MASER CONSULTING P.A.
Consulting, Municipal & Environmental Engineers
Planners ▪ Surveyors ▪ Landscape Architects

240 Princeton Avenue, Suite 152
Hamilton, NJ 08619
Tel: 609.587.8200 ▪ Fax: 609.587.8260
www.maserconsulting.com

Stormwater Management Plan

For

Township of East Windsor
Mercer County, New Jersey

Prepared by:

Maser Consulting, PA

August 2005

05000703

TABLE OF CONTENTS

List of Figures

Introduction

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

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. In addition, the 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, an increase in non-point source pollution;
- Maintain the integrity of stream channels for their biological functions, as well as for drainage;
- 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;
- Protect public safety through the proper design and operation of stormwater basins;

- Encourage low impact design and the non-structural Stormwater Management strategies outlined in this plan;
- Particular attention shall be given to the water quality and control of flood damage of special target areas including the Millstone River and the Rocky Brook;
- Guide development and establish stormwater management strategies consistent with Delaware and Raritan Canal Commission regulations; and
- Guide development and establish stormwater management strategies consistent with the General Goals and Objectives of the Township Master Plan as well as the following items of the Conservation and Recreation Plan Element:
    - Discourage of development in those area which are prone to flooding, have seasonal high water table at or near the surface of the ground, have wetland characteristics or have slopes over 15 percent.
    - Preservation of lands lying along stream banks for recreation and open space.

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 under natural conditions. These increases can create new and aggravate existing downstream flooding and erosion problems and increase the quantity of sediment in the channel. Filtration of runoff and removal of pollutants by surface and channel vegetation is eliminated by storm sewers that discharge runoff directly into a stream. Increases in impervious area can also decrease opportunities for infiltration, which in turn, reduces stream base flow and groundwater recharge. Reduced base flows and increased peak flows produce greater fluctuations between normal and storm flow rates, which can

increase channel erosion. Reduced base flows can also negatively impact the hydrology of adjacent wetlands and the health of biological communities that depend on base flows. Finally, erosion and sedimentation can destroy the habitat of some species.

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.

