BOROUGH OF BLOOMINGDALE

PASSAIC COUNTY, NEW JERSEY

STORMWATER MANAGEMENT PLAN

AUGUST 2006

PREPARED FOR:
BOROUGH OF BLOOMINGDALE
PASSAIC COUNTY, NEW JERSEY

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BOROUGH OF BLOOMINGDALE
MUNICIPAL STORMWATER MANAGEMENT PLAN

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Introduction

On January 5, 2004 the New Jersey Department of Environmental Protection (NJDEP) adopted the Phase II Municipal Stormwater Regulation Program for the State of New Jersey. These regulations appeared in the February 2, 2004 New Jersey Register. Under these regulations, four New Jersey Pollutant Discharge Elimination System (NJDPES) General Permits were issued. Two of these General Permits, Tier A and Tier B Municipal Stormwater Permits, require New Jersey municipalities to begin a five year process implementing various measures to improve surface water quality within the State of New Jersey. Tier A municipalities, such as Bloomingdale, are generally located within the more densely populated regions of the state or along or near the coast. All municipalities in Passaic County are designated as Tier A. New Jersey's regulations are a direct result of the United States Environmental Protection Agency National Pollutant Discharge Elimination System (NPDES) Phase II Regulations published on December 8, 1999. There are a number of Statewide Basic Requirements (SBRs) which must be implemented under New Jersey's Tier A Municipal Stormwater Permit including, but not limited to, the following:

- *Post-Construction Stormwater Management in New Development and Redevelopment*
- *Local Public Education*
- *Improper Disposal of Waste*
- *Solids and Floatable Controls*
- *Maintenance Yard Operations*
- *Employee Training*

As part of the SBR for Post-Construction Stormwater Management in New Development and Redevelopment, municipalities must prepare and adopt a Municipal Stormwater Management Plan (MSWMP). This MSWMP documents the strategy for the Borough of Bloomingdale (the Borough) to address stormwater-related impacts from new development and redevelopment. The creation of this Plan is required by the Municipal Stormwater Regulations, published at New Jersey Administrative Code (N.J.A.C.) 7:14A-25. This Plan contains all of the required elements described in the Stormwater Management Rules, published at N.J.A.C. 7:8. The Plan addresses groundwater recharge, stormwater quantity, and stormwater quality impacts of new development and redevelopment 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 also addresses long-term operation and maintenance measures for existing and future stormwater facilities. 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 *Municipal Mitigation Plan* section, specific stormwater management measures are identified to lessen the impact of existing development. Neither a "build-out" analysis, nor review of the Borough Master Plan to assess incorporation of low impact development techniques has been

included in this Plan, as the Borough has a combined total of less than one square mile of vacant or agricultural lands, and thus is not required to provide this information.

Goals

The general goals of this MSWMP are to present an overview of the Borough's waterways and to establish a framework for compliance with the Municipal Stormwater Regulations. The specific goals of this Plan are to:

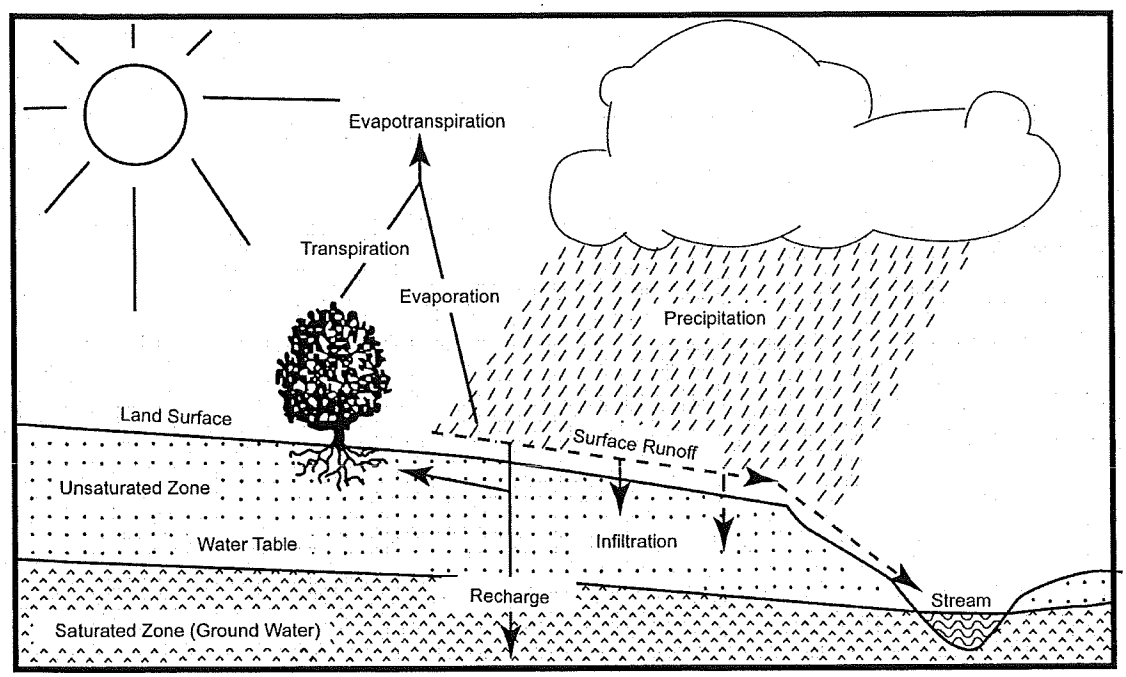
1. Reduce flood damage, including damage to life and property;
2. Minimize any increase in stormwater runoff from any new development or redevelopment;
3. Reduce soil erosion from any development or construction project;
4. Assure the adequacy of existing and proposed culverts and bridges, and other in-stream structures;
5. Maintain groundwater recharge where feasible;
6. Prevent, to the greatest extent feasible, an increase in nonpoint pollution (pollution caused by rainfall or snowmelt moving over and through the ground and contacting items such as fertilizers, pet waste, and litter);
7. Maintain the integrity of stream channels for their biological functions, as well as for drainage;
8. Minimize pollutants in stormwater runoff, using best management practices such as those described in Section 8 of the Stormwater Control Ordinance, 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
9. 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 and redevelopment. 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 Fundamentals

