

MUNICIPAL STORMWATER MANAGEMENT PLAN  
FOR THE  
BOROUGH OF ALPINE  
BERGEN COUNTY, NEW JERSEY

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PREPARED BY

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# MUNICIPAL STORMWATER MANAGEMENT PLAN

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## Introduction

This Municipal Stormwater Management Plan (MSWMP) documents the strategy for the Borough of Alpine 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 acres of land. These standards are intended to minimize the adverse impact of stormwater runoff on water quality and water quantity and the loss of groundwater recharge that provides base flow in receiving water bodies. The plan describes long-term operation and maintenance measures for existing and future stormwater facilities.

The plan does not provide a build-out analysis since the municipality has less than one square mile of vacant or agricultural land (one square mile is equal to 640 acres). The most recent Master Plan (2002) places the quantity of vacant, undeveloped land at approximately 138 acres. Since then, many of those vacant parcels have been developed. Although not required due to the small amount of vacant land available, the plan does address the review and update of existing ordinances, the Master Plan, and other planning and development documents to consider project designs that include low impact development techniques, where practical. The final component of this plan is a mitigation strategy for when a variance or exemption of the design and performance standards is sought by a developer. As part of the mitigation section of the stormwater plan, specific stormwater management measures are identified to lessen the impact of existing developments.

## Goals

The goals of this MSWMP are as follows:

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

To achieve these nine goals, the Borough, through this Plan and subsequent Stormwater Control Ordinance, will outline specific stormwater design and performance standards for new development and redevelopment. Flooding, as commonly perceived, is not an issue in the Borough (detailed later in this Plan). Each plan for development and redevelopment is thoroughly evaluated by the land use Boards and the Borough Engineer's office to insure that the development does not create any new adverse impacts on adjoining, downhill residences as a result of stormwater runoff. Furthermore, the development will be reviewed to determine the ability to address and reduce the intensity of any pre-existing stormwater related problem to adjoining

property owners. Through its current ordinances, the Borough requires all development and redevelopment to **reduce** the peak rate and volume of stormwater runoff. Drainage reports are a mandatory submission item. All development is currently required to provide erosion control devices as a condition of the issuance of building permits. These devices are required to be installed in accordance with the Standards for Soil Erosion and Sediment Control in New Jersey, and must be installed **prior to** any soil moving activity.

New culverts, bridges, and in-stream structures are required to be submitted to NJDEP for review and permits and, as such, are within the jurisdiction of the Department. The adequacy of existing culverts, bridges, and in-stream structures will need to be evaluated on a case-by-case basis. Through observations during intense storm conditions, capacity-related problems will be reported to the Borough Engineer's office for evaluation. To date, the capacity related problems are caused, not by undersized culvert openings, but by a build up of eroded material deposited at culvert entrances, thereby reducing the culvert capacity. Maintenance of identified problem areas is performed by Borough personnel and erosion-prone stream embankment areas will be protected to the extent permitted by the Department.

New development applications will be required to submit Stormwater Management reports, outlining the groundwater recharge requirements of the site in question. The plans shall incorporate those measures identified in the approved report. Groundwater recharge requirements will be required for all projects that are deemed to be "major developments", as defined by the Department (disturbance of more than one acre of land area or creation of more than ¼ acre of impervious area).

Nonpoint pollution will be controlled and, to the extent feasible, diminished with each new development and redevelopment project within the Borough. The on-site stormwater management requirements will mandate the reduction in the peak rate and/or volume of stormwater runoff as well as instituting water quality and groundwater recharge measures where applicable. The measures regarding stormwater quantity have been in effect since April, 2001 for **all** sites. Water quality and groundwater recharge for all sites shall be required to comply with the requirements of NJAC 5:21-7 and/or NJAC 7:8, which ever is applicable to that particular development. In addition, this Plan recommends that certain recommendations and goals offered in the most recent Master Plan (2002) should be revisited by the Governing Body. These recommendations are detailed later in this Plan. The creation of impervious areas is controlled under the current zoning ordinance of the Borough. Stormwater runoff from these areas is, and will continue to be, the priority when reviewing plans for new development and redevelopment, to insure compliance with the above noted NJAC stormwater control requirements.