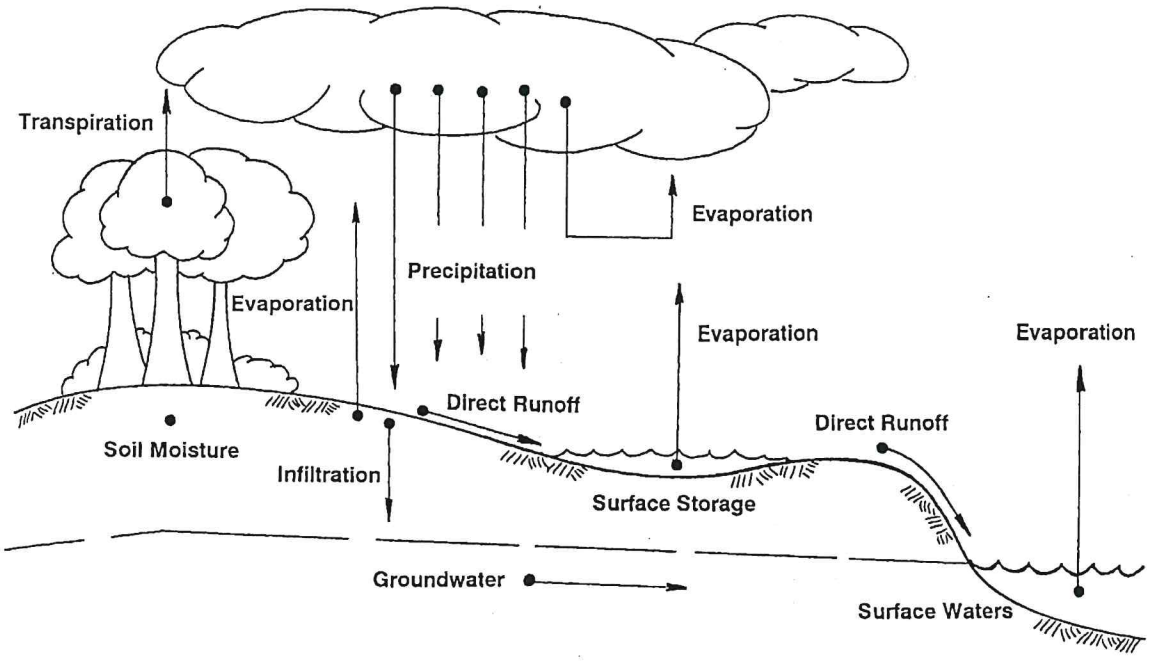

Figure 1 – Hydrologic Cycle

Background

The Township encompasses 15.65 square miles in the eastern portion of Mercer County, New Jersey. Approximately 63 percent of the Township is undeveloped or used for agriculture uses. The bulk of this undeveloped or agricultural land is to the east of the New Jersey Turnpike and to the south of Hightstown between Route 33 and the New Jersey Turnpike. According to the 2000 census, the Township has 24,919 residents. The population rose approximately 11 percent since the 1990 census. This population increase was slightly higher than the overall state and county increases of approximately 9 and 7 percent respectively over the same period. This population increase of East Windsor has resulted in considerable demand for new industrial, retail and residential development. This widespread development has had an affected the Township's watercourses and flood plains.

The Township is situated in the Millstone Watershed Management Area 10 of the Raritan Water Region. There are a number of streams located within the municipality including Big Bear Brook, Rocky Brook, the Millstone River and a number of associated tributaries. The streams and water bodies within the Township are shown in Figure 2 and the topography of the Township is shown in Figure 3.

The Township contains portions of eight (8) Hydrologic Unit Code (HUC-14) areas. These HUC14 areas are shown in Figure 4. The term "HUC-14" is derived 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 hydrologic unit code (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. The average size of a HUC 14 is 8.5 square miles. There are 150 HUC 11 watersheds in New Jersey ranging in size from 0.1 to 143 square miles with an average size of 51.9 square miles[1].

The New Jersey Department of Environmental Protection (NJDEP) has established an Ambient Biomonitoring Network (AMNET) to document the health of the State's waterways. There are over 800 AMNET sites throughout New Jersey. These sites are sampled for benthic macroinvertebrates by NJDEP on a five-year cycle. Streams are classified as non-impaired, moderately impaired, or severely impaired based on the AMNET data. The data is used to generate a New Jersey Impairment Score (NJIS), which is based on a number of biometrics related to benthic macroinvertebrate community dynamics.

[1] SOURCE: NJDEP Division of Watershed Management website (http://www.state.nj.us/dep/watershedmgt/stormwaterfaqs)

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 show that the instream benthic macroinvertebrates concentrations for the Millstone River frequently exceed the State's criteria. This means the waterway is impaired and the NJDEP is required to develop a Total Maximum Daily Load (TMDL) for these pollutants. It is important to protect these waterbodies, since any development in the municipality will have an impact on its TMDLs.

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 source pollution, 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 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 following waters are listed on Sublist 5 (August 9, 2004):

Waterbody and Location	**Site ID#**	**Impairment**
Millstone River at Route 535 in East Windsor	AN0382B	Benthic macroinvertebrates

The Township has exhibited occasional flooding and stream bank erosion at various locations along the Stoney Brook and the Millstone River. The 100-year floodplain of these streams has been indicated in Figure 5.

The existing Land Use/ Land Cover Map, based on 1995/1997 aerial photography, is shown in Figure 6. This map clearly indicates the Township's residential development has increased since the time of the data was collection, since many tracts of land that were identified as forest or cropland have now been subdivided as residential developments. The existing zoning is shown in Figure 7. A current aerial photo with parcel lot lines overlain on it is shown in Figure 8. Approximately 60% of the Township is situated within the State Plan Designation PA2 Suburban Planning Area with the remaining areas in the southwest portion of the Township, which are classified as Rural (PA4) and Environmentally sensitive (PA4B). However, groundwater recharge rates for

native soils in this area are generally between 1 and 19 inches annually. The average annual groundwater recharge rates are shown graphically in Figure 9.

According to the NJDEP, a "Well Head Protection Area" (WHPA) 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.

A Well Head Protection Area (WHPA) consists of three tiers, each based on the time of travel (TOT) to the well. The outer boundaries of these tiers will have the following times of travel:

Tier 1 - 2 Years (720 days)
Tier 2 - 5 Years (1,826 days)
Tier 3 - 12 Years (4,383 days)

The portion of the zone of contribution designated as the WHPA is based upon the TOT of the ground water to a pumping well. The TOT for the outer boundary of a Tier 1 WHPA is based on the average of findings that bacteria have polluted wells as far as 170 days TOT. The 2-year TOT provides a reasonable margin of safety and municipalities should make efforts to protect theses areas. East Windsor has a number of wellhead protection areas and is in close proximity to a wellhead located in the Borough of Hightstown, as shown in Figure 10.

In addition to the rivers and streams that run through and along the Township, there are a number of wetland areas. The Township Ordinance specifically identifies land development as the main cause for the deterioration of the Township's watercourses and flood plains. These wetland areas, shown in Figure 11, provide flood storage, nonpoint source pollutant removal and habitat for flora and fauna.