Land development can dramatically alter the hydrologic cycle (see figure below) of a site and, ultimately, an entire watershed. Prior to development, native vegetation can either directly intercept precipitation or extract that portion of the precipitation 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, and construction activities may also compact the soil and diminish its infiltration ability, resulting in increased volumes and rates of stormwater runoff from the site.

Groundwater Recharge in the Hydrologic Cycle



Source: New Jersey Geological Survey Report GSR-32.

Impervious areas that are connected to each other through gutters, channels, and storm sewers typically transport runoff more quickly than naturally vegetated areas. This decrease of the transport time accelerates the rainfall-runoff response of the drainage area, causing flow in downstream waterways to peak more quickly and higher than in natural conditions. These increases can create new, and aggravate existing, downstream flooding and erosion problems and increase the quantity of sediment in the waterway. Additionally, storm sewers that discharge runoff directly into a stream eliminate filtration of runoff, and the associated removal of pollutants, by surface and channel vegetation. 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.

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

Land development can also 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 also may remove trees along stream banks that normally provide shading, channel stabilization, and leaf litter that falls into streams and becomes food for the aquatic community.

Bloomingdale Waterways

The Borough of Bloomingdale encompasses 9.2 square miles in Passaic County, New Jersey. The Borough is primarily a single-family residential community which has experienced a stable population since 1970s. The population of the Borough has fluctuated recently from 7,867 in 1980, to 7,530 in 1990, to 7,610 in 2000. The Borough experienced the biggest population increase between 1950 and 1970 when the population increased from 3,251 to 7,797. This population increase, combined with business and commercial development, has resulted in some changes in the landscape, which likely resulted in increased stormwater runoff volumes and pollutant loads to the waterways of the Borough.

The 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. According to the latest AMNET data, the monitoring sites closest to Bloomingdale are on the Pequannock River in both West Milford and Riverdale. 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. This 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 Pequannock River is the most significant waterway in the Borough. The Pequannock River flows west to east along the southern boundary of the Borough. The Pequannock River is classified as non-impaired at the two monitoring sites closest to Bloomingdale. There are several tributaries to the Pequannock River located in the Borough including Cold Spring Brook, Van Dam Brook, and Oakwood Lake Brook. These tributaries are located in the southern portion of the Borough and flow north to south. The other significant waterways in the Borough are Posts Brook and its tributaries located in the central and northern portions of the Borough. None of these waterways are currently classified based on the AMNET data. Figures 1 and 2 identify the major waterways in the Borough.

In addition to the AMNET data, the NJDEP and other regulatory agencies collect water quality chemical data on the streams in the State. This data shows that the Pequannock River is impaired for temperature, as indicated by elevated temperature levels. Accordingly, the NJDEP is in the process of developing a Total Maximum Daily Load (TMDL) for temperature for the Pequannock River.

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 nonpoint sources, which include 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.

The TMDL for temperature impairment identified the chief cause of the impairment as the significant modification of the natural flow regime and heating of water that results from current reservoir management practices. Beaver activity, which results in ponding of water, stormwater runoff from paved areas and detention facilities, and increased solar incidence in areas where shading vegetation is lacking in the riparian buffer also contribute to the temperature impairment. Implementation strategies that relate specifically to stormwater management include adoption of the Municipal Stormwater Regulation Program, implementation of the new Stormwater Management Rules, and establishment of a 300-foot special water resource protection area (SWRPA) around Category One (C1) waters. The Pequannock River, Posts Brook, and Blue Mine Brook are designated as C1 waterbodies. Refer to the *Design and Performance Standards* section for further information regarding the C1 waterbodies. Further information regarding TMDL's can be found at the NJDEP Division of Watershed Management website (www.nj.gov/dep/watershedmgt/tmdl.htm).

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 (the Integrated List is published by the NJDEP Bureau of Water Quality Standards and Assessment, website: www.state.nj.us/dep/wmm/sgwqt/wat/index.html). 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. The Pequannock River is on Sublist 5 as being impaired due to high lead, temperature, and dissolved oxygen levels.

In addition to water quality problems, the Borough has exhibited water quantity problems including flooding, stream bank erosion, and diminished base flow in its streams. The primary mode of stormwater conveyance in the developed portion of the Borough is through a subsurface storm drainage system consisting of catch basins, inlets, manholes, storm drains, and culverts. Stormwater runoff is collected by the catch basins and inlets and transported through the storm drains and culverts to a location where the stormwater discharges to the various waterways in the Borough. Many of the storm drains and culverts associated with the drainage system in the Borough are undersized. During severe storm events, these undersized culverts do not have adequate capacity, thereby causing a backwater effect and flooding upstream.