Any new development and, in particular, new development in close proximity to a watercourse will be evaluated to ensure adequate protection of the watercourse and its overbank areas. Specifically, developments within the Tenakill and Dwars Kill HUC 14 drainage areas will be evaluated to insure compliance with their sensitive Category One designation (discussed in detail later in this Plan). These watercourses and their affected tributaries have been mapped and identified for reference purposes. These developments will be reviewed to insure compliance with the requirements of NJAC 7:9B. Finally, at such time that TMDL's are established for any of the affected water courses, the Borough will evaluate what, if anything, will need to be done to satisfy the established TMDL limits.

The Borough will minimize pollutants in stormwater runoff from new development and redevelopment by strictly adhering to the requirements of the above noted NJAC regulations. Adherence will be reviewed and evaluated through the land use approval process and further evaluated to verify compliance through on-site inspections during construction. This Plan also proposes stormwater management controls to minimize pollutants from existing developments. These controls are identified in the "Mitigation Plan" section of this Plan. The mitigation projects are all situated in areas of the Borough that were initially developed prior to 1980 and, therefore, were developed substantially without stormwater management of water quantity, water quality, or groundwater recharge as a design feature. Furthermore, most of these areas are situated in the vicinity of the newly-designated Category One watercourses. Redevelopment of these sites will be closely monitored to insure that each site that is redeveloped will contribute its small portion to reversing prior trends by addressing the quantity, quality and recharge issues. The Borough has already begun retrofitting existing street catch basins with acceptable style grates and, where required, curb pieces to minimize solids and floatables from entering the watercourses.

Public safety will continue to be addressed through proper design of stormwater facilities. Stormwater management facilities are required to provide a safe means of entry in order to visually inspect and, when necessary, maintain the facilities. Security fencing shall be required along the perimeter of detention basins to prevent entry to anyone except authorized personnel performing normal or remedial maintenance at the facility. Control structures fitted with trash racks or choke pipes (orifices) will be monitored and cleaned after all intense rainfall events, to prevent clogging and/or abnormal build-up of stormwater.