Design and Performance Standards

The Township will adopt the design and performance standards for stormwater management measures as presented in N.J.A.C. 7:8-5 to minimize the adverse impact of stormwater runoff on water quality and water quantity and loss of groundwater recharge in receiving water bodies. The design and performance standards include the language for maintenance of stormwater management measures consistent with the stormwater management rules at N.J.A.C. 7:8-5-8 Maintenance Requirements, and language for safety standards consistent with N.J.A.C. 7:8-6 Safety Standards for Stormwater Management Basins. The ordinances will be submitted to the County for review and approval within 12 month of adoption of the Municipal Stormwater Management Plan.

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 at this time. In the event that a Regional Stormwater Management Plan is developed and approved, this Municipal Stormwater Management Plan will be updated to be consistent. The Municipal Stormwater Management Plan will also be updated to address approved TMDL's.

The Municipal Stormwater Management Plan is consistent with the Residential Site Improvement Standards (RSIS) at N.J.A.C. 5:21. The Township will utilize the most current update of the RSIS in the stormwater review of residential areas. 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 will observe on-site soil erosion and sediment control measures and report any inconsistencies to the local Soil Conservation District. All pertinent design calculations for stormwater management facilities should adhere to the new design rainfall depths for Mercer County as revised by the Natural Resources Conservation Service as of September 2004 accordingly:

NRCS 24 Hour Design Storm Rainfall Depths

as Revised September 2004

Storm Period	1 Year		2 Year		5 Year		10 Year		25 Year		50 Year		100 Year	
	Old	New	Old	New	Old	New	Old	New	Old	New	Old	New	Old	New
Mercer County	2.7	**2.8**	3.3	**3.3**	4.3	**4.2**	5.2	**5.0**	5.8	**6.2**	6.4	**7.2**	7.5	**8.3**

The Stormwater Management Ordinance shall be consistent with and require all new development and redevelopment plans to comply with the Stormwater Management Amendment of the Mercer County Land Development Standards including the following:

- Alternative to Detention Basin Standards.
- Water Quality Control Standards.
- Flood and Erosion Standards.
- Joint & Regional Detention Facilities Standards.
- Stream Corridor Protection Standards.
- Maintenance and Repair Standards.

In addition, the Mercer County Growth Management Plan objectives shall be adhered to specifically the following items:

Water Resources

a. Flood Control and Drainage Facilities
    1. The design, construction, and maintenance of regional flood and drainage control facilities are to be encouraged.
    2. The expansion of existing regional facilities for flood control is to be encouraged.
    3. County and Municipal land development requirements for drainage facilities are to be revised to include updated standards for drainage control.
    4. Stormwater management plans are to be developed to anticipate further maintenance problems for flooding and drainage control facilities, and to identify needs for public action to ensure the continued operation of both public and private facilities.

The Stormwater Management Ordinance shall be consistent with and requires all new development and redevelopment plans to comply with the Stormwater Management Amendment of the Mercer County Land Development Standards.

Nonstructural Stormwater Management Strategies

The Township master plan and ordinances have reviewed and the sections to be modified to incorporate nonstructural stormwater management strategies have been provided. These are 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 12 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.

The Township Code, was reviewed in regard to incorporating non-structural stormwater management strategies. Several changes are recommended in order to better incorporate the following strategies

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

Chapter XIX Land Subdivision

Section 19-5.1a (Design Criteria) In preparation of preliminary plats and all engineering documents and plans to be presented for major subdivision approval, the developer shall be guided by the design objectives set forth in subsections 20-30.0501a and b of the East Windsor Township Zoning Ordinance and by the specific provisions of the East Windsor Township Technical Standards Ordinance. *Additional language should be added to encourage the use of nonstructural stormwater management strategies including minimizing land disturbance, discouraging unnecessary tree removal and reducing the possibilities of clear cutting in the design and layout of subdivisions.*

Chapter XIXA Site Plan Review

Section 19A-2.3 (Parking) describes the minimum number of off-street parking spaces for each use in all zone districts. *Consideration should be given to allow applicants to*

demonstrate that fewer spaces are necessary, provided area is set aside for additional spaces if necessary.