Historical information indicates that the low-lying areas above and below Oak Street are subject to flooding by the Van Dam Brook. Flooding along the Pequannock River has also been noted. The maximum recorded flow for the Pequannock River near Bloomingdale is 6,100 cubic feet per second (cfs) which occurred in October 1904. More recent high flows were recorded during significant rainfall events that occurred in April 1984 (4,880 cfs) and in October 1996 (2,350 cfs). The Borough has also identified recent drainage problems near Van Dam Brook at Chestnut Street and Delazier Field. The Borough has also identified Catherine and Elizabeth

Streets, and Fitcher Street and Delazier Place near Oakwood Lake Brook as being periodically subject to flooding conditions.

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

Several maps associated with the hydrologic conditions in the Borough are contained in this Plan. The maps include the following:

- A map of the primary groundwater recharge areas in the Borough is shown on Figure 3.
- Wellhead protection areas are shown on Figure 4.
- A map of the Hydrological Unit Codes 14 (HUC-14s) drainage areas is included on Figure 6. The term "HUC-14" is from the hydrologic unit code system developed by the United States Geological Service for delineating and identifying drainage areas. The system starts with the largest possible drainage areas and progressively smaller subdivisions of the drainage area are delineated and numbered in a nested fashion. A drainage area with a HUC designation with 14 numbers, or HUC-14, is one of several sub-watersheds of a larger watershed with 11 numbers, or a HUC-11. There are 921 HUC-14 sub-watersheds in New Jersey that range in size from 0.1 to 42 square miles.
- Flood Boundary and Floodway Maps for Bloomingdale, which are produced by the Federal Emergency Management Agency (FEMA), are included as Figures 9 & 10.

Design and Performance Standards

The Borough will adopt a Stormwater Control Ordinance which will incorporate the design and performance standards for stormwater management measures as presented in N.J.A.C. 7:8-5. This ordinance will be used to minimize the adverse impact of stormwater runoff with respect to water quality, water quantity, and loss of groundwater recharge in receiving water bodies. The implementation of water quality standards will help to achieve Goals 6, 7, and 8 by minimizing the pollutants in stormwater runoff. The standards for water quantity reduction will help to achieve Goals 1 and 2 by reducing stormwater runoff for sites with new development and redevelopment. The water quantity standards will also help to achieve Goals 4 and 7 by preventing increases in stormwater runoff from sites being developed. The implementation of the standards for groundwater recharge will help to achieve Goal 5 by maintaining groundwater recharge at sites being developed.

In order to ensure adequate long-term operation and maintenance of stormwater management measures in the Borough, the design and performance standards include the requirements for maintenance of stormwater management measures consistent with the stormwater management rules at N.J.A.C. 7:8-5.8 (Maintenance Requirements). The design and performance standards will also include the requirements for safety standards consistent with N.J.A.C. 7:8-6 (Safety Standards for Stormwater Management Basins). These safety standards include requirements for trash racks, overflow grates, and escape provisions for stormwater management basins. These standards will help to achieve Goal 9, and shall be implemented in all new and/or rehabilitated stormwater management basins. A draft copy of the Bloomingdale Stormwater Control Ordinance is included in Appendix A.

As stated previously, the Pequannock River, Posts Brook, and Blue Mine Brook are designated as C1 waterbodies. The Stormwater Management Rules require that SWRPAs be established along all waters designated C1, and all perennial or intermittent streams within the associated HUC14 drainage area that drain into or upstream of the C1 waters as shown on the United States Geological Survey (USGS) Quadrangle Maps or in the County Soil Surveys. Accordingly, SWRPAs shall be established along the Pequannock River, Posts Brook, Blue Mine Brook and their tributaries which are located in the same HUC-14 as the River / Brook. These tributaries include Van Dam Brook, Oakwood Lakes Brook, and Cold Spring Brook for the Pequannock River. These areas shall be established for the protection of water quality, aesthetic value, exceptional ecological significance, exceptional recreational significance, exceptional water supply significance, and exceptional fisheries significance of those Category One waters. A 300-foot SWRPA shall be provided on each side of the waterway, measured perpendicular to the waterway from the top of the bank outwards or from the centerline of the waterway where the bank is not defined, consisting of existing vegetation or vegetation allowed to follow natural succession. Development within the 300-foot SWRPA is limited to only certain activities.

A portion of the Borough is located in the Highlands Preservation Area. Under the Highlands Water Protection and Planning Act, Category One anti-degradation provisions for the Surface

Water Quality Standards and the Stormwater Management Rules apply to all Highlands open waters regardless of current DEP classifications. Several unnamed tributaries to Posts Brook are located in the Highlands Preservation Area and thus, the SWRPAs shall be applied to the Posts Brook tributaries.

Along with implementing the ordinances to address stormwater management design, maintenance, and safety, Borough inspectors (or their representatives) will observe the construction of projects to ensure that the stormwater management measures are constructed and function as designed.

Plan Consistency

There is currently not a Regional Stormwater Management Plan (RSWMP) specifically for the Pequannock River; however, as noted in the *Background* section, a TMDL has been proposed for the Pequannock River. This MSWMP will be consistent with the goals of the TMDL. The primary stormwater related goals of the TMDL are the implementation the Municipal Stormwater Regulation Program, implementation of the new Stormwater Management Rules, and establishment of a 300-foot SWRPA around C1 waters. The Borough will implement the Stormwater Regulation Program and the Stormwater Management Rules as required by the NJDEP in order to help achieve these goals. The Borough's Stormwater Control Ordinance will address requirements for operation and maintenance of stormwater basins associated with development and redevelopment, and the Borough will also be required to conduct cleaning and maintenance of municipal stormwater facilities. If any RSWMP or new TMDL is developed in the future, this Municipal Stormwater Management Plan shall be reviewed in comparison to the goals and implementation criteria of the RSWMP and/or TMDL, and be updated to be consistent with any new criteria. This review and update shall, at a minimum, occur when the Municipal Stormwater Management Plan is updated as part of required municipal master plan review, or within one (1) year of adoption of a RSWMP. The Regional Master Plan being developed by the New Jersey Highlands Council may have stormwater related impacts, and should similarly be reviewed in comparison to this Municipal Stormwater Management Plan. The Highlands Regional Master Plan is currently scheduled to be adopted in 2006.

