

# **Stormwater Management Plan**

**For**

**Bedminster Township  
Somerset County, New Jersey**

**Prepared by:**



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NJPE 32978**

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# TABLE OF CONTENTS

	Page
1. List of Figures in Appendix A	3
2. Introduction	4
3. MSWMP Goals	4-5
4. Stormwater Discussion	5-6
5. Background	6-10
6. Design and Performance Standards	10
7. Plan Consistency	10-11
8. Nonstructural Stormwater Management Strategies	12-14
9. Land Use/Build-Out Analysis	14-15
10. Mitigation Plans	15-17
Appendix A –Figures	18-28

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List of Figures in Appendix A

Figure 1 – Hydrologic Cycle

Figure 2 – Streams and Rivers

Figure 3 – USGS Map

Figure 4 – HUC14 Drainage Areas

Figure 5 – 100-Year Frequency Floodplain

Figure 6 – Land use/Land Cover

Figure 7 – Zoning

Figure 8 – Aerial Photo and Parcel Lines

Figure 9 – Average Annual Groundwater Recharge Rates

Figure 10 – Well Head Protection Areas

Figure 11 – Wetlands

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## **Introduction**

This Municipal Stormwater Management Plan (MSWMP) documents the strategy for Bedminster Township (“the Township”) to address stormwater related impacts. The creation of this plan is required by N.J.A.C. 7:14A-25, Municipal Stormwater Regulations. While the creation of this plan is a new requirement, Bedminster Township has been on the forefront in the efforts to limit decreases in groundwater recharge and the other impacts of development through its long history of creating large lot zoning, stream corridor buffers and open space acquisition. 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. 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 will be included in this plan in the future. It will be based upon existing zoning and land available for development. The build-out analysis will consider the areas of environmentally constrained land which will reduce the actual coverage substantially from the 5% that is permitted in most of the land area of the Township. This 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 includes 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 are identified to lessen the impact of existing development.

## **MSWMP 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, any increase in non-point pollution;
- Maintain the integrity of stream channels for their biological functions and drainage capabilities;
- Minimize pollutants in stormwater 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. Preventive 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, reduce 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 create disruption to habitat to which some species cannot adapt.

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.