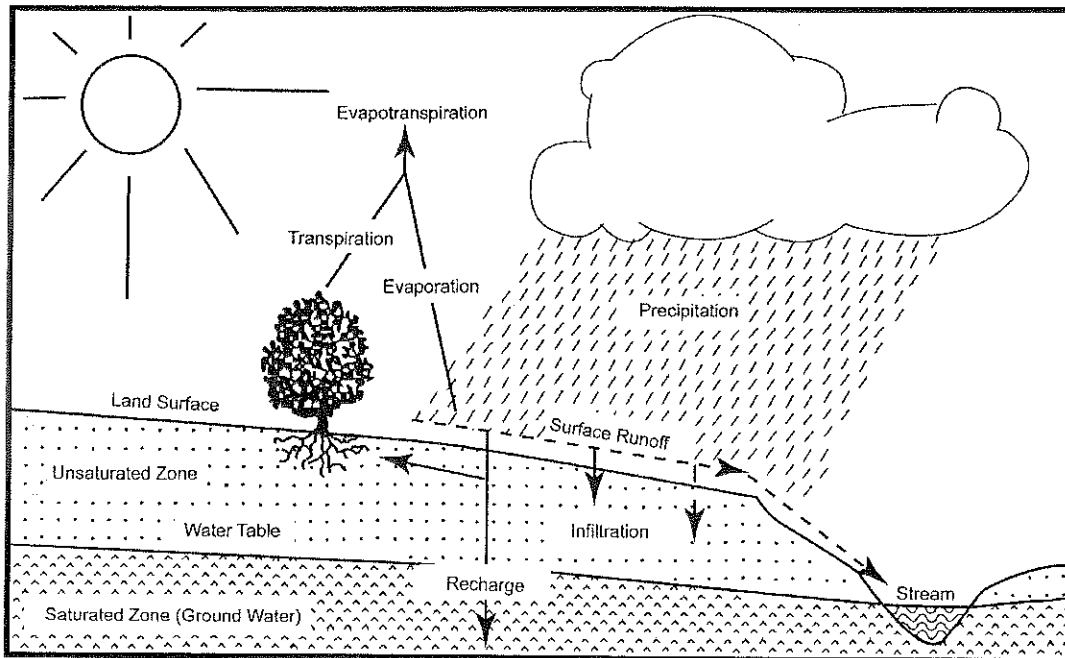
## Stormwater Discussion

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 areas, causing flow in downstream waterways to peak faster and higher than natural conditions. These increases can create new and aggravate existing downstream flooding and erosion problems and increase the quantity of sediment in the channel. Filtration of runoff and removal of pollutants by surface and channel vegetation is eliminated by storm sewers that discharge runoff directly into a stream. Increases in impervious areas can also decrease opportunities for infiltration, which, in turn, reduce stream base flow and groundwater recharge. Reduced base flows and increased peak flows produce greater fluctuations between normal and storm flow rates, which can increase channel erosion. Reduced base flows can also negatively impact the hydrology of adjacent wetlands and the health of biological communities that depend on base flows. Finally, erosion and sedimentation can destroy habitat without which some species cannot adapt.

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

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

Figure 1: Groundwater Recharge in the Hydrologic Cycle



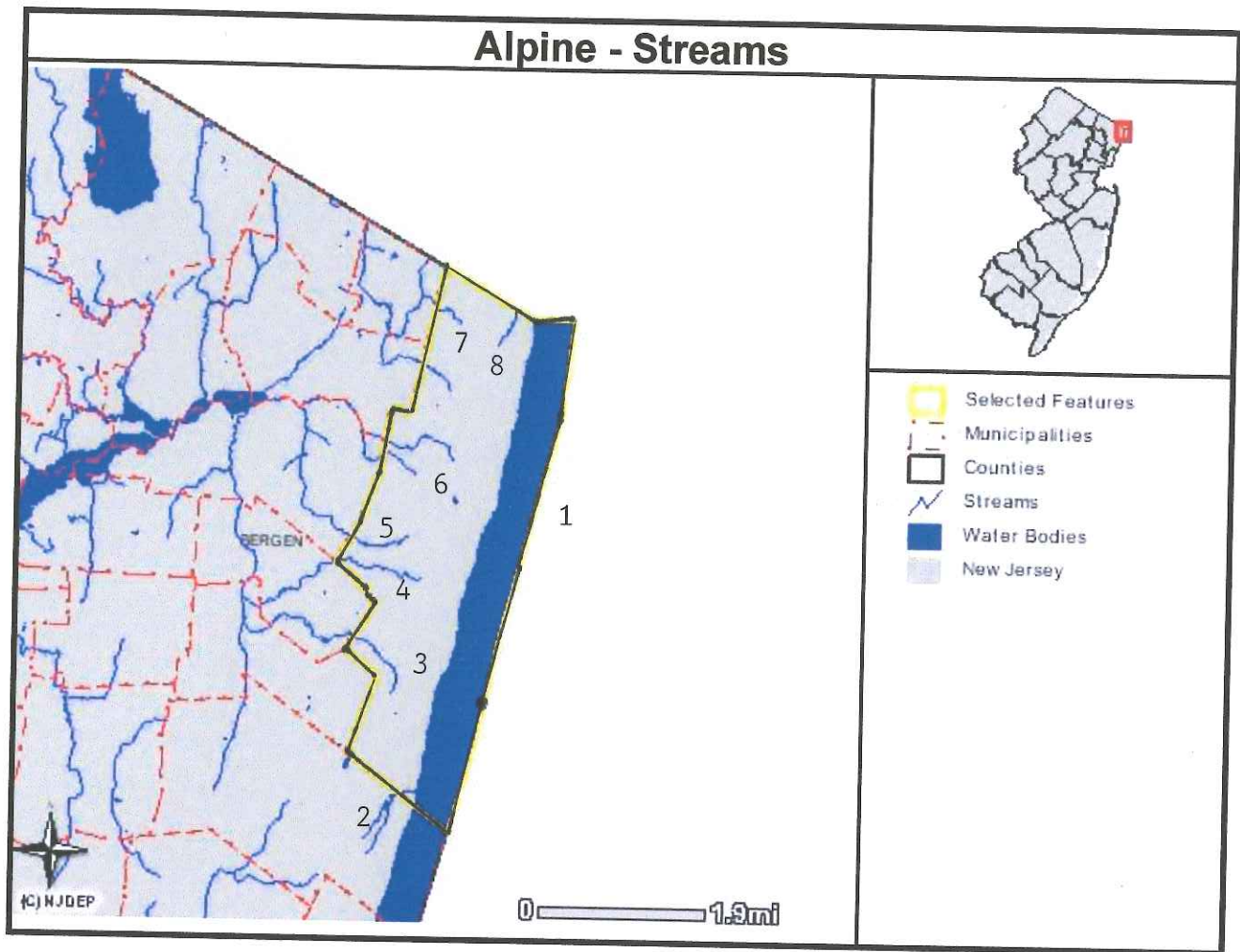
Source: New Jersey Geological Survey Report GSR-32.