This Municipal Stormwater Management Plan is consistent with the Residential Site Improvement Standards (RSIS) at N.J.A.C. 5:21. The Borough will utilize the most current update of the RSIS in the stormwater management review of residential areas. This MSWMP will be updated to be consistent with any future updates to the RSIS. This review and update shall, at a minimum, occur when the Municipal Stormwater Management Plan is updated as part of required municipal master plan review.

The Borough's Stormwater Control Ordinance will require all new development and redevelopment plans to comply with New Jersey's Soil Erosion and Sediment Control Standards. Borough inspectors (or their representatives) will observe on-site soil erosion and sediment control measures during construction and report any inconsistencies to the Hudson, Essex, & Passaic Soil Conservation District. This will help in achieving Goal 3 by reducing soil erosion from new development or redevelopment projects.

Nonstructural Stormwater Management Strategies / Low Impact Development Techniques

Land development can have severe adverse stormwater impacts, particularly if the land is converted from woods, meadow, or other natural condition to a highly disturbed area with large percentages of impervious and non-native vegetated covers. Such impacts typically include an increase in stormwater runoff volume, rate, velocity, and pollutants and a corresponding decrease in the quality of runoff and stream flow. Frequently, management of these impacts has focused on collecting and conveying the runoff from the entire site through a structural conveyance system to a centralized facility (e.g., detention basin, wet pond) where it is stored and treated prior to discharge downstream. In effect, such practices first allow the adverse runoff impacts to occur throughout the site and then provide remedial and/or restorative measures immediately prior to releasing the runoff downstream.

Since the 1960s, the range of remedial measures provided in centralized stormwater management facilities has increased from merely 100-year peak flow attenuation, to the range of peak flow, volume, and nonpoint source pollutant controls required by New Jersey's current Stormwater Management Rules at N.J.A.C. 7:8. This has required modifications to established methods of runoff computation and the development of alternative treatment methods to be used in centralized facilities.

However, with the increasing emphasis on nonpoint source pollution and concerns over the environmental impacts of land development, it has become necessary to develop effective alternatives to the centralized conveyance and treatment strategy that has been the basis for much of the stormwater management systems and programs in the State. New strategies must be developed to minimize and even prevent adverse stormwater runoff impacts from occurring and then to provide necessary treatment closer to the origin of those impacts. Such strategies, known collectively as Low Impact Development (LID), seek to reduce and/or prevent adverse runoff impacts through sound site planning and both nonstructural and structural techniques that preserve or closely mimic the site's natural or pre-developed hydrologic response to precipitation. Rather than responding to the rainfall-runoff process like centralized structural facilities, low impact development techniques interact with the process, controlling stormwater runoff and pollutants closer to the source and providing site design measures that can significantly reduce the overall impact of land development on stormwater runoff. As such, low impact development promotes the concept of designing with nature.

Effective low impact development includes the use of both nonstructural and structural stormwater management measures that are a subset of a larger group of practices and facilities known as Best Management Practices (BMPs). The BMPs utilized in low impact development, known as LID-BMPs, focus first on minimizing both the quantitative and qualitative changes to a site's pre-developed hydrology through nonstructural practices and then providing treatment as necessary through a network of structural facilities distributed throughout the site. In doing so, low impact development places an emphasis on nonstructural stormwater management measures, seeking to maximize their use prior to utilizing structural BMPs.

Nonstructural BMPs used in low impact development seek to reduce stormwater runoff impacts through sound site planning and design. Nonstructural LID-BMPs include such practices as minimizing site disturbance, preserving important site features, reducing and disconnecting impervious cover, flattening slopes, utilizing native vegetation, minimizing turf grass lawns, and maintaining natural drainage features and characteristics. Structural BMPs used to control and treat runoff are also considered LID-BMPs if they perform these functions close to the runoff's source. As such, they are typically smaller in size than standard structural BMPs. Structural LID-BMPs include various types of basins, filters, surfaces, and devices located on individual lots in a residential development or throughout a commercial, industrial, or institutional development site in areas not typically suited for larger, centralized structural facilities.

Finally, low impact development promotes the view of rainwater as a resource to be preserved and protected, not a nuisance to be eliminated. For example, with low impact development, roof runoff can be captured and stored in rain barrels for plant watering or other uses. Runoff can also be directed to small on lot bioretention or infiltration basins, also known as rain gardens, to provide both runoff treatment and landscape enhancements.

Unfortunately, low impact development techniques and strategies are considered by some to be applicable only to land development sites with limited impervious cover. However, it has been clearly demonstrated that low impact development techniques can be applied to virtually any development site, regardless of impervious coverage, to produce enhanced site designs and "lower" stormwater impacts.