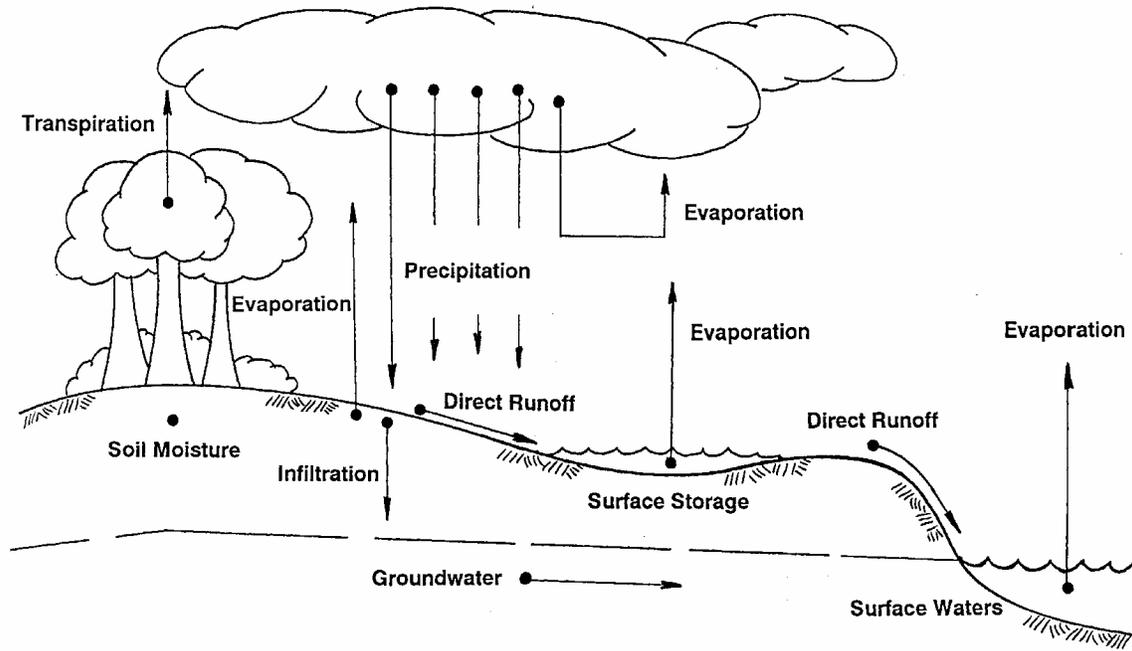


Figure 1 - Hydrologic Cycle

**Background**

The Township encompasses 26.7 square miles in the northwestern part of Somerset County and is primarily known for its farms, stables and private estates. The Township was founded before the American Revolution in 1749 as an agricultural center. During the 19<sup>th</sup> century, the beauty of the area attracted many wealthy families who built expansive estates for the enjoyment of the country life. It remained a quiet rural area until the 1970's when I-78 was opened along its southern side, and I-287 crossed at the eastern border. Beginning in the mid 1980's, The Hills, with its town-homes, condos, and houses on small lots, was developed east of I-287, tripling the population within a few years. Sixty five percent of the Township residents now live within the Hills development.

Although the majority of the lands in the Township are sparsely developed, there are four village areas: Pluckemin, east of I-287; Bedminster further north on the west side of Route 287; Lamington in the center of the Township; and Pottersville in the northwest corner.

Bedminster takes great pride in its efforts at preserving open space and farmland for future generations. With aggressive planning and 10-acre zoning in the western section of the Township, the rural character will be retained. Over 1,000 acres have already been saved from development with more to follow. Private land owners have been generous in supporting these efforts, and Township residents, present and future, are most grateful for these acts of vision. Many of the preservation areas have been purchased with the assistance of Somerset County and the New Jersey Green Acres program.

Bedminster is bounded on its western and southern side by the Lamington River. The northern portion of the Lamington River and its tributaries of Tanners Brook and Herzog Brook are classified as Category I waterways. These exceptional streams are trout production streams. Streams and rivers within the Township are shown in Figure 2 and the topography of the Township is shown in Figure 3.

According to the 2000 census, the Township has 8,302 residents. The population rose approximately 17.2 percent since the 1990 census. This population increase is more than the overall state increase of 8.9 percent but less than the County increase of 23.8 percent over the same period.

The Township is bordered along its west side by the Lamington River and on part of its east side by the North Branch of the Raritan River. It is located in Watershed Management Area (WMA) 8 – Upper Raritan River. The Township contains portions of nine Hydrologic Unit Code (HUC) areas:

**Table 1 – HUC14 Areas**

HUC14 Area	Watershed
02030105050050	Lamington River
02030105050070	Lamington River
02030105050110	Lamington River
02030105060080	N. Branch Raritan River
02030105060090	N. Branch Raritan River
02030105070010	N. Branch Raritan River
02030105060070	N. Branch Raritan River
02030105060060	N. Branch Raritan River
02030105060040	N. Branch Raritan River

These HUC14 areas are shown in Figure 4.

The New Jersey Department of Environmental Protection (NJDEP) has established an Ambient Bio-monitoring Network (AMNET) to document the health of the state’s waterways. There are over 800 AMNET sites throughout New Jersey. These sites are sampled for benthic macro-invertebrates 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 macro-invertebrate community dynamics.

There are eight AMNET sites within or bordering Bedminster Township as follows:

<b>Site Number</b>	<b>Location</b>
AN0361	Herzog Brook at Black River Road
AN0354	Middle Brook at Spook Hollow Road
AN0350	Peapack Brook at Old Dutch Road
AN0351	North Branch Raritan River at Route 202
AN0355	Middle Brook at River Road
AN0363	Lamington River at Lamington Road (rte. 523)
AN0370	Lamington River at Cowperthwaite Road
AN0371	Chambers Brook at Airport Road

Based on the AMNET data, only one of the waterbodies bordering the Township is moderately impaired. Seven of the eight sites show no impairment and only the site at Chambers Brook at Airport Road is classified as moderately impaired.

In addition to the AMNET data, the NJDEP and other regulatory agencies collect water quality chemical data on the streams in the state. These data show that the instream total phosphorus concentrations and temperature of the Lamington River exceed the allowed amounts. This means that the river is an impaired waterway and the NJDEP is required to develop a Total Maximum Daily Load (TMDL) for these pollutants.

