

# **Stormwater Control Ordinance For Lands Within the Great Swamp Watershed Overlay Zone**

**Prepared by the Great Swamp Watershed Association**

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## **Section 1**

### **1.1 Statutory Authority**

The Municipal Land Use Law, N.J.S.A. 40:44D-1 et seq., and the Soil Erosion and Sediment Control Act, N.J.S.A. 4:24-39 et seq., provide the statutory authority for this ordinance.

### **1.2 Findings of Fact**

It is hereby determined that:

1. Waterbodies, roadways, structures and other property within, and downstream of, the municipality are at times subjected to flooding;
2. Flooding is a danger to the lives and property of the public and is also a danger to the natural resources of the municipality and the region;
3. Land development projects and activities alter the hydrologic response of watersheds resulting in increased stormwater runoff rates and volumes, increased flooding, increased stream channel erosion, and increased sediment transport and deposition;
4. Stormwater runoff produced by the land development contributes to increased quantities of water-borne pollutants;
5. Increases of stormwater runoff, soil erosion and non-point source pollutants have occurred in the past as a result of land development, and constitute deterioration of the water resources of the municipality and downstream municipalities;

6. Stormwater runoff, soil erosion and nonpoint source pollution can be controlled and minimized by the regulation of stormwater runoff from development projects.
7. The State of New Jersey Surface Water Quality Standards (NJAC. 7:9B-1.1 et seq.) establish surface water quality standards and antidegradation policies applicable to all surface waters of the state and these standards and antidegradation policies provide reasonable guidance to New Jersey municipalities for the regulation of stormwater runoff for purposes of protecting surface water resources from degradation.
8. A portion of this municipality lies within the watershed of the Great Swamp and hence, some surface waters located in this municipality are tributary to the Great Swamp National Wildlife Refuge and Wilderness area. The waters of the Great Swamp National Wildlife Refuge and Wilderness Area are all classified as Category One waters, for purposes of applying the State of New Jersey's surface water quality antidegradation policies.
9. The existing uses of the Great Swamp National Wildlife Refuge and Wilderness Area, which are to be protected in accordance with the State's surface water quality antidegradation policies, are dependent on maintaining good water quality and natural rates and volumes of flow. These uses include the following:
  - a. to preserve, restore and enhance, in their natural ecosystem, all species of animals and plants that are endangered or threatened with becoming endangered;
  - b. to perpetuate the migratory bird resource;
  - c. to preserve a natural diversity and abundance of fauna and flora on refuge lands;
  - d. to provide an understanding and appreciation of fish and wildlife ecology and people's role in their environment, and to provide refuge visitors with high quality, safe, wholesome and enjoyable recreational experiences oriented toward wildlife to the extent these activities are compatible with the purposes for which the refuge was established.
  - e. Within the Wilderness Area, to manage so as to maintain the wilderness resource for future benefit and enjoyment; to preserve the wilderness character of the biological and physical features of the area; to provide opportunities for research, solitude and permitted recreational uses; to ensure that the works of man remain substantially unnoticeable.
10. Stormwater runoff, soil erosion, stream channel erosion and nonpoint source pollution, due to land development activities

within the Great Swamp watershed, have resulted in a deterioration of the water resources of the municipality and downstream municipalities, including the water resources of the Great Swamp National Wildlife Refuge and Wilderness Area.

11. Increased stormwater runoff rates and volumes, and the sediments and pollutants associated with stormwater runoff, from future development projects within the Great Swamp watershed, have the potential to adversely affect the municipality's streams and water resources, and the streams and water resources of downstream municipalities, including the Category One waters of the Great Swamp National Wildlife Refuge and Wilderness Area.

It is therefore determined that it is in the public interest to regulate the discharge of stormwater runoff from land development projects and other construction activities, within the Great Swamp watershed, as provided in this ordinance, in order to control and minimize increases in stormwater runoff rates and volumes and to control and minimize soil erosion, stream channel erosion, and nonpoint source pollution associated with stormwater runoff.

### **1.3 Purpose**

It is the purpose of this ordinance to establish minimum stormwater management requirements and controls:

1. To reduce artificially induced flood damage to public health, life, and property;
2. To minimize increased stormwater runoff rates and volumes from any new land development.
3. To minimize the deterioration of existing watercourses, culverts and bridges, dams and other structures;
4. To induce water recharge into the ground where geologically favorable conditions exist;
5. To prevent an increase in nonpoint source pollution;
6. To maintain the integrity of stream channels for their biological functions, as well as for drainage and other purposes;
7. To minimize the impact of development upon streambank and streambed stability;
8. To reduce erosion from any development or construction project;
9. To preserve and protect water supply facilities and water resources by means of controlling increased flood discharges, stream erosion, and runoff pollution;

10. To reduce stormwater runoff rates and volumes, soil erosion and nonpoint source pollution, wherever possible, from lands that were developed without stormwater management controls meeting the purposes and standards of this ordinance; and
11. To minimize public safety hazards at any stormwater detention facility constructed pursuant to subdivision or site plan approval.

## **1.4 Applicability**

This ordinance shall be applicable to any major subdivision or site plan application, as defined in the Municipal Land Use Law, or any project, as defined by the Soil Erosion and Sediment Control Act, located within the municipality and within the Great Swamp Watershed Overlay Zone, as shown on Attachment 1.