The use of nonstructural and structural LID-BMPs can be a significant improvement over the more centralized approach to stormwater management traditionally used in New Jersey. Even in those instances where centralized structural BMPs are still required to fully provide downstream areas with effective pollution, erosion, and flood protection, LID-BMPs can help to reduce the number and/or size of such facilities, further reducing site disturbance. And, in certain instances, it may be possible to satisfy all stormwater management requirements through the use of nonstructural LID-BMPs alone, thereby eliminating the need for any structural BMPs. In all instances, specific site and downstream conditions must be evaluated to determine the range of standard and low impact development BMPs that can be utilized at a land development site.

It is also important to note that, since low impact development typically relies on an array of nonstructural and relatively small structural BMPs distributed throughout a land development site, ownership and maintenance of the various BMPs may be similarly distributed over an array of property owners. As such, it is vital to have public understanding of and support for the various LID-BMPs officially authorized for use in a particular municipality. Such understanding and support must include an appreciation for the role that the LID-BMPs play in the site's or watershed's stormwater management program and a commitment to preserve and maintain them.

The use of both nonstructural and structural BMPs in low impact development is governed by certain principles, objectives and requirements. It should be noted that, while consideration of nonstructural stormwater management techniques at land development sites is required by the NJDEP Stormwater Management Rules at N.J.A.C. 7:8, the NJDEP believes that effective, state-wide use of such practices can be best achieved through municipal master plans and land

development ordinances that mandate specific LID goals and authorize the use of specific LID-BMPs.

Nonstructural Stormwater Management Strategies

Effective low impact development includes the use of both nonstructural and structural stormwater management measures known as LID-BMPs. Of the two, nonstructural LID-BMPs play a particularly important role. The NJDEP Stormwater Management Rules at N.J.A.C. 7:8 require in Section 5.2(a) that the design of any development that disturbs at least 1 acre of land or increases impervious surface by at least 1/4 acre must incorporate nonstructural stormwater management strategies "to the maximum extent practicable." Such a development is defined in the Rules as a "major development." As such, nonstructural LID-BMPs are to be given preference over structural BMPs. Where it is not possible to fully comply with the Stormwater Management Rules solely with nonstructural LID-BMPs, they should then be used in conjunction with LID and standard structural BMPs to meet the Rules' requirements.

More precisely, to achieve the Rules' design and performance standards, Subchapter 5 of the NJDEP Stormwater Management Rules requires the maximum practical use of the following nine nonstructural strategies at all major developments:

1. Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss.
2. Minimize impervious surfaces and break up or disconnect the flow of runoff over impervious surfaces.
3. Maximize the protection of natural drainage features and vegetation.
4. Minimize the decrease in the pre-construction "time of concentration."
5. Minimize land disturbance including clearing and grading.
6. Minimize soil compaction.
7. Provide low maintenance landscaping that encourages retention and planting of native vegetation and minimizes the use of lawns, fertilizers, and pesticides.
8. Provide vegetated open-channel conveyance systems discharge into and through stable vegetated areas.
9. Provide preventative source controls.

In addition, Subchapter 5 further requires an applicant seeking approval for a major development to specifically identify which and how these nine nonstructural strategies have been incorporated into the development's design. Finally, for each of those nonstructural strategies that were not able to be incorporated into the development's design due to engineering, environmental, or safety reasons, the applicant must provide a basis for this contention.

While the nonstructural stormwater management strategies listed above represents a wide range of both objectives and practices, Strategies 1 through 8 can be directly addressed through the use of specific nonstructural LID-BMPs that can be grouped into four general categories:

1. Vegetation and Landscaping;

2. Minimizing Site Disturbance;
3. Impervious Area Management; and
4. Time of Concentration Modifications.

Listed below are examples of LID techniques that should be considered by the Borough. Although the Borough is not required to complete a thorough review and revision to its master plan and land use and zoning ordinances (because it has less than one (1) square mile of vacant or agricultural lands, per NJAC 7:8-4.2.10), these items should be considered for incorporation into the Borough's Master Plan and/or ordinances. This list represents a sample of site planning and structural and nonstructural stormwater management strategies that can be used to reduce and/or prevent adverse stormwater runoff impacts.

Buffers – The use of buffer areas is encouraged along all lot and street lines separating residential uses from arterial and collector streets, separating a nonresidential use from either a residential use or residential zoning district line, and along all street lines where loading and storage areas can be seen from the street. Landscape requirements for these buffer areas should consider the use of native vegetation which requires less fertilization and watering than non-native species. Buffer areas can be utilized for stormwater management by disconnecting impervious surfaces and treating runoff from these impervious surfaces.

Cluster Development - cluster development is encouraged 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 use of native vegetation, which requires less fertilization and watering than non-native ornamental plants, is encouraged. The use of mulched or stone paths, to decrease the impervious area, is encouraged.

Curb and Gutters – the use of curb cuts or flush curbs with curb stops is encouraged to allow vegetated swales to be used for stormwater conveyance and to allow the disconnection of impervious areas.

Drainage - the use of natural vegetated swales in lieu of inlets and pipes is encouraged wherever possible.

Driveways and Accessways - The use of pervious paving materials to minimize stormwater runoff and promote groundwater recharge is encouraged.

Natural Features - natural features, such as trees, brooks, swamps, hilltops, and views, should be preserved whenever possible, and that care should be taken to preserve selected trees to enhance soil stability and landscaped treatment of the area.

Off-street Parking and Loading Areas - flush curb with curb stop, or curbing with curb cuts is encouraged to allow for the discharge of impervious areas into landscaped areas for stormwater management. The use of natural vegetated swales for the water quality design storm, with overflow for larger storm events into storm sewers should be considered. Pervious paving should be utilized in overflow parking areas.