## **Background**

The Borough of Alpine encompasses 9.4 square miles in northeastern Bergen County, New Jersey. In consideration of the fact that nearly fifty percent of the municipality consists of public property, there has been a significant increase in development during the last several years. The population of the municipality has increased from 1,549 in 1980 to 1,730 in 1990 and to 2,183 in 2000. The population increase from 1990 to 2000 is the largest numeric and percentage increase since the 1960's. The population increase has resulted in considerable demand for new development/housing. Inasmuch as Alpine is an attractive, well-to-do community; most of the new development has included large, single-family residences with substantial site amenities (recreational accessories such as in-ground pools, tennis courts, etc.). These developments have resulted in changes in the landscape which have, most likely, increased stormwater runoff volumes and pollutant loads to the waterways of the municipality. Figure 2 illustrates the waterways of the Borough. Figure 3 depicts the Borough's boundary on a USGS quadrangle map.

The primary method of wastewater collection within the Borough is with individual subsurface disposal systems. With the exception of a relatively small number of properties located along the Borough's perimeter, development of property in the





**Figure 2**

- 1 Hudson River
- 2 Green Brook
- 3 Cresskill Brook
- 4 Demarest Brook
- 5 Anderson Brook
- 6 Dwars Kill Brook
- 7 Sparkill Brook
- 8 uncoded tributary (Skunk Hollow)

Source – NJDEP website  
[www.state.nj.us/dep/gis/newmapping.htm](http://www.state.nj.us/dep/gis/newmapping.htm)  
 (i-MAPNJ DEP)