## **1.5 Compatibility with Other Permit and Ordinance Requirements**

Development approvals issued pursuant to this ordinance are to be considered an integral part of development approvals under the subdivision and site plan review process and do not relieve the applicant of the responsibility to secure required permits or approvals for activities regulated by any other applicable code, rule, act or ordinance. In their interpretation and application, the provisions of this ordinance shall be held to be the minimum requirements for the promotion of the public health, safety, and general welfare.

This ordinance is not intended to interfere with, abrogate, or annul any other ordinances, rule or regulation, statute, or other provision of law. Where any provision of this ordinance imposes restriction different from those imposed by any other ordinance, rule or regulation, or other provision of law, whichever provisions are more restrictive or impose higher standards shall control.

In addition, in the event a regional stormwater management plan is prepared and formally adopted for the Great Swamp Watershed, this ordinance shall be amended to ensure consistency with that regional plan.

## **1.6 Severability**

If the provisions of any article, section, subsection, paragraph, subdivision or clause of this ordinance shall be judged invalid by a court of competent jurisdiction, such order of judgment shall not affect or invalidate the remainder of any article, section, subsection, paragraph, subdivision or clause of this ordinance.

## Section 2

### Definitions

Unless specifically defined below, or in the Municipal Land Use Law (N.J.S.A. 40:55D-1 et seq.), or in the Soil Erosion and Sediment Control Act (N.J.S.A. 40:44D-1 et seq.), or in New Jersey's Surface Water Quality Standards (N.J.A.C. 7:9B-1.1 et seq.), words or phrases used in this ordinance shall be interpreted so as to give them the meaning they have in common usage and to give this ordinance its most reasonable application.

"Agricultural development" means land uses normally associated with the production of food, fiber, and livestock for sale. For purposes of this ordinance, such uses shall not include the development of land for the processing or sale of food and the manufacture of agriculturally related products.

"Detention basin" means an impoundment area made by construction and embankment, or excavation a pit, or both, for the purpose of temporarily storing stormwater.

"Detention facility" means a detention basin or alternative structure designed to temporarily retain stormwater runoff.

"Flood plain" means the area inundated by NJDEP's regulatory flood including the water course that creates it. NJDEP's regulatory flood means NJDEP's adopted Flood Hazard Area Design Flood along streams for which NJDEP has an adopted flood hazard area and floodway study, and the 100-year flood along non-delineated streams for which NJDEP has not delineated a flood hazard area.

"Floodway" means the channel of a natural stream and portions of the flood hazard areas adjoining the channel, which are reasonably required to carry and discharge the flood water or flood flow of any natural stream. For this ordinance, the term floodway refers to both the delineated floodway along streams which have state adopted flood hazard area and floodway studies, and the area between NJDEP approved encroachment lines located on both sides of non-delineated streams for which no state adopted flood hazard area and floodway study exists.

"Freshwater wetlands" means an area that is inundated or saturated by surface water or groundwater at a frequency and duration sufficient to support, and that under normal circumstances does support, a prevalence of vegetation typically adapted for life in saturated soil conditions, commonly known as hydrophytic vegetation; provided, however, that in designating a wetland, the municipality shall use the three parameter approach (that is, hydrology, soils and vegetation) enumerated in the "Federal Manual for Identifying and Delineating Jurisdictional Wetlands" and any subsequent amendments thereto.

"Great Swamp Stream Corridor Preservation Area" means the portion of the municipality, within the watershed of Great Swamp, for which it is the policy of the municipality to preserve all lands in their natural state, to the greatest extent possible. Section 3.4 of this ordinance specifies the lands that constitute the Great Swamp Stream Corridor Preservation Area.

"Infiltration facility" means any structure or device designed to infiltrate retained water to the subsurface and which is not an injection well. These facilities may be above grade or below grade. Above grade infiltration facilities temporarily impound surface water runoff above grade, to a maximum depth of two feet, with all retained water infiltrated to recharge. Below grade infiltration facilities temporarily retain surface water runoff below grade in the interstices of coarse aggregate, or other porous media, with all retained water infiltrated to recharge. Examples of below grade infiltration facilities include gravel surface parking areas and gravel filled trenches.

"Nonpoint source pollution" means pollution from any source other than from any discernible, confined, and discrete conveyances, and shall include, but not be limited to, pollutants from agricultural, silvicultural, mining, construction, subsurface disposal and urban runoff sources.

"Recharge" means the replenishment of underground water reserves.

"Retention Basin" means an impoundment area with a permanent pool made by construction and embankment, or excavation a pit, or both, for the purpose of temporarily storing storm water. A retention basin is also called a "wet basin" or "wet detention basin".

"Stormwater runoff" means flow on the surface of the ground, resulting from precipitation.

"Treatment train" means a sequence of structures or devices through which runoff passes before exiting the project site. The combined characteristics of the individual structures or devices shall satisfy the performance requirements associated with the no net increase provisions of this ordinance.

"Water Quality Storm" means a one-year frequency, 24-hour storm, using the Type III rainfall distribution recommended for New Jersey by the US Soil Conservation Service or a storm of 1.25 inches of rainfall falling uniformly in two hours.

"Wet basin" means a detention basin designed to retain some water on a permanent basis. Another name for wet basin is "detention basin" or "retention basin".