Sidewalks - sidewalks should be designed to discharge stormwater to neighboring lawns where feasible to disconnect these impervious surfaces, or the use permeable paving materials should be considered where appropriate.

Soil Erosion and Sediment Control – in addition to the New Jersey Soil Erosion and Sediment Control Standards follow general design principles, including: whenever possible, retain and protect natural vegetation; minimize and retain water runoff to facilitate groundwater recharge; and, install diversions, sediment basins, and similar required structures prior to any on-site grading or disturbance.

More information regarding low impact development can be found in the New Jersey Stormwater Best Management Practices Manual, specifically *Chapter 2, Low Impact Development Techniques*. This manual is available at www.njstormwater.org.

Land Use/Build-Out Analysis

Bloomingdale encompasses a total of 9.2 square miles, which is comprised primarily of State forest. Figure 5 shows the existing land use in the Borough, while Figure 7 shows the zoning districts in the Borough. The existing land use in the Borough is summarized in the following table.

Existing Land Use

Land Use	Area (Sq. Miles)
Agriculture	0.03
Barren Land	0.13
Forest	6.31
Urban	1.76
Water	0.47
Wetlands	0.52

Within these land uses there are approximately 1.59 square miles of vacant land in the Borough. Approximately 0.83 square miles of this land is environmentally constrained due to steep slopes or wetlands and waterways on the land. Figure 2 depicts a portion of the constrained lands in the Borough. When the portion of the vacant land that is constrained is considered, it leaves approximately 0.77 square miles of developable land in the Borough. According to NJAC 7:8-4.2.10, if a municipality has a combined total of less than one square mile of vacant or agricultural lands, the land use/build-out analysis is not required as part of the MSWMP. Bloomingdale has approximately 0.80 square miles of vacant or agricultural lands. Accordingly, the land use/build-out analysis is not included in this MSWMP. Given that there is only a small area of vacant and agricultural lands in the Borough, the pollutant loads for total suspended solids, total nitrogen, and total phosphorous in the waterways will be similar when comparing the existing conditions to a full build-out scenario. A break-down of the vacant land in the Borough is presented below.

Vacant Land Analysis

Tract No.	Block	Lot	A	B	C	Developable D = A - B - C
				Constrained Land		
			Lot Size (acres)	Slopes 15% + (acres)	Wetlands & Floodplains (acres)	Developable Land (acres)
20	5	39A	7.2	7.2	0.0	0.0
21	92	182	8.9	0.0	0.0	8.9
	32	22				
22	32	8, 9, 10A	4.2	1.3	0.0	2.9
23	92	38	32.6	0.0	0.0	32.6
27	49	3	4.4	0.0	0.0	4.4
29	49	2	230.0	56.5	56.9	116.6
30	49	111	103.6	23.5	18.2	61.9
31	49	113A	6.0	0.0	0.5	5.5
32	57	39	3.4	0.0	0.0	3.4
33	57	43	13.2	0.0	0.0	13.2
34	57	43B	5.6	0.0	0.0	5.6
35	59	6, 7	34.7	13.4	0.8	20.5
36	60	5	69.8	18.2	0.5	51.1
	59	8				
37	64	16	7.7	0.0	5.4	2.3
	64	17				
38	60	15	9.8	0.0	4.4	5.4
39	59	1C	175.0	105.7	10.8	58.5
	60	9A, 16, 16A, 21A, 21B, 45, 46, 47, 48A, 60, 60A, 60B				
40	60	1-4, 61-64	272.2	166.1	9.6	96.5
41	62	1, 1A	12.6	0.0	12.6	0.0
42	62	2	12.1	0.0	12.1	0.0
44	5	46, 46L	6.6	5.6	0.0	1.0
		Total (acres)	1019.6	397.5	131.8	490.3
		Total (square miles)	1.59	0.62	0.21	0.77

Source: Borough of Bloomingdale Master Plan.

Municipal Mitigation Plan

A mitigation plan is provided for a proposed development that is granted a variance or exemption (by the Planning Board) from the design and performance standards for stormwater runoff quality, stormwater runoff quantity, and groundwater recharge, as established by Municipal Stormwater Management Plan. The mitigation project should offer an option that clearly offsets the effect of groundwater recharge, stormwater quantity control, and/or stormwater quality control that was created by granting the variance or exemption. The existence of a mitigation plan does not preclude the requirements that an applicant meet the design and performance standards for stormwater runoff quality, stormwater runoff quantity, and groundwater recharge on the project site. Instead, it allows the Borough, in limited circumstances, to waive the strict compliance with one or more of the performance standards, where full compliance cannot be reasonably accommodated on-site, including through a reduction in the size or scale of the development. A waiver cannot be granted if the project requesting a waiver/exemption would result in a localized adverse impact or create a compliance deficit that cannot be compensated for by off-site mitigation. Under no circumstance will the Borough waive the Special Water Resource Protection Area requirements established under the Stormwater Management Rules at N.J.A.C. 7:8-4.

The Borough may waive any or all of the design and performance standards for projects reviewed under the Municipal Land Use Law (MLUL), or for projects undertaken by the Borough that are not subject to the MLUL. Any waiver granted by the Borough for its own projects must include a report for the project addressing the requirements for mitigation projects. A summary of each waiver granted must be included in the Annual Report prepared by the Borough as part of the compliance with the Borough's NJPDES General Permit. Waivers for linear development projects must be evaluated using the requirements under N.J.A.C. 8:8-5.2(e), which includes the requirements to address mitigation for the performance standard for which compliance was not obtained. The issuance of a permit by the NJDEP, that includes a stormwater management review and an associated waiver under the provisions of the specific permit, does not automatically waive the requirements for mitigation to be performed under the Borough review. The Borough may choose to require mitigation for projects receiving a waiver from the Department.