Section 19A-2.8 (Landscaping) This section describes the designed, installed and maintainance of site landscaping. The landscaping plan shall include such use of varied plant matter and/or berming as will provide for a visually attractive site with privacy for residential units as set forth in the Technical Standards. Such activities must be viewed in terms of continued care and replacement of initial plantings to insure natural plants, shrubs and shade trees for energy conservation as well as for screening and buffering, photosynthesis and aesthetic life quality. *The language of this section should be amended to require the use of native vegetation, which requires less fertilization and watering than non-native species.*

Section 19A-2.10 (Off Tract Improvements) In any case where site development has an impact beyond the site boundaries that requires the construction or extension of public improvements to meet that impact, an applicant is subject to and must comply with Section 19-6 of the Subdivision Ordinance. *Language should be added to this section to require that any off-site and off-tract stormwater management and drainage improvements must conform to the standards of Section 22-10 (Storm Drainage Flow and Facilities).*

Section 19A-2 13 (Drainage) describes stormwater run-off from the site is so controlled that on and off-site erosion is neither caused nor worsened. L*anguage should be added to this section indicating drainage improvements must conform to the standards of Section 22-10 (Storm Drainage Flow and Facilities) and Section 22-23 (Soil Erosion and Sediment Control).*

Chapter XX Zoning

Section 20-4.1500 (Residential Cluster Development) provides for a cluster development option to offer flexibility in residential design, encourage energy conservation through flexibility, building orientation, reduce residential development costs, and provide a method of providing sufficient space in appropriate locations for agriculture, open space, common property, conservation, schools, recreation, parks and land for other public purposes by permitting a reduction in residential lot size without increasing the number of lots or permitted number of dwelling units. The cluster provision requires land equal in area to a minimum of 20 percent of the tract's total land area to be set aside for agriculture, open space, common property, conservation, schools, recreation, parks, and land for other public purposes, singly or in combination. Lands to be set aside shall be either dedicated to the Township or owned in common by an association.

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. Consideration should be given to increasing the amount of land area to be set aside for open space.

At least one-half of the required land to be set aside (ten percent of the tract's total land area) shall lie outside delineated wetlands, wetland transition areas, and lands which lie within 100 year flood hazard area. The land to be set aside shall be suitable and usable for active recreation and/or other stated purposes as determined by the Township, and shall be concentrated in one part of the site in order to maximize usability. *Revision to this section should also consider requirements to preserve natural wood tracts and limit land disturbance for new construction.*

The Township has 8 types of residential districts. Each district has a maximum percent improvement allocation, ranging from 25 percent for the S-L Residential Small Lot District, which has a minimum lot size of 5,000 square feet for detached single-family homes with public sewer and water, to 60 percent for the R-3 Residential Medium Density Districts, which have a minimum lot size of 2,000 square feet for attached dwellings. The Township has 7 types of non-residential or mixed-use districts. Each of these districts has a maximum percent improvement allocation, ranging from 30 percent for the NC Neighborhood Commercial District to 80 percent for the HC Highway Commercial District and the TC Turnpike Commercial District. *The Township should evaluate the maximum percent improvement cover for each zone to determine whether a reduction in impervious cover is appropriate. The Township should also evaluate a maximum percent of disturbance for each zone, to better preserve those areas identified as natural features and environmentally sensitive lands. 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 Chapter XXII. A detailed description of how to develop a mitigation plan is included in this Municipal Stormwater Management Plan.*

Chapter XXII Technical Standards for the Construction of Improvements

Section 22-5 (Walks and Paths) describes the sidewalk and pedestrian walks technical requirements for the Township. Sidewalks are to be a minimum of four feet wide and constructed of concrete. The section does indicate that sidewalks should have a slope from the curbline toward private property. *Additional language should be added to this section to require developers to design sidewalks and pedestrian paths to discharge stormwater to lawn areas where feasible to disconnect these impervious surfaces, or use permeable paving materials where appropriate.*

Section 22-7 (Curbs) requires that concrete curb be installed on both sides of all streets in a subdivision. Outdoor parking areas shall be curbed around the perimeter unless specifically approved otherwise. *This section should be amended to allow for curb cuts or flush curbs with curb stops to allow vegetated swales to be used for stormwater conveyance and to allow the disconnection of impervious areas.*

Section 22-8 (Driveways) describes the procedure for the design of new driveways and the technical construction standards for driveways in specific zones. *Amendments to this section should be considered to allow the use of pervious paving materials in residential zones, to minimize stormwater runoff and promote groundwater recharge.*

Section 22-9 (Off Street Parking Areas) describes the technical standards for off-street parking facilities. *This section should be amended to make reference to Section 22-7, allowing for flush curb with curb stop, or curbing with curb cuts to encourage developers to allow for the discharge of impervious areas into landscaped areas for stormwater management. Also, language should 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. Consideration should be given to allow pervious paving to be used in areas to provide overflow parking, vertical parking structures, smaller parking stalls, and shared parking.*

Section 22-10 (Storm Drainage Flow and Facilities) lists the Township's stormwater management requirements. *This section should be revised to include all requirements outlined in N.J.A.C. 7:8-5. These changes were presented earlier in this document.*

Section 22-23 (Soil Erosion and Sediment Control) addresses soil erosion and sediment control by referencing the required approval by the Mercer County Soil Conservation District.