## **Section 3**

# Technical Standards

## 3.1 No Net Increase Provisions

1. *No net increase in nonpoint source pollution* - Stormwater control systems shall be designed so that there is no degradation of water quality in the receiving watercourse, due to nonpoint source pollution associated with stormwater runoff. NJDEP's Surface Water Quality Standards, NJAC 7:9B, shall be used as guidelines for this determination.
2. *No net increase in sediment loadings* - Stormwater control systems shall be designed to reduce, to the maximum extent possible, the total suspended solids (TSS) generated by the development for storm events up to the water quality design storm and to retain, as closely as possible, the pre-development hydrologic response of the site, and the watershed..
3. *No net increase in stormwater runoff rates and stream channel erosion* - Stormwater control systems shall be designed so that, to the maximum extent possible, the post-development stormwater runoff rates, from the site, and at any point in the watershed between the site and the Great Swamp, are no greater than pre-development rates, in order to retain as closely as possible, the pre-development hydrologic response of the site and the watershed.
4. *No net increase in stormwater runoff volumes* - Stormwater control systems shall be designed so that all stormwater runoff is infiltrated into the ground for the 1.25 inch, 24-hour storm, using the Type III rainfall distribution recommended for New Jersey by the US Soil Conservation Service. In addition, the first 1.25 inches of stormwater runoff from all larger storms shall also be infiltrated into the ground.

## 3.2 Procedures for Measuring Compliance with the No Net Increase Provisions of the Ordinance

1. Hydrologic/hydraulic analyses shall be prepared and submitted demonstrating that the post-development stormwater runoff rates do not exceed the standards set forth in this ordinance for the water quality storm and the 2-, 10-, and 100-year storms.

The hydrologic and hydraulic analyses shall follow generally accepted methodologies for evaluating stormwater runoff rates and volumes, including the methodologies specified in NJDEP's *Stream Encroachment Manual*, the USDA/SCS's TR-55 and TR-20 methodologies, and the US Army Corps of Engineers' HEC-1 model.

For infiltration facilities proposed to meet the no net increase provisions of this ordinance, the results of soil tests demonstrating the suitability of the area's soils for infiltration of runoff shall also be provided.

2. A nonpoint source pollutant loading analysis shall be prepared and submitted, demonstrating that the post development nonpoint source pollutant and sediment loadings do not exceed the standards set forth in this ordinance, as a result of the proposed land development project.

In preparing the required analysis it shall be acceptable to utilize the average removal efficiency statistics provided in the *Stormwater and Nonpoint Source Pollution Control Best Management Practices Manual*, dated December 1994, and any subsequent revisions thereto, prepared by the New Jersey Department of Environmental Protection and the New Jersey Department of Agriculture.

### 3.3 Mitigation Measures

If the natural or existing physical characteristics of the project site preclude achievement of any of the above no net provisions, the municipality may grant a variance from strict compliance with the specific no net increase provisions that are precluded, provided that acceptable mitigation measures are provided. However, to be eligible for a variance, the applicant must demonstrate to the satisfaction of the municipal engineer that the immediately downstream waterways will not be subject to:

1. Deterioration of existing culverts, bridges, dams, and other structures;
2. Deterioration of their biological functions, as well as for drainage and other purposes;
3. Streambank or streambed erosion or siltation;
4. Increased threat of flood damage to public health, life and property.

Furthermore, where partial compliance with a specific no net increase provision is possible, the municipal engineer will direct the applicant to satisfy a reduced performance criterion. Mitigation measures will be required to compensate for the unfulfilled component of the no net increase provision.

In all cases, however, those no net provisions that are not precluded by the site's physical characteristics, shall be met. Mitigation measures may include, but are not limited to, the following:

1. If one or more of the no net increase provisions of this ordinance cannot be met on-site, and a regional stormwater



management plan for the Great Swamp Watershed has not been adopted by a regional entity, then the applicant shall meet those no net provisions of this ordinance, precluded by the site's physical characteristics, by employing one or more of the following mitigation measures, in this order of preference.

- The purchase, or donation of, privately owned lands within the Great Swamp Stream Corridor Preservation Area, that are not currently protected by NJDEP's Freshwater Wetlands Protection Act Rules or NJDEP's Flood Hazard Area Control Regulations, said lands to be dedicated for preservation and/or reforestation, in accordance with Attachment 2, "Great Swamp Watershed Mitigation Requirements."
  - The purchase, or donation of, privately owned lands within the Great Swamp Watershed, but not within the Great Swamp Stream Corridor Preservation Area, to be dedicated for preservation and/or reforestation, in accordance with Attachment 2, "Great Swamp Mitigation Requirements."
  - Mitigation on previously developed properties, public or private, that currently lack stormwater management facilities designed and constructed in accordance with the purposes and standards of this ordinance, in accordance with Attachment 2, "Great Swamp Mitigation Requirements."
  - Cash contributions to fund stormwater management related studies within the Great Swamp Overlay Zone, including regional wetland delineation studies, stream monitoring studies for water quality and macroinvertebrates, stream flow monitoring, and threatened and endangered species studies. The amount of the cash contribution shall be determined in accordance with Attachment 2, "Great Swamp Watershed Mitigation Requirements."
2. If one or more of the "no net increase" provisions of this ordinance cannot be met on-site, and a regional stormwater management plan for the Great Swamp Watershed been adopted by a regional entity, the applicant may elect to meet the no net increase provisions of this ordinance, precluded by the site's physical characteristics, by financially or otherwise participating in the implementation of the regional stormwater management plan, in accordance with a specific formula for participation, specified by the regional entity.