The mitigation project must provide additional groundwater recharge benefits, or 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 applicant must ensure the long-term maintenance of the project, including the maintenance requirements under Chapters 8 and 9 of the NJDEP Stormwater BMP Manual. If a suitable mitigation site cannot be located in the same drainage area as the proposed development, 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 total suspended solids (TSS) requirement is not met; the selected project may address water quality impacts due to a fecal impairment.

Specific Mitigation Projects

The different performance standards require different ways to look at mitigation projects for each performance standard identified. Stormwater quality is intended to prevent an increase in pollutants from entering the waterbodies. Stormwater quantity focuses on the impacts of increased runoff on flooding, and groundwater recharge maintains the water that feeds base flow in streams and aquifers. Mitigation projects can be retrofits of an existing system, such as pre-existing development where stormwater management was not sufficiently addressed based on the new performance standards. They may also be new projects designed to provide control of stormwater runoff where none previously existed.

Sensitive receptors are areas with specific sensitivity to impacts of stormwater, whether through changes to stormwater runoff quality, stormwater runoff quantity, and groundwater recharge. Examples of sensitive receptors are trout associated waters, threatened and endangered species, impaired waterways, inadequate culverts, property subject to flooding, category one waters, and aquifers. The sensitive receptor that is affected by the performance standard for which a variance is sought should be identified and considered when selecting the mitigation project.

Mitigation Projects for Stormwater Quality

Stormwater quality is regulated for the purpose of minimizing/preventing non-point pollution from reaching the waterway. Mitigation for stormwater quality can be achieved by directing the runoff from the water quality design storm into a natural area where it can be filtered and/or infiltrated into the ground; by constructing a new BMP to intercept previously untreated runoff; or by retrofitting existing stormwater systems that previously did not provide sufficiently for water quality.

Some examples of areas or features sensitive to water quality changes include:

- *Trout associated waters* - chemical pollutants and temperature effects can diminish viability of trout populations;
- *Lakes, ponds or other impoundments* - these waterways are sensitive to the addition of nutrients;
- *Threatened and endangered species or their habitats* - sensitive to both quality and quantity changes;
- *Drinking water supplies* - adverse affects on quality can increase the cost of treatment or threaten the use of drinking water supplies;
- *Category One waters* - an issue for those streams where quality was basis of the designation; and
- *Waterways with water quality or use impairment* – non-point pollution may result in further deterioration of quality.

Mitigation Projects for Stormwater Quantity

Increased stormwater runoff volume from new development can cause damage to property and habitat due to increased flood elevations and/or flood velocities. Mitigation project areas can

include locations that will provide for additional storage and slower release of excess stormwater. Mitigation of stormwater quantity can be accomplished by increasing existing ponding areas along the waterway, creating new BMPs to control previously uncontrolled runoff, or by retrofitting existing stormwater structures to decrease the volume and peak of runoff.

In areas adjacent to a stream, a hydrologic and hydraulic analysis can be performed to determine if increasing storage capacity would offset the additional volume of runoff from sites upstream of the storage area. Areas that may provide storage are lakes, ponds, parkland, or other land upstream of constrictions such as inadequately sized bridges or culverts. Increases in the storage capacity of an existing structure, such as upstream of a bridge or culvert, can also be considered provided that it is demonstrated that such as increase does not exacerbate flooding at other areas.

Some examples of areas or features sensitive to changes with regard to flooding include:

- *Culverts and bridges* - these features may constrict flow and cause flooding or may provide storage that, if lost, would cause downstream flooding problems;
- *Property subject to flooding* - areas of concern include those where there is historical evidence of recurrent problems, particularly if exacerbated over time because of increasing impervious surface in the contributing watershed;
- *Eroding/widening stream banks or channels* - particularly if due to changes in hydrology due to the effects of development;
- *Category One waters* - flooding affects could alter habitat that was the basis for the designation; and
- *Wetlands* - changes in hydrology can affect viability of wetlands, either by increasing or decreasing volumes and velocities of water discharging to the wetlands.

Mitigation Projects for Groundwater Recharge

Groundwater recharge is regulated to maintain the groundwater hydrology of the project area. Recharge is the portion of the infiltrated stormwater runoff that makes it below the root mass and becomes groundwater. There are two (2) options to demonstrate compliance with the groundwater recharge standards. The first is that 100 percent of the site's average annual pre-developed groundwater recharge volume be maintained after development, and the second is that 100 percent of the difference between the sites pre-and post-development 2-year runoff volumes be infiltrated. To mitigate for groundwater recharge, either computational method can be utilized to determine the volume lost that needs to be provided by the mitigation project.

Some examples of areas or features sensitive to groundwater recharge changes include:

- *Springs, seeps, wetlands, white cedar swamps* – these features are sensitive to changes in ground water level/hydrology;
- *Threatened and endangered species or their habitats* - some are sensitive to changes in ambient groundwater levels;
- *Streams with low base flow or passing flow requirements* – these features may be particularly sensitive to changes in hydrology;

- *Aquifer recharge zones* - loss of recharge in these areas can adversely affect groundwater supply; and
- *Category One waters* - loss of base flow may affect the basis for the designation.