A TMDL is the amount of a pollutant that can be accepted by a waterbody without causing an exceedance of water quality standards or interfering with the ability to use a waterbody 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 non-point 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 (BMP's).

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 TMDL's are needed. The Lamington River at Burnt Mills, at Route 523 and near Pottersville are all listed in the 2004 proposed Sublist 5 (March 1, 2004).

As with the NJDEP, the Upper Raritan Watershed Association (URWA) also collects water samples for the purposes of gathering data. The Association's website can be visited at [www.urwa.org](http://www.urwa.org). Founded in 1959, the URWA is a non-profit organization that tries to protect and preserve the natural resources of the Upper Raritan watershed region. The Association has worked to increase environmental awareness and has seen that changes in the countryside and municipalities are guided by sound and reasonable environmental principals. URWA's mission is accomplished through advocacy, scientific research and education. The URWA has volunteers perform monitoring for the North Branch of the Raritan River as well as the other streams within its watershed. The URWA will be providing rating data for streams within Bedminster Township that will be added to this plan when it is received.

In addition to water quality problems, the Township has occasional flooding problems. Occasional flooding occurs at the confluence of the Lamington and North Branch Raritan River. The 100-year floodplain, shown in Figure 5, depicts the North Branch Raritan River and Lamington River floodplains.

In conjunction with the USGS, Somerset County operates a Flood Information System for its 21 municipalities. The Somerset County Flood Information System (SCFIS) consists of a network of stream and precipitation gauges throughout the County. Information from these gauges is automatically transmitted to a central location via telephone, radio and satellite. The information is then processed and appropriate actions are taken. These actions include notifying municipal police, fire and emergency management personnel with flood potential and water level information.

There are several SCFIS stream and precipitation gauges near Bedminster Township. The Township has a stream gauge on the Lamington River at Burnt Mills Road and a precipitation gauge in Pottersville. In addition, there are stream gauges on the following streams:

North Branch Raritan River Near Far Hills New Jersey  
North Branch Raritan River Near Raritan New Jersey

Information from these latter gauges is available on the United States Geological Survey (USGS) web site in real time (<http://waterdata.usgs.gov/nj/nwis>).

The Township has a moderate amount of developable land. The existing land use, based on 1995/1997 aerial photography, is shown in Figure 6. The existing zoning is shown in Figure 7. A current aerial photo with parcel lot lines overlain on it is shown in Figure 8. The Township is not within the State Plan Designation PA1 Metropolitan Planning Area but Bedminster Village and Pluckemin Town Center are designated centers where infiltration requirements are not applicable. Groundwater recharge rates for native soils

in this area are generally between 1 and 14 inches annually. The average annual groundwater recharge rates are shown graphically in Figure 9.

According to the NJDEP, “A Well Head Protection Area (WHPA) in New Jersey is a map area calculated around a Public Community Water Supply (PCWS) well in New Jersey that delineates the horizontal extent of ground water captured by a well pumping at a specific rate over a two-, five-, and twelve-year period of time for unconfined wells. ... The confined wells have a fifty foot radius delineated around each well serving as the well head protection area to be controlled by the water purveyor in accordance with Safe Drinking Water Regulations (see NJAC 7:10-11.7(b)1).”

WHPA delineations are conducted in response to the Safe Drinking Water Act Amendments of 1986 and 1996 as part of the Source Water Area Protection Program (SWAP). The delineations are the first step in defining the sources of water to a public supply well. Within these areas, potential contamination will be assessed and appropriate monitoring will be undertaken as subsequent phases of the NJDEP SWAP.

As shown in Figure 10, none of the Well Head Protection Areas are located within the municipality of Bedminster.

In addition to the rivers and streams that run through and along the Township, there are a number of wetland areas. These wetland areas, shown in Figure 11, provide flood storage, non-point pollutant removal and habitat for flora and fauna.

### **Design and Performance Standards**

The Township has adopted 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.

During construction, Township inspectors will observe the construction of each 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 TMDL's have been developed for waters within the Township; therefore this plan does not need to be consistent with any regional stormwater management plans (RSWMPs)

nor any TMDL's. If any RSWMPs or TMDLs are developed in the future, this Municipal Stormwater Management Plan will be updated to be consistent.