### **3.4 Great Swamp Watershed Stream Corridor Preservation Area**

The following lands constitute the Great Swamp Watershed Stream Corridor Preservation Area and the preservation requirements associated with those lands:

1. *Lands within the Standard Transition Areas of Freshwater Wetlands Associated with the Great Swamp's State Open Waters* - Trees, shrubs, grasses and other existing vegetation within standard transition areas of freshwater wetlands located along state open waters located in the Great Swamp Watershed shall not be disturbed except in accordance with a valid transition area waiver issued by NJDEP, pursuant to the New Jersey Freshwater Wetlands Protection Act Rules (NJAC 7:7A1.1 et seq.).
2. *Lands Proximate to the Top of Channel Banks of State Open Waters* - Trees, shrubs, grasses and other existing vegetation within 25 feet of the top of the channel bank of any State open water within the Great Swamp watershed shall not be disturbed unless the applicant demonstrates that there is no alternative to the proposed project design which would eliminate or further minimize the disturbance.

The 25 foot distance shall be increased to 50 feet of the top of the channel bank if the stream corridor is a critical part of the habitat supporting a threatened or endangered species of plant or a current population of any species of threatened endangered animal on a permanent or temporary basis, for any purpose such as resting, breeding or feeding, during any portion of its life cycle; or if the stream corridor lies within documented, historic habitat for threatened or endangered species of animals, which habitat remains suitable for breeding, resting or feeding by those species of animal during any portion of its life cycle.

3. *Additional Lands* - Any land areas, other than those described above, that lie within 150 feet of any intermittent or perennial stream within the Great Swamp Watershed, or within 150 feet of freshwater wetlands associated with those streams, shall also be preserved to the maximum extent possible, to serve as a natural buffer area to the watershed's streams and wetlands, and to assist in meeting the no net increase provisions of this ordinance.<

### **3.5 Detention/Retention Basins for Stream Flooding and Erosion Control**

The standards for detention/retention basins shall be as follows:

1. Detention and/or retention basins shall be designed to capture and retain all stormwater runoff from the site's impervious surfaces during the water quality storm, and from all smaller storms. The runoff shall then be slowly released in accordance

with the requirements presented in Section 3.7.1. "For detention basins."

2. The post-development peak runoff rate for the two year storm event shall be 50 percent of the pre-development peak runoff rate and the post-development peak runoff rate for the 10- and 100-year storm events shall be 75 percent and 80 percent of the pre-development peak runoff rates, respectively.
3. Most water quality control and infiltration measures will also provide some benefit in runoff peak control. Where water quality control or infiltration measures are instituted, appropriate adjustments to the post-development peak runoff may be incorporated by the introduction of modified runoff coefficients (e.g., time of concentration, initial abstraction, SCS runoff curve number). Procedures used by the applicant to adjust runoff coefficients to take credit for the detention properties of miscellaneous stormwater control measures (i.e., measures not specifically designed for providing runoff peak control) must be approved by the municipal engineer.
4. The US Soil Conservation Service procedures, such as "Urban Hydrology for Small Watersheds", Technical Release No. 55, or other generally accepted methodologies, may be used for computing pre-development and post-development runoff rates and volumes. For the purposes of choosing runoff curve numbers, the curve numbers presented in Attachment 3, "Curve Numbers for Use in the Great Swamp Watershed, shall be used.
5. In computing pre-project construction runoff, all significant land features, such as ponds, depressions, or hedgerows which increase the ponding factors, shall be accounted for.
6. The applicant shall provide plans and calculations which show that the discharge attributable to the proposed project will not cause erosion along the flow path between the outfall and the receiving waterbody.
7. Soil erosion and sediment control shall be provided in accordance with Standards for Soil Erosion and Sediment Control promulgated by the State Soil Conservation Committee pursuant to NJAC 4:24-42 administered by the local Soil Conservation District.
8. If detention basins or other detention facilities are provided through which water passes at times other than following rainfall, the municipal engineer shall be consulted concerning design criteria. It will be necessary for detention requirements to be met, despite the necessity of passing certain low flows. This applies to all on-stream or on-line detention basins.
9. Detention basins located in freshwater wetlands may be allowed only in accordance with the Freshwater Wetlands

Protection Act, NJSA 13.9B-1 et seq., and any rules adopted pursuant thereto.

10. Any detention facility that impounds water through the use of an artificial dike, levee or other barrier and raises the water level five feet or more above the usual mean low water height when measured from the downstream toe-of-dam to the emergency spillway crest is classified as a dam and subject to the New Jersey dam safety standards, NJAC 7:20. All such dams must be designed, constructed, operated and maintained in compliance with the rules of NJAC 7:20.

### **3.6 Water Quality Control and Infiltration Measures**

In most instances, the water quality control and infiltration performance requirements of this ordinance will be satisfied by multiple structures or devices (see Section 3.7 of this ordinance). Furthermore, most structures or devices will achieve both a water quality control and infiltration benefit. Compliance with the no net increase provisions of the ordinance will be based on a project-wide summation of runoff characteristics. The applicant will show how the collection of structures or devices incorporated in the stormwater management plan will jointly satisfy the performance requirements of this ordinance.