Section 22-27 (Landscape Architectual Guidelines)

Section 22-27.3 (Streetscape) Landscape architectural development of the streetscape shall be provided in conjunction with all development, on all existing and proposed roads upon which the site of development has or creates frontage Improvements consistent with a Formal Tree Lined Avenue (Section 22-27.3 a) or an Informal Street Trees streetscape concepts (Section 22-27.3 a), or an alternative concept of more appropriate design can be provided. *These sections should be amended to require trees to be native species, which requires less fertilization and watering than non-native ornamental plants.*

Section 22-27.4 (Cul-de-Sac) describes the standards for islands in the turnaround portion of cul-de-sac roads. All plant material must exhibit a mature canopy height under 30 inches or above seven feet with no more than three trunks in order to allow adequate visibility. All plant varieties shall be tolerant of harsh, dry roadside conditions and subject to approval by the Township Shade Tree Commission and/or Township landscape architect All planting must be designed to consider the level of expected maintenance, and provide a neat

clean appearance. *The section should be amended to require trees to be native species, which requires less fertilization and watering than non-native ornamental plants.*

Section 22-27.5 (Stormwater Areas) describes the standard for the landscaping of Stormwater management areas include retention and detention basins, drainage ditches and swales. *This section should be revised to include some but not limited to all of the General Landscaping Guidance for all Stormwater BMPs as indicated in Chapter 7 (Part 2) of the New Jersey Stormwater Best Management Practices Manual.*

Section 22-27.6 (Open Space) indicates that landscape features and open space is encouraged in all developments, even when not required The objectives of the landscape treatment of open space is to provide the opportunity and space for a wide range of active and passive recreation in all areas of human activity and residence, to protect and enhance the township's natural amenities such as wooded areas, water bodies, streams, and to retain or create a visually pleasing image of East Windsor Township. *Additional language should be included to allow open space areas to be used for stormwater management by disconnecting impervious surfaces and treating runoff from these impervious surfaces.*

Section 22-27.7 (Landscape Buffers and Strips) indicates the landscape architectural treatment of landscape buffers and strips may include planting, berms or grading, and fences or walls provided as necessary. *Additional language should be included to allow buffer areas to be used for stormwater management by disconnecting impervious surfaces and treating runoff from these impervious surfaces. An additional amendment should require trees to be native species, which requires less fertilization and watering than non-native ornamental plants.*

Section 22-28 (Stream Corridor Protection)

This ordinance section identifies the Township's limitations for development within Stream Corridors. The purposes of the ordinance are as follows:

a. Maintain the quality streams and improve the currently impaired streams of the watershed;

b. Protect significant ecological components of stream corridors such as wetlands, floodplains, woodlands, steep slopes and wild life and plant life habitats within the stream corridors of the watershed; and prevent flood related damage to the communities of the watershed;

c. Complement the existing State, regional, county and municipal stream corridor protection and management regulations and initiatives.

Furthermore the ordinance identifies activities permitted in stream corridors with emphasis on having such corridors remaining in their natural state, with no clearing or cutting of trees and brush (except for removal of dead vegetation and pruning for reasons of public safety), altering of watercourses, regrading or construction.

Land Use/Build-Out Analysis

Since the Township of East Windsor has a combined total of more than one square mile of vacant lands, the Township is required to do a build-out analysis. A detailed land use analysis for the Township was conducted. Figure 6 illustrates the existing land use in the Township based on 1995/97 GIS information from NJDEP. Figure 4 illustrates the HUC14s within the Township. The Township zoning map is shown in Figure 7. Figure 11 illustrates the constrained lands within the Township. The build-out calculations for impervious cover are shown in Table C-1. As expected when developing agricultural and forestedlands, the build-out of these HUC14s will result in a significant increase in impervious surfaces.