The Township is within the Raritan Basin and much information on the basin and its characteristics has been used to develop the Raritan Plan. Additional information concerning this plan can be found at: <http://www.raritanbasin.org>. The Township supports the Raritan Plan. The following summarizes the plan:

- Protection and preservation of lands that play a critical role in the protection of Raritan Basin water resources, including headwaters streams.
- Maintenance and restoration of ground water recharge to ensure sufficient supplies for dry weather stream flow and public use, and to minimize stormwater runoff.
- Improved control of stormwater through watershed-based management plans, improved site design techniques and attention to the impacts of stormwater on stream stability and flooding.
- Management of water supply resources on a subwatershed, watershed and regional basis so that substantial levels of resources use are not exceeded, ensuring adequate water for both human and ecosystem uses.
- Restoration of streams and riparian areas that have been physically damaged by harmful land use and stormwater management practices, and protection of high-quality streams and riparian areas.
- Restoration and protection of ground and surface waters that are currently or prospectively impaired by excessive pollutant loads, through a combination of regulatory and non-regulatory programs affecting both point and nonpoint sources of pollutants.
- Understanding by residents, landowners, businesses and government decision-makers of the basic aspects of water resources and critical watershed management issues in the Raritan River Basin and tools to resolve them, so that they are moved to help solve these issues.

The Township supports the Raritan Plan as the Raritan Plan's strategy is similar in nature to the principles mandated by Phase II of the EPA Clean Water Act.

The Municipal Stormwater Management Plan is consistent with the Residential Site Improvement Standards (RSIS) at N.J.A.C. 5:21. The Township utilizes the most current update of the RSIS in the stormwater review of all projects. The Township ordinances require that all projects, both residential and non-residential, be designed in accordance with the Stormwater Design Standards of the Residential Site Improvement Standards. This Municipal Stormwater Management Plan will be updated to be consistent with any future updates of 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 and those from the Somerset-Union Soil Conservation District 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 begun a review of the master plan and ordinances, and has provided a partial list of the sections in the Township land use and zoning ordinances that are to be modified to incorporate nonstructural stormwater management strategies. Below are a portion of the ordinances identified for revision. Once the ordinance texts are completed, they will be submitted to the county review agency 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.

Chapter XIII of the Township Code, entitled Land Management, is being reviewed with regard to incorporating non-structural stormwater management strategies. Several changes are being made to Article 13-500 of this Chapter, entitled “General Provisions and Design Standards” to incorporate these strategies. Other articles of this chapter are also being changed to incorporate these strategies.

**Section 13-502: Drainage** requires that all drainage design shall be in accordance with the Stormwater Design Standards of the New Jersey Residential Site Improvement Standards (RSIS) N.J.A.C. 5:21-1 et seq. These design standards shall apply to all nonresidential projects as well as residential developments. Part c. of this section requires that detention or retention basins or other stormwater facilities shall be required to hold stormwater runoff as required in the RSIS. A waiver of this requirement may be granted only when the applicant demonstrates that the impact from the additional runoff resulting from the proposed development will be negligible. This section will be amended to state that a waiver may be granted only when the applicant provides different measures chosen from the mitigation plan that are similar to the measures for which the applicant seeks a waiver. This section will be amended to encourage the use of natural vegetated swales in lieu of inlets and pipes.

**Section 13-506: Natural Features** requires that natural features, such as trees, brooks, swamps, hilltops, and views, be preserved whenever possible, and that care be taken to preserve selected trees to enhance soil stability and landscaped treatment of the area. This section will be amended to expand trees to forested areas, to ensure that leaf litter and other beneficial aspects of the forest are maintained in addition to the trees.

**Section 13-506c: Shade Trees** requires a minimum of eight shade trees per acre per lot be planted on a site to be constructed. This ordinance recognizes that the preservation of mature trees and forested areas is a key strategy in the management of environmental resources, particularly watershed management, air quality, and ambient heating and cooling. This complies with minimizing land disturbance, which is a nonstructural stormwater management strategy. This section currently requires the preservation of natural wood tracts and limits land disturbance for new construction.