Selection of Mitigation Projects

Mitigation projects shall be proposed by the applicant. The applicant shall locate an appropriate project and site for the mitigation of the performance standard for which they are requesting a waiver. The applicant shall look at existing problems related to stormwater runoff quality, stormwater runoff quantity, and groundwater recharge to assist in the identification of appropriate projects. The process of selecting mitigation projects must incorporate the following requirements:

1. The mitigation project must be within the same drainage area that would contribute to the sensitive receptor impacted by the project. If there is no specific sensitive receptor impacted, then the location of the mitigation project can be located anywhere with the Borough, preferably at a location that would provide the most benefit relative to an existing stormwater problem in the same category (i.e. quality, quantity, or recharge).

2. Legal authorization must be obtained to construct the project at the location selected. This includes the maintenance and any access needs for the project in the future.

3. The project should be close to the location of the original project, and if possible, be located upstream at a similar distance from the identified sensitive receptor. This distance should not be based on actual location, but on a similar hydraulic distance to the sensitive receptor. For example, if the project for which a waiver is obtained discharges to a tributary, but the closest location discharges to the main branch, it may be more beneficial to identify a location discharging to the same tributary.

4. It is preferable to have one location that addresses any and all performance standards waived rather than one location for each performance standard.

5. The project location must demonstrate no adverse impacts to other properties.

6. Mitigation projects that address stormwater runoff quantity can choose to provide storage for proposed increases in runoff volume, as opposed to a direct peak flow reduction.

7. Mitigation projects that address stormwater runoff quality can choose to address another pollutant other than TSS, which has been demonstrated to be of particular concern such as streams listed as an impaired waterbody on the Integrated List. Care should be taken to ensure that waivers from the TSS requirement do not result in impairment of an existing unimpaired area.

Requirements for Mitigation Projects

The following requirements for mitigation projects must be included in the project submission:

1. **Impact from noncompliance:** Provide a table to show the required values, and the values provided in the project, and include an alternatives analysis demonstrating that on-site compliance was maximized.

2. **Narrative and supporting information regarding the need for the waiver:**
   - The waiver cannot be due to a condition created by the applicant. If the applicant can provide compliance with the Stormwater Management rules through a reduction in the scope of the project, the applicant has created the condition and a waiver cannot be issued.
   - A discussion and supporting information of the site conditions that would not allow the construction of a stormwater management facility to provide compliance with these requirements, and/or if the denial of the application would impose an extraordinary hardship on the applicant brought about by circumstances particular o the subject property. Site conditions to be considered are soil type, the presence of karst geology, acid soils, a high groundwater table, unique conditions that would create an unsafe design, as well as conditions that may provide a detrimental impact to public health, welfare and safety. Demonstrate that the grant of the requested waiver/exemption will not result in an adverse impact that will not be compensated for by off-site mitigation.

3. **Sensitive Receptor:** Identify the sensitive receptor to the performance standard from which a waiver is sought. Demonstrate that the mitigation site contributes to the same sensitive receptor.

4. **Design of Mitigation Project:** Provide the design of the mitigation project. This includes, but is not limited to, drawings, calculations, and other information needed to evaluate the mitigation project.

5. **Responsible Party:** List the party or parties responsible for the construction and the maintenance of the mitigation project. Documentation must be provided to demonstrate that the responsible party is aware of, has authority to perform, and accepts the responsibility for the construction and maintenance of the mitigation project. Under no circumstances shall the responsible party be an individual single-family homeowner.

6. **Maintenance:** Include a maintenance plan that addresses the maintenance criteria at N.J.A.C. 7:8-5.8 as part of the mitigation plan. In addition, if the maintenance responsibility is being transferred to the Borough (if such an arrangement is approved by the Borough), or other entity, the entity responsible for the cost of the maintenance must be identified. The Borough may provide the option for the applicant to convey the mitigation project to the Borough (if such an arrangement is approved by the Borough), if the applicant provides the cost of maintenance in perpetuity.

7. **Permits:** Obtain any and all local, State or other applicable permits for the mitigation measure or project. These must be obtained prior to the Borough approval of the project for which mitigation is being provided.

8. **Construction:** Demonstrate that the construction of the mitigation project coincides with the construction of the proposed project. A certificate of occupancy or final approval by the Borough for the application project cannot be issued until the mitigation project or measure receives final approval. Any mitigation project proposed by the Borough to offset the stormwater impacts of the Borough's own projects must be completed within 6 months of the completion of the Borough project, in order to remain in compliance the NJPDES General Permit.

Funding Municipal Projects

The Borough may allow an applicant to fund analyses to identify potential mitigation projects that could be used to address deficits in complying with each of the performance standards. However, this funding option shall only be allowed where the project requesting the waiver will have no measurable impact with respect to flooding, erosion, water quality degradation, etc. and will have no immediate impact to a sensitive receptor. The funding option may also be used in situations where the size of an individual project requesting a waiver/exemption is small, or the degree of deficit in complying with the design and performance standard(s) is small. Also, if the project requiring mitigation is for one individual single family home, given authority constraints, a financial contribution may be a preferred option. In these situations, it may not be practical to implement a commensurate mitigation project and may be preferable to accumulate funds to implement a larger mitigation project. In such cases, the receipt of the financial contribution shall satisfy the mitigation obligation for the applicant. This funding option will only be used in limited circumstances after all other mitigation options have been considered. The Borough becomes responsible to ensure that the mitigation occurs in a timely fashion and must provide a detailed discussion of the status of the mitigation fund and funded projects in the annual report required under the NJPDES municipal stormwater permit.