Table C-1: Build-Out Calculations

HUC14	Zone		Total Area (Ac.)	Wetlands/ Constrained Area (Ac.)	Developable Area (Ac.)	Allowable Imperv. (%)	Build-Out Imperv. (Ac.)
02030105100030	ARH	AGE RESTRICTED HOUSING	99.33	39.68	59.65	65%	38.77
	NC	NEIGHBORHOOD COMMERCIAL	4.79	0.00	4.79	70%	3.35
	PUD	PLANNED UNIT DEVELOPMENT	205.01	37.06	167.95	80%	134.36
	R1	RESIDENTIAL LOW DENSITY	197.76	39.38	158.38	40%	63.35
	R2	RESIDENTIAL LOW DENSITY	25.67	3.77	21.91	45%	9.86
	R3	RESIDENTIAL MEDIUM DENSITY	84.52	29.04	55.48	60%	33.29
	RM	MULTIFAMILY	53.85	0.76	53.09	40%	21.24
	RO	RESEARCH OFFICE	190.29	52.99	137.30	65%	89.24
		Totals	**861.22**	**202.68**	**658.54**		**393.46**
02030105100050	ARH	AGE RESTRICTED HOUSING	120.51	39.39	81.12	65%	52.73
	HC	HIGHWAY COMMERCIAL	128.30	18.03	110.26	80%	88.21
	IO	INDUSTRIAL OFFICE	281.46	211.21	70.26	75%	52.69
	MH	MANUFACTURED HOUSING	66.33	32.76	33.57	40%	13.43
	PAC	PLANNED ADULT COMMUNITY	24.24	12.08	12.16	50%	6.08
	PRC	PLANNED RETIREMENT COMMUNIT	93.07	28.15	64.92	25%	16.23
	PUD	PLANNED UNIT DEVELOPMENT	473.27	166.06	307.21	80%	245.77
	R1	RESIDENTIAL LOW DENSITY	349.48	80.00	269.48	40%	107.79
	R2	RESIDENTIAL LOW DENSITY	70.81	4.79	66.02	45%	29.71
	R3	RESIDENTIAL MEDIUM DENSITY	54.06	8.16	45.90	60%	27.54
	RA	RURAL AGRICULTURAL	1,809.86	547.58	1,262.28	25%	315.57
	RE	RURAL ESTATES	186.19	13.97	172.21	25%	43.05
	RM	MULTIFAMILY	14.28	0.00	14.28	40%	5.71
	RO	RESEARCH OFFICE	259.95	106.35	153.60	65%	99.84
	SL	RESIDENTIAL SMALL LOT	11.22	1.12	10.09	40%	4.04
	TC	TURNPIKE COMMERCIAL	129.91	43.15	86.77	80%	69.41
		Totals	**4,072.94**	**1,312.81**	**2,760.13**		**179.00**
02030105100060	ARH	AGE RESTRICTED HOUSING	136.91	28.97	107.93	65%	70.16
	HC	HIGHWAY COMMERCIAL	162.96	13.69	149.27	80%	119.41
	IO	INDUSTRIAL OFFICE	0.18	0.10	0.08	75%	0.06
	R1	RESIDENTIAL LOW DENSITY	30.34	4.12	26.23	40%	10.49
	R2	RESIDENTIAL LOW DENSITY	19.06	3.27	15.79	45%	7.10
	R3	RESIDENTIAL MEDIUM DENSITY	12.17	0.00	12.17	60%	7.30
	RM	MULTIFAMILY	78.12	3.80	74.32	40%	29.73
	RO	RESEARCH OFFICE	893.54	192.35	701.18	65%	455.77
		Totals	**1,333.26**	**246.30**	**385.77**		**700.02**
02030105100120	CC	COMMUNITY COMMERCIAL	14.54	5.40	9.14	60%	5.48
	HC	HIGHWAY COMMERCIAL	1,308.59	303.35	1,005.23	80%	804.19
	IO	INDUSTRIAL OFFICE	43.53	21.84	21.69	75%	16.27
	R1	RESIDENTIAL LOW DENSITY	358.87	134.16	224.71	40%	89.88
	R2	RESIDENTIAL LOW DENSITY	256.87	61.37	195.50	45%	87.98
	R3	RESIDENTIAL MEDIUM DENSITY	103.29	4.06	99.23	60%	59.54
	RA	RURAL AGRICULTURAL	765.45	330.79	434.66	25%	108.66
	RE	RURAL ESTATES	65.75	0.00	65.75	25%	16.44
	RM	MULTIFAMILY	106.05	11.29	94.76	40%	37.90
	RO	RESEARCH OFFICE	131.96	5.61	126.35	65%	82.13
	SL	RESIDENTIAL SMALL LOT	10.33	1.95	8.38	40%	3.35
		Totals	**3,165.22**	**879.82**	**2,285.40**		**1,311.82**
02030105100130	RO	RESEARCH OFFICE	32.84	0.00	32.84	65%	21.35
		Totals	**32.84**	**0.00**	**32.84**		**21.35**
02040105230020	RA	RURAL AGRICULTURAL	467.85	107.57	360.28	25%	90.07
	RE	RURAL ESTATES	16.86	0.23	16.63	25%	4.16
		Totals	**484.72**	**107.80**	**376.91**		**94.23**
02040105230040	RA	RURAL AGRICULTURAL	22.11	0.00	22.11	25%	5.53
		Totals	**22.11**	**0.00**	**22.11**		**5.53**

Table C-2 presents the pollutant loading coefficients by land cover as indicated in the NJDEP Best Management Practices Manual.