In order to meet the no net increase provisions of this ordinance with regard to stormwater runoff volumes, sediment loadings and other nonpoint source loadings, stormwater management facilities shall provide for the control of a water quality design storm, in accordance with the following basic principles:

1. Infiltration facilities shall be designed to achieve the recharge of at least 60 percent (tabulated on an annual basis) of direct rainfall. This will be achieved by the implementation of measures which will retain and infiltrate all runoff generated for storms up to the 1.25 inch, 24-hour storm, using the Type III rainfall distribution recommended for New Jersey by the US Soil Conservation Service. In general, multiple infiltration facilities will be required to collectively satisfy the infiltration requirement.
2. Concentrations of stormwater volume shall be minimized by designing small impervious surface drainage units.
3. Runoff shall be attenuated at the source.
4. Land uses shall be classified into "Harmfulness Classes", as shown in Attachment 4, "Stormwater Management for Water Quality Improvement and Infiltration in the Great Swamp Watershed," dated \_\_\_\_\_, and prepared by Tourbier & Walmsley, Inc. Stormwater runoff from Harmfulness

Class 1 surfaces shall be directed through one or more water quality devices prior to infiltration.

5. Water quality and infiltration device treatment trains shall be designed that utilize the natural qualities of the landscape.
6. Due to the difficulties associated with their design and maintenance, detention/retention basins are not suitable as infiltration facilities. Therefore, retention volumes associated with basins may not be used to comply with the no net increase provision of this ordinance as it regards runoff volume. However, retention basins (or "wet basins") may be used to satisfy the water quality requirements of this ordinance.
7. The incorporation of porous pavement systems, including porous asphalt pavement and modular paving block systems, are encouraged as a means of lowering the effective runoff curve number for a developed site. By increasing the perviousness of the developed site, benefits will be achieved in the form of reduced infiltration and peak runoff control requirements.

Utilizing the above design principles, a stormwater management plan shall be designed for the project area, utilizing the stormwater control "Best Management Practices" (BMPs) presented in *Stormwater and Nonpoint Source Pollution Control Best Management Practices Manual*, dated December 1994, and any subsequent revisions thereto, prepared by the New Jersey Department of Environmental Protection and the new Jersey Department of Agriculture.

In preparing the project's stormwater management plan, the design procedure presented in Attachment 4, "Stormwater Management for Water Quality Improvement and Infiltration in the Great Swamp Watershed," dated \_\_\_\_\_, and prepared by Tourbier & Walmsley, Inc., shall be followed.

The no net increase provision of this ordinance shall be deemed to have been met regarding nonpoint source pollutants and sediments if the estimated post-development nonpoint source annual pollutant loadings after water quality treatment have been reduced prior to discharge by the following percentages for the nonpoint source pollutant indicator parameters.

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Percent Removal of  
Post-development NPS Pollutant Loadings

Nonpoint Source Undergoing Indicator Parameters	For New Developments on Previously Undeveloped Land	For Sites Redevelopment
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Total Suspended Solids (TSS)	90% or greater	45% or greater
Total Nitrogen (TN)	65% or greater	30% or greater
Total Phosphorous (TP)	75% or greater	25% or greater
Zinc (Zn)	90% or greater	20% or greater
Lead (Pb)	90% or greater	50% or greater

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In estimating the removal efficiencies of the water quality control measures proposed, it shall be acceptable to utilize the average removal efficiency statistics provided in the *Stormwater and Nonpoint Source Pollution Control Best Management Practices Manual*, dated December 1994, and any subsequent revisions thereto, prepared by the New Jersey Department of Environmental Protection and the New Jersey Department of Agriculture.

### 3.7 Requirements for Selected Stormwater Management Measures

1. *For detention basins:*

- a. Detention basins shall not be located within the floodway of any watercourse in the Great Swamp Watershed;
- b. The construction of detention basins in flood plains should be avoided, but where this is unavoidable, a special examination to determine adequacy of a proposed detention facility during extreme storm events shall be required. This examination is required to determine what effects, if any, the tailwaters created by the flood plain have on the outflow from and effective storage within the detention facility. All designs of basins in flood plains, therefore, should be based upon an accurate and thorough determination of tailwater effects resulting from runoff from the site and the watershed contributing to the flood plain.
- c. Beginning at the time of peak storage in the basin for the water quality design storm, no more than 90 percent of the total peak storage volume is released over an 18 hour period for residential developments or over a 36 hour period for commercial developments. Longer drawdowns are permissible, but in no case shall the drawdown period exceed 72 hours. The rate of release shall be as uniform as possible;
- d. The minimum outlet diameter, width or height is three inches. If this minimum outlet size does not allow for the detention times required in this ordinance, then alternative techniques for the removal of TSS prior to discharge into the basin shall be provided; and

- e. The species of native or non-intrusive exotic vegetation used in the basin shall be approved by the municipality and the appropriate County Soil Conservation District.

2. *For wetponds/retention basins:*

- . Such basins shall not be located within the floodway of any watercourse in the Great Swamp watershed.
- a. The volume of the permanent pool shall be at least three times the volume of the expected runoff from the water quality design storm;
- b. The pool shall be shallow enough to avoid thermal stratification and deep enough to minimize algal blooms and resuspension of decomposing organics and other previously deposited materials;
- c. The flow from the contributory drainage area shall be sufficient in dry weather to maintain the permanent pool during the summer months and prevent stagnation;
- d. The configuration of the permanent pool shall promote maximum sedimentation and minimize plug flow;
- e. Where feasible, native fish stock shall be used to control mosquitoes; and
- f. There shall be no adverse effects to the receiving watercourse resulting from differences in temperature between the discharge and the waters in the receiving watercourse.