**Section 13-508: Off-street Parking, Loading Areas and Driveways** details off-street parking, driveway and loading requirements. All parking lots, driveways and loading areas are required to have landscaping. This section will be amended to allow for flush curb with curb stops, or curbing with curb cuts to encourage developers to allow for the discharge of impervious areas into landscaped areas for stormwater management. Also, language will be added to allow for use of natural vegetated swales for the water quality design

storm, with overflow for larger storm events into storm sewers. This section will be amended to allow pervious paving to be used in areas to provide overflow parking, vertical parking structures and shared parking. The ordinance already encourages vertical parking structures since roofed parking areas do not count towards a property's permitted gross floor area. Additionally, language will be included to allow buffer areas to be used for stormwater management by disconnecting impervious surfaces and treating runoff from these impervious surfaces.

**Section 13-508.1: Landscaping** requires, except for detached single-family and two (2) family dwelling units, a screen planting, berm, fence, wall or combination thereof, not less than four (4') feet in height, be provided between the off-street parking areas and any lot line or street line except where a building intervenes or where the distance between such areas and the lot line or street line is greater than one hundred fifty (150') feet. The landscape requirements for these buffer areas in the existing section do not recommend the use of native vegetation. The language of this section will be amended to require the use of native vegetation, which requires less fertilization and watering than non-native species.

**Section 13-508.3: Paving and Curbing** describes the procedure for construction of any new parking area, loading area, and driveway or accessway to any street. This section will be amended to allow the limited use of pervious paving materials to minimize stormwater runoff and promote groundwater recharge.

**Section 13-513.1: Streets** describes the requirements for streets in the Township. The Township has several street classifications, ranging from "Arterial," which has a minimum right-of-way of 66 feet, to "Local," which has a minimum right-of-way of 50 feet. Street paving widths are a function of the number of units served, whether a street is curbed, whether on-street parking is permitted, and whether on-site topographical constraints allow design flexibility. Depending on these factors, paving width for local streets has a range from 24 to 36 feet. This section will be amended to encourage developers to limit on-street parking to allow for narrower paved widths consistent with the Residential Site Improvement Standards. This section also required that cul-de-sacs have a minimum radius of 50 feet. Language will be added to this section to reduce the minimum radius of cul-de-sac designs to be consistent with the Residential Site Improvement Standards.

**Section 13-513.2: Curbs** requires that curbing, either Belgian block or concrete, be installed at all street intersections, where stormwater velocities exceed the soil erosion velocities specified in the "New Jersey Standards for Soil Erosion and Sediment Control", and/or bordering streets or other areas where on street parking is permitted and/or likely to occur. This section will be amended to allow for curb cuts or flush curbs to allow vegetated swales to be used for stormwater conveyance and to allow the disconnection of impervious areas.

**Section 13-513.3: Sidewalks** describes sidewalk requirements for the Township. Although sidewalks are not required along all streets, the Township can require them in areas where the probable volume of pedestrian traffic, the development's location in relation to other populated areas and high vehicular traffic, pedestrian access to bus stops, schools, parks, and other public places, and the general type of improvement intended indicate the advisability of providing a pedestrianway. Sidewalks are to be a minimum of four feet wide and constructed of concrete. Language will be added to this section to require

developers to design sidewalks to discharge stormwater to neighboring lawns where feasible to disconnect these impervious surfaces, or use permeable paving materials where appropriate.

**Section 13-409: Cluster Development** provides for a cluster development option to preserve land for public and agricultural purposes, to prevent development on environmentally sensitive areas, and to aid in reducing the cost of providing streets, utilities and services in residential developments. This cluster option is an excellent tool for reducing impervious roads and driveways. The option allows for smaller lots with smaller front and side yard setbacks than traditional development options. It also minimizes the disturbance of large tracts of land, which is a key nonstructural stormwater management strategy. The cluster option requires that thirty (30%) percent of the total tract be preserved as common open space for residential area. The cluster option also requires that no more than one-half (1/2) of the minimum thirty (30%) percent land area may be critical lands. This language will be amended to promote the use of native vegetation, which requires less fertilization and watering than non-native ornamental plants.

**Section 13-903: Off-tract Improvements** describes essential off-site and off-tract improvements. Language will be added to this section to require that any off-site and off-tract stormwater management and drainage improvements must conform to the “Design and Performance Standards” described in this plan and provided in the Stormwater Management Ordinance. Additionally, language will be included to allow buffer areas to be used for stormwater management by disconnecting impervious surfaces and treating runoff from these impervious surfaces.