Table C-2: Pollutant Loads by Land Cover

Land Cover	Total Phosporus Load (lb/acre/yr)	Total Nitrogen Load (lb/acre/yr)	Total Suspended Solid Load (lb/acre/yr)
High, Medium Density Residential	1.4	15	140
Low Density Rural Residential	0.6	5	100
Commercial	2.1	22	200
Industrial	1.5	16	200
Urban, Mixed Urban, Other Urban	1.0	10	120
Agriculture	1.3	10	300
Forest, Water, Wetlands	0.1	3	40
Barrenland/ Transitional Area	0.5	5	60

Source: NJDEP Stormwater BMP Manual 2004.

The pollutant loads for each zoning district within the four HUC14's at full build-out are presented in Table C-3.

Table C-3: Non-Point Source Loads at Build-Out

HUC14	Zone		Zoning Build-out	Developable (acres)	TP (lb/acre/yr)	TP (lb/yr)	TN (lb/acre/yr)	TN (lb/yr)	TSS (lb/acre/yr)	TSS (lb/yr)
02030105100030	ARH	AGE RESTRICTED HOUSING	High, Medium Density Residential	59.65	1.40	83.51	15	894.74	140	8,350.94
	NC	NEIGHBORHOOD COMMERCIAL	Commercial	4.79	2.10	10.06	22	105.42	200	958.33
	PUD	PLANNED UNIT DEVELOPMENT	Urban, Mixed Urban, Other Urban	167.95	1.00	167.95	10	1,679.49	120	20,153.87
	R1	RESIDENTIAL LOW DENSITY	Low Density Rural Residential	158.38	0.60	95.03	5	791.88	100	15,837.65
	R2	RESIDENTIAL LOW DENSITY	Low Density Rural Residential	21.91	0.60	13.14	5	109.54	100	2,190.71
	R3	RESIDENTIAL MEDIUM DENSITY	High, Medium Density Residential	55.48	1.40	77.67	15	832.17	140	7,766.97
	RM	MULTIFAMILY	High, Medium Density Residential	53.09	1.40	74.33	15	796.35	140	7,432.59
	RO	RESEARCH OFFICE	Industrial	137.30	1.50	205.95	16	2,196.79	200	27,459.86
			Totals	**658.54**		**727.64**		**7,406.38**		**90,150.92**
02030105100050	ARH	AGE RESTRICTED HOUSING	High, Medium Density Residential	81.12	1.40	113.57	15	1,216.86	140	11,357.38
	HC	HIGHWAY COMMERCIAL	Commercial	110.26	2.10	231.56	22	2,425.82	200	22,052.88
	IO	INDUSTRIAL OFFICE	Industrial	70.26	1.50	105.38	16	1,124.10	200	14,051.26
	MH	MANUFACTURED HOUSING	High, Medium Density Residential	33.57	1.40	46.99	15	503.48	140	4,699.12
	PAC	PLANNED ADULT COMMUNITY	High, Medium Density Residential	12.16	1.40	17.03	15	182.43	140	1,702.73
	PRC	PLANNED RETIREMENT COMMUNI	High, Medium Density Residential	64.92	1.40	90.88	15	973.73	140	9,088.17
	PUD	PLANNED UNIT DEVELOPMENT	Urban, Mixed Urban, Other Urban	307.21	1.00	307.21	10	3,072.14	120	36,865.72
	R1	RESIDENTIAL LOW DENSITY	Low Density Rural Residential	269.48	0.60	161.69	5	1,347.40	100	26,947.91
	R2	RESIDENTIAL LOW DENSITY	Low Density Rural Residential	66.02	0.60	39.61	5	330.11	100	6,602.17
	R3	RESIDENTIAL MEDIUM DENSITY	High, Medium Density Residential	45.90	1.40	64.26	15	688.49	140	6,425.94
	RA	RURAL AGRICULTURAL	Agriculture	1,262.28	1.30	1,640.96	10	12,622.79	300	378,683.71
	RE	RURAL ESTATES	Low Density Rural Residential	172.21	0.60	103.33	5	516.64	100	51,664.40
	RM	MULTIFAMILY	High, Medium Density Residential	14.28	1.40	19.99	15	299.80	140	41,972.38
	RO	RESEARCH OFFICE	Industrial	153.60	1.50	230.40	16	2,457.57	200	30,719.58
	SL	RESIDENTIAL SMALL LOT	High, Medium Density Residential	10.09	1.40	14.13	15	211.98	140	29,677.38
	TC	TURNPIKE COMMERCIAL	Commercial	86.77	2.10	182.21	22	1,908.89	200	17,353.59
			Totals	**2,760.13**		**3,369.21**		**29,882.25**		**689,864.32**