3. *For artificial wetlands:*

- . Where feasible, the wetlands shall be created around a standing pool of water at least 6 feet in depth;
- a. At least one-half of the perimeter of the water area shall be graded to form a 10 to 20 foot wide shallow bench for aquatic emergents;
- b. The surface area of the artificial wetlands shall be at least three percent of the total area contributing flow into the artificial wetland;
- c. Vegetation shall be commercial wetland plant stock, either live plants or dormant rhizomes, instead of transplants from existing wetlands areas or seeding;
- d. At least two hardy and rapid colonizing indigenous primary wetlands species shall be planted over 30 percent of the total shallow water area. Each species shall be planted in three or four monospecific stands with individual plants spaced two to three feet apart. Up to three less aggressively colonizing secondary wetlands

species shall be randomly distributed in clumps around the perimeter of the marsh; and

- e. At least 25 percent of the total surface area of a basin designed exclusively to act as a shallow marsh shall be open water with a depth of at least two feet in order to provide habitat for waterfowl and other marsh birds.

4. *For vegetated or biofilter swales:*

- . The water velocity shall not exceed two feet per second (FPS) to allow for settlement of TSS during the water quality design storm. The slope shall not be less than 0.5 percent so that positive drainage is maintained. The swale shall be of sufficient length to allow for settlement of TSS taking into consideration the velocity, depth of flow and expected loading of TSS;
- a. Where feasible, vegetation shall be used in the swale to filter out the TSS and to provide a secondary treatment by absorption of pollutants leached into the soil. Vegetation used in the swale shall be native or non-intrusive exotic species approved by the County Soil Conservation District;
- b. If the swale is designed to provide infiltration, the soil texture shall be sand, loamy sand or sandy loam as defined by the US Department of Agriculture and there shall be a minimum of three feet separation between the bottom of the swale and the seasonal high water table; and
- c. The swale shall be used internally within the stormwater collection system and in conjunction with other methods such as vegetated filter strips to increase their effectiveness; and

5. *For above grade infiltration facilities:*

- . There shall be at least three feet vertical separation between the bottom of the facility and the seasonal high water table;
- a. The maximum depth of impoundment shall be two feet;
- b. The soil texture of the upper six inches of the facility (i.e., immediately below the surface layer of turf, gravel, paving blocks, etc.) shall be sand, loamy sand or sandy loam, as described by the US Department of Agriculture. As necessary, the applicant will import appropriate cover material to comply with this requirement;
- c. The surface of the facility may be stabilized by turf, gravel, porous asphalt pavement, modular paving blocks, or other measures approved by the municipal engineer;



- d. The entire volume of the runoff impounded during a storm shall be recharged to groundwater within 72 hours; and
- e. The design of the infiltration facility shall be based on infiltration rates measured using procedures outlined in EPA guidance (citation) or other method acceptable to the municipal engineer.

6. *For below grade infiltration facilities:*

- . Where porous media are used (e.g., gravel surfaced parking areas, gravel filled trenches), the applicant shall provide documentation of the in-place porosity of the media for purposes of estimating the retained runoff volume;
- a. A media separation (e.g., geotextile or graded sand filter) shall be used to maintain the integrity of the interface between porous media and the native soil;.
- b. The design of the facility shall be based on infiltration rates measured using procedures outlined in EPA guidance (citation) or other method acceptable to the municipal engineer;
- c. The entire volume of the runoff impounded during a storm shall be recharged to groundwater within 72 hours. Standpipes are required in all below grade infiltration facilities for the purpose of inspecting water levels; and
- d. As required by the municipal engineer, runoff shall be treated to remove TSS and other nonpoint source pollutants prior to discharge to a below grade infiltration facility. Treatment may consist of a vegetated buffer strip, sediment trap, etc.

7. *For porous asphalt pavement:*

- . The soil beneath the pavement shall be sand, loamy sand or sandy loam as defined by the US Department of Agriculture;
- a. The porous pavement shall be buffered with vegetative screening to prevent the intrusion of aeolin sand and silt;
- b. The permittee shall undertake a strict maintenance schedule including but not limited to vacuum sweeping on a weekly basis and high pressure water washing on a monthly basis;
- c. The porous pavement shall be used in light traffic areas subject to automobiles only and is marked by a sign restricting traffic to only passenger vehicles;
- d. No asphalt sealer may be used; and

- e. No sand is used during periods of snow and ice.
8. *For sediment traps and oil/grease separators:* The drainage areas served shall be less than one-tenth of an acre in size and the applicant's comprehensive maintenance plan is approved by the municipality.
9. *For modular paving block systems:*
- . The upper six inches of soil beneath the paving system shall be sand, loamy sand or sandy loam as defined by the US Department of Agriculture. As necessary, the applicant will import appropriate cover material to comply with this requirement;
  - a. In-place infiltration rates shall be measured using procedures outlined in EPA guidance (citation) or other method acceptable to the municipal engineer;
  - b. Permissible paving blocks include, but are not limited to bricks bedded in sand (minimum one-half inch separation between blocks) and interlocking concrete blocks with open work cutouts;
  - c. Paving block systems shall be used in pedestrian and in light traffic areas subject to automobiles only and marked by a sign restricting traffic to only passenger vehicles;
  - d. The permittee shall undertake a semi-annual program of inspection and maintenance; and
  - e. Modification of paved areas to provide benefits associated with below grade infiltration facilities can be obtained by constructing pavement over a layer of coarse aggregate or similar porous media.