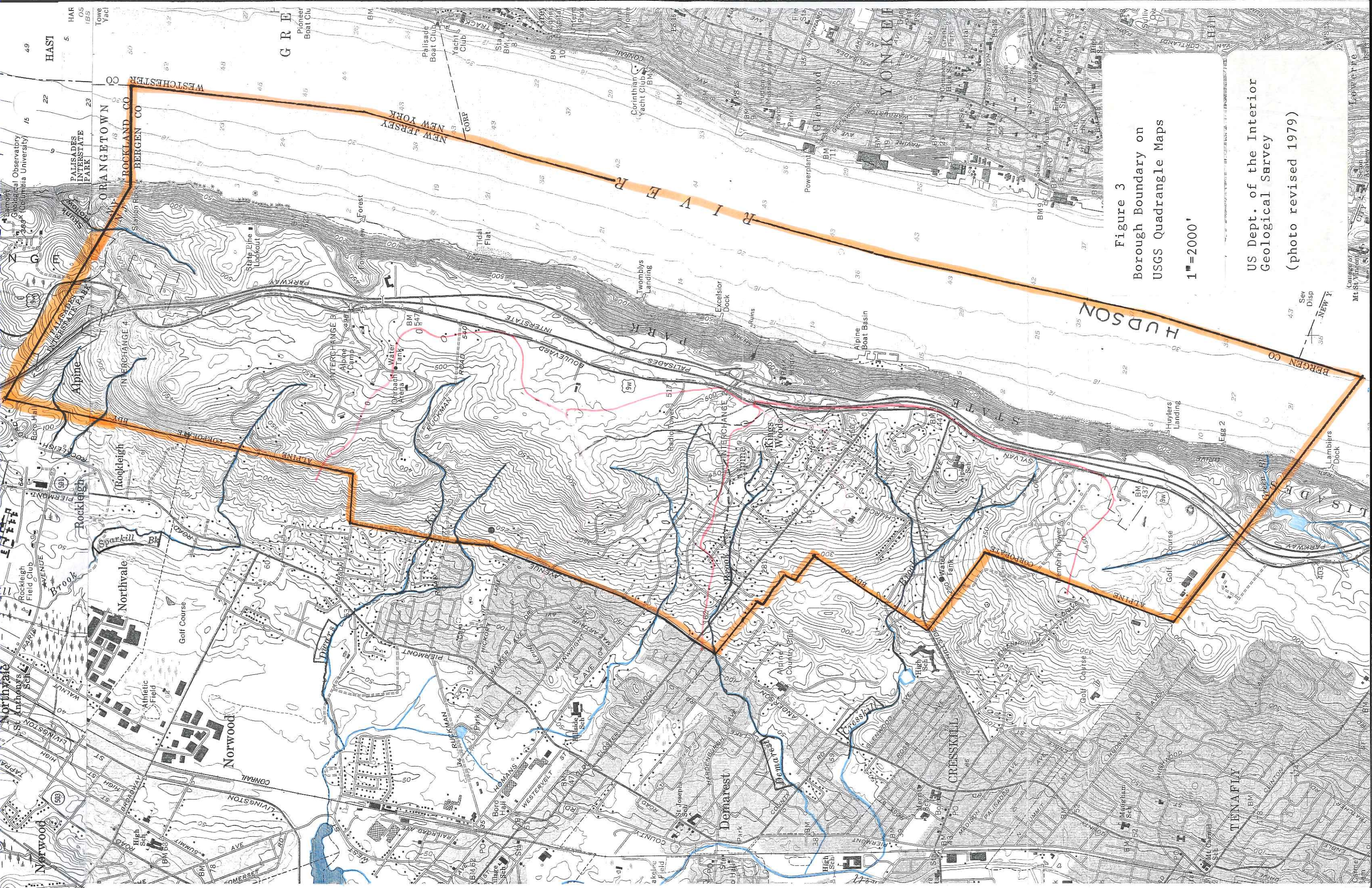


Figure 3  
Borough Boundary on  
USGS Quadrangle Maps

1"=2000'

US Dept. of the Interior  
Geological Survey  
(photo revised 1979)



Borough generally includes the installation of individual on-site septic systems, including two disposal fields for each system.

The New Jersey Department of Environmental Protection has established an Ambient Biomonitoring Network (AMNET) to document the health of the state's waterways. There are over 800 AMNET sites throughout the State of New Jersey. These sites are sampled for benthic macroinvertebrates by NJDEP on a five-year cycle. Streams are classified as non-impaired, moderately impaired, or severely impaired based on the AMNET data. The data is used to generate a New Jersey Impairment Score (NJIS), which is based on the number of biometrics related to benthic macroinvertebrate community dynamics. The Borough of Alpine is bordered by the Hudson River to the east. Seven additional watercourses and their tributaries flow through the Borough – Sparkill Brook, Dwars Kill, Anderson Brook, Demarest Brook, Cresskill Brook, Green Brook, and Skunk Hollow. These seven watercourses are included in the Watershed Management Area 5 as a part of either the Hudson River Basin or the Hackensack River Basin.

Of these seven watercourses that flow through the Borough, the Skunk Hollow and Green Brook are relatively minor watercourses, flowing directly to the Hudson River and are included in the Hudson River HUC 14. The Sparkill Brook is a more significant waterway, named as one of the four HUC 14 drainage areas within the Borough. This watercourse runs in a westerly direction, leaving the Borough, then northerly into New York State, then easterly to the Hudson River. This termination point is nearly three miles north of Alpine.