02030105100060	ARH	AGE RESTRICTED HOUSING	High, Medium Density Residential	107.93	1.40	151.11	15	1,619.00	140	15,110.63
	HC	HIGHWAY COMMERCIAL	Commercial	149.27	2.10	313.46	22	3,283.90	200	29,853.61
	IO	INDUSTRIAL OFFICE	Industrial	0.08	1.50	0.12	16	1.23	200	15.37
	R1	RESIDENTIAL LOW DENSITY	Low Density Rural Residential	26.23	0.60	15.74	5	131.13	100	2,622.57
	R2	RESIDENTIAL LOW DENSITY	Low Density Rural Residential	15.79	0.60	9.47	5	78.94	100	1,578.79
	R3	RESIDENTIAL MEDIUM DENSITY	High, Medium Density Residential	12.17	1.40	17.03	15	182.49	140	1,703.21
	RM	MULTIFAMILY	High, Medium Density Residential	74.32	1.40	104.04	15	1,114.74	140	10,404.26
	RO	RESEARCH OFFICE	Industrial	701.18	1.50	1,051.78	16	11,218.95	200	140,236.90
			Totals	**385.77**		**1,511.64**		**16,011.38**		**186,414.71**
02030105100120	CC	COMMUNITY COMMERCIAL	Commercial	9.14	2.10	19.20	22	201.11	200	1,828.30
	HC	HIGHWAY COMMERCIAL	Commercial	1,005.23	2.10	2,110.99	22	22,115.12	200	201,046.53
	IO	INDUSTRIAL OFFICE	Industrial	21.69	1.50	32.54	16	347.09	200	4,338.64
	R1	RESIDENTIAL LOW DENSITY	Low Density Rural Residential	224.71	0.60	134.83	5	1,123.55	100	22,471.01
	R2	RESIDENTIAL LOW DENSITY	Low Density Rural Residential	195.50	0.60	117.30	5	977.52	100	19,550.43
	R3	RESIDENTIAL MEDIUM DENSITY	High, Medium Density Residential	99.23	1.40	138.92	15	1,488.48	140	13,892.44
	RA	RURAL AGRICULTURAL	Agriculture	434.66	1.30	565.05	10	4,346.57	300	130,397.23
	RE	RURAL ESTATES	Low Density Rural Residential	65.75	0.60	39.45	5	328.73	100	6,574.62
	RM	MULTIFAMILY	High, Medium Density Residential	94.76	1.40	132.66	15	1,421.39	140	13,266.33
	RO	RESEARCH OFFICE	Industrial	126.35	1.50	189.52	16	2,021.59	200	25,269.88
	SL	RESIDENTIAL SMALL LOT	High, Medium Density Residential	8.38	1.40	11.73	15	125.64	140	1,172.62
			Totals	**2,285.40**		**3,492.19**		**34,496.80**		**439,808.04**
02030105100130	RO	RESEARCH OFFICE	Industrial	32.84	1.50	49.26	16	525.45	200	6,568.14
				32.84						
02040105230020	RA	RURAL AGRICULTURAL	Agriculture	360.28	1.30	468.37	10	3,602.82	300	108,084.70
	RE	RURAL ESTATES	Low Density Rural Residential	16.63	0.60	9.98	5	83.16	100	1,663.18
			Totals	**376.91**		**478.35**		**3,685.98**		**109,747.87**
02040105230040	RA	RURAL AGRICULTURAL	Agriculture	22.11	1.30	28.75	10	221.12	300	6,633.54
			Totals	**22.11**		**28.75**		**221.12**		**6,633.54**

Mitigation Plans

Applicants for development will be expected to mitigate the impacts of development on stormwater at their own site or other sites within the subject watershed that it controls. No variances and exemptions from the standards shall be granted. The Township may consider preparing a list of specific projects that can be used to address the mitigation requirements of development applications. In the event that such a list is prepared, this Municipal Stormwater Management Plan will be updated accordingly.

Recommended Implementing Stormwater Control Ordinances

The Township will implement or revise the following ordinances:

- Illicit Connection Ordinance
- Improper Waste Disposal Ordinance
- Litter Ordinance
- Pet Waste Ordinance
- Wildlife Feeding Ordinance
- Yard Waste Ordinance
- The Stormwater Control Ordinance will be implemented in accordance with NJAC 7:8-4.