### **3.8 Planning and Design Standards for Maintenance and Repair**

1. The goal for the planning and design of a stormwater management facility is for its operation with the least practical amount of maintenance. To accomplish this, the facility shall be developed to eliminate avoidable maintenance tasks, minimize the long term amount of regular maintenance, facilitate the performance of required maintenance tasks, and reduce the potential for extensive, difficult, and costly remedial or emergency maintenance efforts.
2. Strong, durable, and noncorrodible materials, components, and fasteners shall be used to reduce required maintenance efforts. These include but are not limited to lightweight noncorrodible metals such as aluminum for trash racks, orifice plates, and access hatches; hardy, disease resistant grasses for bottoms

and side slopes as prescribed by Soil Erosion and Sediment Control standards administered by the local Soil Conservation District; reinforced concrete for outlet structures and inlet headwalls; and gabions for channel and outlet linings.

3. Detention facilities shall be designed to minimize propagation of insects, particularly mosquitoes.
4. Detention facilities should be designed in a harmonious and attractive manner.
5. Detention facility outlets shall be designed to function without manual, electric or mechanical controls.
6. Maintenance shall be required as part of all stormwater management plans. Specific maintenance techniques and schedules shall be provided for each type of system used on the site. If maintenance of the system will be the responsibility of a person other than a State, county or municipal agency, then the maintenance plan approved by the municipality shall be recorded upon the deed of record for the property.
  - a. The maintenance plan shall include the name, address and telephone number of the party or parties responsible for long term maintenance. Documentation of their assumption of this responsibility shall be submitted as part of the permit application. The transfer of maintenance responsibility to individual property owners in residential subdivisions is prohibited except through a homeowners association agreement.
  - b. written maintenance and repair records for all stormwater management systems shall be maintained for at least five years by the person's identified in (6) above and shall be provided to the municipality upon request.
  - c. Maintenance of artificial wetlands shall include, but not be limited to:
    - i. documented visual inspection of all components of the system at least once every six months;
    - ii. documented removal of silt, litter and other debris from all catch basins, inlets and drainage pipes at least once every six months, or upon noticeable buildup; and
    - iii. vegetation removal and replacement, as necessary, at least once a year.
  - d. Maintenance of detention basins shall include, but not be limited to:

- . documented visual inspection of all components of the system at least once every six months;
  - i. documented removal of silt, litter and other debris from all catch basins, inlets and drainage pipes at least once every six months or upon noticeable buildup;
  - ii. documented maintenance, including grass cutting, and necessary replacement of all landscape vegetation within the basin at least once a year; and
  - iii. documented aeration of basin bottoms at least once a year and scraping and replanting at least once every five years to prevent the sealing of the basin bottom.
- e. Maintenance of wet ponds/retention basins shall include, but not be limited to, annual documented monitoring of water quality, dissolved oxygen, vegetative growth, temperature and fish population, for a period of three years to ensure that the wet pond/retention basin is working as intended.

### **3.9 Safety Measures**

Safety measures are to be incorporated in the design of all stormwater and infiltration control projects. These may include but not be limited to fencing, warning signs/stadia rod indicating depth at lowest point, and outlet structures designed to limit public access.

## **Section 4**

### **Requirements for a Site Development Stormwater Plan**

#### **4.1 Submission of Site Development Stormwater Plan**

1. Whenever an applicant seeks municipal approval of a development subject to this ordinance, the applicant shall submit all of the required components of the Checklist for the Site Development Stormwater Plan as part of the submission of the application for subdivision or site plan approval.
2. The applicant shall demonstrate that the project meets the standards set forth in this ordinance.

3. The applicant shall submit five copies of the materials listed in the checklist for site development stormwater plans in accordance with section 4.3 of this ordinance.

## 4.2 Site Development Stormwater Plan Approval

The applicant's plans for development shall be reviewed as a part of the subdivision or site plan review process by the municipal board or official from which municipal approval is sought. That municipal board or official shall consult the engineer retained by the Planning and/or Zoning Board (as appropriate) to determine if all the checklist requirements have been satisfied and to determine if the project meets the standards set forth in this ordinance.

## 4.3 Checklist Requirements

The following information shall be required:

1. *Topographic Base Map* - A topographic base map of the site shall be submitted which extends a minimum of 200 feet beyond the limits of the proposed development, at a scale of 1"=200' or greater, showing 2-foot contour intervals. The map shall indicate existing surface water drainage; marshlands and other wetlands; pervious or vegetative surfaces; existing man-made structures; roads; bearing and distances of property lines; and significant natural and manmade features not otherwise shown. The reviewing engineer may require upstream tributary drainage system information as necessary.
2. *Environmental Site Analysis* - A written and graphic description of the natural and man-made features of the site and its environs shall be provided. This description should include a discussion of soil conditions, slopes, wetlands, and vegetation on the site. Particular attention should be given to unique, unusual, or environmentally sensitive features and to those that provide particular opportunities or constraints for development.
3. *Project Description and Site Plan(s)* - A map (or maps) at the scale of the topographical base map indicating the location of existing and proposed buildings, roads, parking areas, utilities, structural facilities for stormwater management and sediment control, and other permanent structures. The map(s) shall also clearly show areas where alterations occur in the natural terrain and cover, including lawns and other landscaping, and seasonal high groundwater elevations. A written description of the site plan and justification of proposed changes in natural conditions may also be provided.

4. *Stormwater Management Facilities Map* - The following information shall be provided and illustrated on a map of the same scale as the topographic base map, shall be included:
  - a. total area to be paved or built upon, proposed surface contours, estimated land area to be occupied by the stormwater management facilities and the type of vegetation thereon, and details of the proposed plan to control and dispose of surface water.
  - b. details of all stormwater management facility designs, during and after construction, including discharge provisions, discharge capacity for each outlet at different levels of detention and emergency spillway provisions with maximum discharge capacity of each spillway.