As a result of the municipality’s Master Plan preparation and review in the past, there has been a substantial reduction in impervious coverage that is allowed in each zone. Therefore, a reduction in stormwater runoff was achieved while retaining a reasonable opportunity for development.

Several changes may still be made to Article 13-300 of the Township Code entitled “Zoning Districts and Zoning Map.” The Township has 15 types of residential districts. Each district has a maximum percent impervious surface allocation, ranging from 5 percent for the R-10 District, which has a minimum lot size of ten acres for detached single-family homes, to 60 percent for the PUD and SCH Districts, which have a minimum lot size of 3,000 square feet for semi-detached dwelling units or 6,000 square feet for detached dwelling units for the PUD district and 2.5 acres for the senior citizen housing district. The Township has 4 types of nonresidential districts. Each of these districts has a maximum percent impervious surface allocation, ranging from 5 percent for the P District to 35 percent for the OR, OR-V, and the OP Districts. Although each zone has a maximum allowable percent impervious surface, the Township Code will be amended to remind developers that satisfying the percent impervious requirements does not relieve them of responsibility for complying with the Design and Performance Standards for Stormwater Management Measures. The Township is evaluating the maximum allowable impervious cover for each zone to determine whether a reduction in impervious cover is appropriate. The Township is also evaluating a maximum percent of disturbance for each zone, for those areas identified as natural features in Section 13-506. Also, if a developer is given a variance to exceed the maximum allowable percent

imperviousness, the developer must mitigate the impact of the additional impervious surfaces. This mitigation effort must address water quality, flooding, and groundwater recharge as described in the Design and Performance Standards for Stormwater Management Measures.

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

Since the Township of Bedminster has a combined total of more than one square mile of vacant lands, the Township is required to do a build-out analysis. A preliminary build-out analysis is being performed for the Township of Bedminster as described below.

The first of two phases of the build out analysis is to construct a map that includes the municipal boundary, existing roads, surface water bodies, HUC-14 boundaries, impervious cover, existing development by land use types, groundwater recharge areas, and wellhead protection area layers. A majority of the layers described above are being taken directly from the website provided by the state of New Jersey, at <http://www.nj.gov/dep/gis/>. After constructing the map, the identification and delineation of land that cannot be developed because of legal restrictions, physical constraints, and environmental sensitivity are performed. Examples of the restrictions include lands in permanently preserved open space, public ownership, deed restrictions, utility easements, steep slopes, wetlands, floodplains, and Category 1 Waters with associated special resource protection areas. Since a portion of Bedminster Township lies within the “Highlands” area, this is also a parameter used for identifying un-developable lands. Next, the identification and delineation of developable land under current zoning and land use regulations, as well as land that is vacant or not restricted as discussed above will be performed. The identification and delineation of the developed areas within the municipality that have significant redevelopment potential and that have not been developed to the maximum allowed will also be performed. For these undeveloped and underdeveloped areas, the maximum future development by projecting the largest number of housing units allowed in residential zones and the largest number of buildings and most intensive land uses in commercial and industrial zones will be determined.

The second phase of the build-out analysis quantifies the impact of the changes based on information provided by the maps. This includes calculations of percentage of impervious surfaces, number of housing units and their density, and remaining farmland and open space acreage. GIS can also assist in this computation by providing values for specific sets of layers such as the combination of the municipality, HUC14, and impervious area layers. This set of variables can provide the impervious cover for each HUC14 required by the Stormwater Management Rules. Values can be exported to other programs from GIS for more comprehensive computations, including the pollutant loading calculations also required by the regulations.

In simpler terms, all of the HUC-14’s within the municipality will be identified as well as the zones within each HUC-14. The area for each zone within each HUC-14 will be calculated. The existing impervious areas will be calculated in acres and in a percentage for each zone within each HUC-14. The same will be done for the wetlands/constrained

areas. An area will then be calculated for the developable area within each zone for each HUC-14. A table will be created itemizing each calculation described above. The maximum allowable impervious coverage in a percentage will be applied to the developable area within each zone for each HUC-14. The result will be the “Build-Out Impervious” area for each zone within each HUC-14. One will then compare the build-out impervious to the existing impervious within each zone for each HUC-14. Once the build-out analysis is completed, the tables and maps will be presented for review and approval.

## **Mitigation Plans**

This mitigation plan is provided for a proposed development that is granted a variance or exemption from the stormwater management design and performance standards. Presented is a hierarchy of options.

