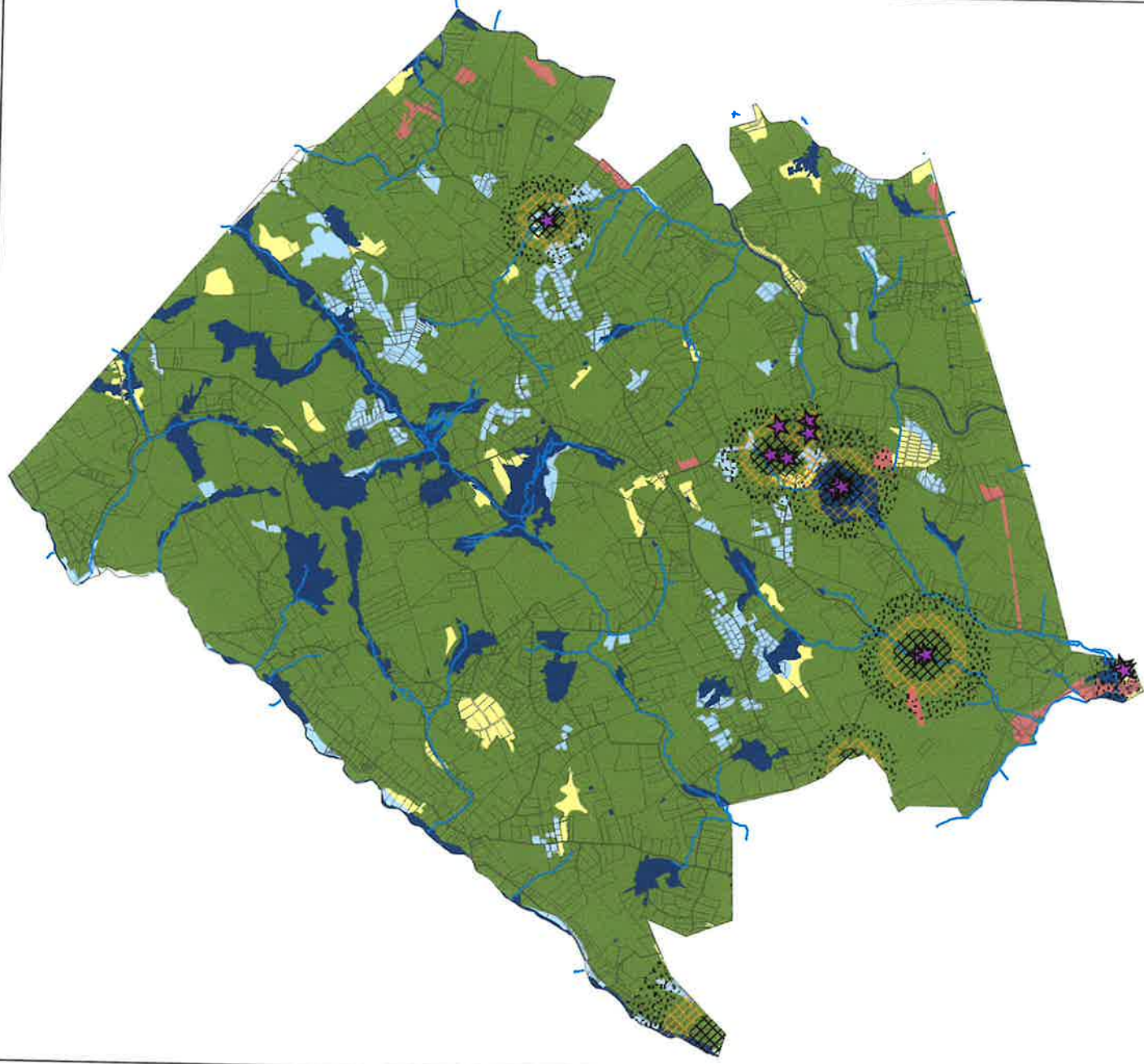
- 16-23 inches per year
- 11-15 inches per year
- 1-7 inches per year
- Hydric Soils
- Wetlands
- Streams



**Data Sources:**  
**Hunterdon County Division of GIS**  
**NJ Dept of Environmental Protection**

This map was developed using New Jersey Department of Environmental Protection Geographic Information System digital data, but this secondary product has not been NJDEP verified and is not State-authorized.

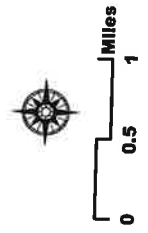
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**Figure 5**  
**1995 Land Use/Land Cover**  
**and HUC 14**  
*Township of Lebanon*  
*Hunterdon County, New Jersey*  
*March 2005*



- Legend**
- HUC 14 Boundary
  - Agriculture
  - Barren Land
  - Forest
  - Urban
  - Water
  - Wetlands













**Data Sources:**  
**Hunterdon County Division of GIS**  
**NJDEP**

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**Figure 6**  
**Zoning and Constrained Lands**  
*Township of Lebanon*  
*Hunterdon County, New Jersey*  
*March 2005*

- Legend**
-  Water
  -  Wetlands
- Zoning**
-  B-1: Neighborhood Business
  -  B-2: Highway Business
  -  I: Industrial
  -  R-1 1/2: One-Family Residential
  -  R-15: One Family
  -  R-3: Rural Residential
  -  R-5: Rural Agricultural
  -  RC: Resource Conservation



0 0.5 1  
 Miles

**Data Sources:**  
**Hunterdon County Division of GIS**  
**NJDEP**

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 Department of Environmental Protection  
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