5. *Calculations*

- . comprehensive hydrologic and hydraulic design calculations for the pre-development and post-development conditions for the design storms as specified in Section 3 of this ordinance.
- a. When the proposed stormwater management control measures (e.g., infiltration basins) depend on the hydrologic properties of soils, then a soils report shall be submitted. The soils report shall be based on on-site boring logs or soil pit profiles. The number and location of required soil borings or soil pits shall be determined based on what is needed to determine the suitability and distribution of soil types present at the location of the control measure.

6. *Maintenance and Repair Plan*

- . The design and planning of the stormwater management facility shall meet the objectives of Section 3.8.
- a. Maintenance procedures shall be detailed which ensure the continuation of the intended function of the facility.
- b. Maintenance and repair plans for stormwater management facilities shall identify the parts or components of the facility that need to be maintained, and when repairs are required, the equipment and skills or training necessary. Plans for stormwater management facilities shall detail the accessibility of maintenance personnel and equipment. Costs and sources of funds shall be identified when possible.
- c. A schedule shall be developed of when and how often maintenance will occur to maintain proper function of the stormwater management facility. To reduce the potential for extensive, difficult, and costly remedial or

emergency maintenance efforts, the schedule of maintenance activities shall include inspections to ensure proper performance of the facility between scheduled cleanouts.

- d. Where a stormwater management facility is used for sediment control during construction, a debris and sediment disposal site shall be confirmed before the facility is constructed. The disposal site may or may not be at the site of the proposed development. The responsible party shall demonstrate that he or she is capable of financing the removal and disposal of debris and sediment before the facility is operating. Disposal site(s) shall be included in the Soil Erosion and Sediment Control Plan and certified by the local Soil Conservation District.
- e. Provisions for periodic review and evaluations to determine the overall effectiveness of the maintenance programs and the need for revised or additional maintenance procedures, personnel and equipment shall be included in the facilities maintenance and repair plan.

## **Section 5**

# **Continued Maintenance, Repair and Safety**

### **5.1 Applicability**

Projects subject to review as specified in Section 1.4 of this ordinance shall comply with the requirements of Sections 5.2 and 5.3

### **5.2 Responsibility for Continued Maintenance, Repair and Safety**

1. The requirements of this section do not apply to stormwater management facilities that are dedicated to and accepted by the municipality or another governmental agency. Responsibility for operation and maintenance of stormwater management facilities, including periodic removal and disposal of accumulated particulate material and debris, shall remain with the property owner, unless assumed by a governmental agency, with permanent arrangements that it shall pass to any successor or owner. If portions of the land are to be sold, legally binding arrangements shall be made to pass the basic responsibility to successors in title. These arrangements shall designate for each project the property owner, governmental agency, or other legally established entity to be permanently

responsible for inspection and maintenance, hereinafter in this section referred to as the responsible person.

2. Prior to granting approval or as a condition of final subdivision or site plan approval to any project subject to review under this ordinance, the applicant shall enter into an agreement with the municipality to ensure the operation and maintenance of the stormwater management facility. In cases where property is subdivided and sold separately, a homeowners' association or similar permanent entity shall be established as the responsible person absent an agreement by a governmental agency to assume responsibility, It shall be demonstrated to the municipality that a proposed new responsible entity has the capability to complete and finance necessary maintenance.
3. In the event that the stormwater management facility becomes a danger to public safety or public health, or if it is in need of maintenance, the municipality shall so notify the responsible person in writing. Upon receipt of that notice, the responsible person shall have fourteen (14) days to effect maintenance and repair of the facility in a manner that is approved by the municipal engineer or his designee. If the responsible person fails or refuses to perform such maintenance and repair, the municipality may immediately proceed to do so and shall bill the cost thereof to the responsible person.

### **5.3 Continued Maintenance and Repair Procedures**

1. Preventive maintenance procedures are required to maintain the intended operation and safe condition of the stormwater management facility by reducing the occurrence of problems and malfunctions. To be effective, preventive maintenance shall be performed on a regular basis and include such routine procedures as training of staff, periodic inspections, grass cutting and fertilizing, silt and debris removal and disposal, upkeep of moving parts, elimination of mosquito breeding habitats, pond maintenance, and review of maintenance and inspection work to identify where the maintenance program could be more effective.
2. Corrective maintenance procedures are required to correct a problem or malfunction at a stormwater management facility and to restore the facility's intended operation and safe condition. Based upon the severity of the problem, corrective maintenance must be performed on an as-needed or emergency basis and include such procedures as structural repairs, mosquito extermination, removal of debris, sediment and trash removal which threaten discharge capacity, erosion repair, snow and ice removal, fence repair and restoration of vegetated and nonvegetated lining.



## **5.4 Penalties**

Any responsible person who violates any portion of Section 5.2.3 or Section 5.3 of this ordinance shall be subject to the following penalties:

## **Section 6**

### **Effective Date**

This ordinance shall take effect upon final passage by the Township Committee.

## **ATTACHMENT 1**

Map of the Great Swamp Watershed Overlay Zone

## **ATTACHMENT 2**

Great Swamp Watershed Mitigation Requirements

## **ATTACHMENT 4**

Stormwater Management for Water Quality Improvement and Infiltration in the Great Swamp Watershed, Prepared by Tourbier & Walmsley, Inc.