### Mitigation Project Criteria

1. The mitigation project must be implemented in the same drainage area as the proposed development. The project must provide additional protection from stormwater runoff quality and quantity from previously developed property that does not currently meet the design and performance standards outlined in the Municipal Stormwater Management Plan. The developer must ensure the long-term maintenance of the project, including the maintenance requirements under Chapters 8 and 9 of the NJDEP Stormwater BMP Manual.

- a. The applicant can select one or more of the following projects listed to compensate for the deficit from the performance standards resulting from the proposed project. More detailed information on the projects can be obtained from the Township Engineer. Listed below are specific projects that can be used to address the mitigation requirement.

Removal of existing impervious areas within the same HUC-14 watershed.

Acquisition of Open Space especially in Well Head Protection Areas.

Retrofitting of Stormwater Inlets.

Labeling of Stormwater Inlets.

Mapping of Stormwater Inlet System.

Water Quality studies on streams

Spook Hollow Road

Problem: Roadside Erosion.

Solution: Install pipes and drains in areas only where headwalls exist currently. Install grouted rip-rap in remaining areas of swales.

Long Lane

Problem: Ponding.

Solution: Install pipes and inlets. Be certain that there will be no clogging in the inlets prior to installing since there is a potential for the loose gravel to clog the inlet. If so, must furnish different solution.

River Road East at Mole' Residence

Problem: Ponding on north side of roadway.

Solution: Install pipes and inlets to connect to existing storm drainage system.

River Road East at Vreeland Residence

Problem: Ponding.

Solution: Install pipes and inlets to connect to existing storm drainage system.

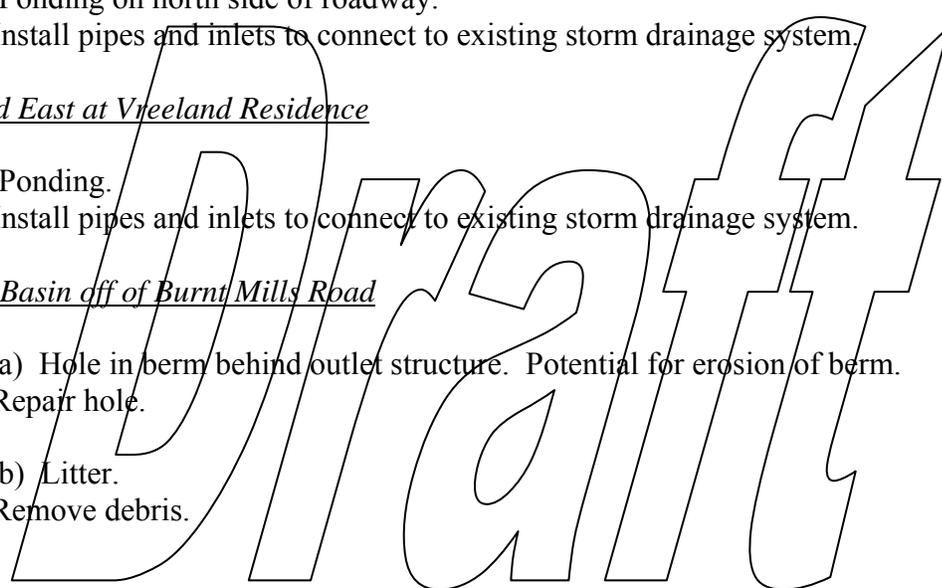
Detention Basin off of Burnt Mills Road

Problem: a) Hole in berm behind outlet structure. Potential for erosion of berm.

Solution: Repair hole.

Problem: b) Litter.

Solution: Remove debris.



Old Stonehouse Road

Problem: Ponding in front of home #57.

Solution: Install pipe/underdrain.

Loamatong Way

Problem: Culvert.

Solution: Replace sub-standard multi-barrel culvert.

2. If a suitable site cannot be located in the same drainage area as the proposed development, as discussed in Option 1, the mitigation project may provide mitigation that is not equivalent to 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 that impact aquatic life along a certain stream.

The Township may allow a developer to provide funding or partial funding to the Township for an environmental enhancement project that has been identified in a Municipal Stormwater Management Plan, 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 outlined above, 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.

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**APPENDIX A**

**FIGURES**

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