The remaining four watercourses are tributary to the Oradell Reservoir and therefore are classified as Category One antidegradation designation watercourses. The Cresskill and Demarest Brooks are tributary to the Tenakill Brook, which feeds the reservoir from the south. The Anderson Brook is tributary to the Dwars Kill (west of the Borough) which, in turn, is tributary to the easterly end of the Oradell Reservoir. The Cresskill Brook, in Alpine, was originally the only watercourse in the entire Hackensack River Basin to be classified as "trout production waters". This classification will remain.

The Category One antidegradation designations are based on "exceptional water supply significance". The Oradell Reservoir provides a potable water supply for 700,000 residents of New Jersey. Under the stormwater management rules, the Category One watercourses will be protected by buffer areas, identified as Special Water Resource Protection Areas (SWRPA). These buffers will extend out 300 feet from the top of bank on each side of the watercourse. Development within these buffer areas will be severely restricted, to be maintained in their natural states. Certain exceptions would be permitted, such as redevelopment of previously disturbed areas (only) and certain time-restricted developments for single family housing. These exceptions would be based on the date of subdivision approvals as well as the areas of permitted disturbance and impervious area created.

The Tenakill Brook is monitored at Cedar Lane in the Borough of Closter. The data collected from that monitoring station has identified the Tenakill Brook as a fecal coliform-impaired stream. The Demarest Brook and the Cresskill Brook are both tributary to the Tenakill Brook, upstream of the monitoring point noted above. As a result of this finding, the NJDEP is required to establish a Total Maximum Daily Load (TMDL) for the pollutant in this waterway and its tributaries. The TMDL has yet to be established.

The Dwars Kill is monitored at Blanch Avenue in the Borough of Norwood. The data collected from that monitoring station has identified mercury as an impairment to that watercourse. As a result of this finding, a TMDL for the Dwars Kill will need to be established by NJDEP. The TMDL has not yet been established. The Priority ranking for these two water quality impaired streams is unknown at this time.

A TMDL is the amount of a pollutant that can be accepted by a water body without exceeding the water quality standards or interfering with the ability to use a water body for one or more of its designated uses. The allowable load is allocated to the various sources of the pollutant; such as stormwater or wastewater discharge, which requires a NJPDES permit to discharge, and non-point source, which includes stormwater runoff from agricultural areas and residential areas, along with a margin of safety. Provisions may also be made for future sources in the form of reserve capacity. An implementation plan is developed to identify how the various sources will be reduced to the designated allocations. Implementation strategies may include improved stormwater treatment of stream corridors, retrofitting stormwater systems, and other Best Management Practices (BMPs).

The New Jersey Integrated Water Quality Monitoring and Assessment Report (305(b) and 303(d)) (Integrated List) is required by the Federal Clean Water Act to be prepared biennially and is a valuable source of water quality information. This combined report presents the extent to which New Jersey waters are attaining water quality standards and identifies waters that are impaired. Sublist 5 of the Integrated List constitutes the list of waters impaired or threatened by pollutants, for which one or more TMDLs are needed. The New Jersey Proposed 2004 Integrated List of Waterbodies lists the following watercourse under Sublist 5:

- a) The Dwars Kill, as monitored at the station on Blanch Avenue in Norwood, identifies mercury as an impairment to be addressed. The determination was based on NJDEP Metal Recon.
- b) The Tenakill Brook, as monitored at Cedar Lane in Closter, identifies two impairments: arsenic, as monitored by NJDEP/USGS, Metal Recon, and benthic macroinvertebrates, as monitored by NJDEP AMNET.

While neither of these monitoring points is located in the Borough, the headwaters of these watercourses are situated in the Borough and, therefore, may be subject to TMDLs, if and when established by the State. The Amendment to the Northeast Water Quality Management Plan (established March 28, 2003, but not adopted as of this report) refers to failing septic systems in Alpine as one of many potential sources for the fecal coliform impairment of the Tenakill Brook, as determined at the Closter monitoring site. In addition, Sublists 1 and 2 of the Integrated List identifies benthic macroinvertebrates as a measurement parameter (used under NJDEP AMNET) at a site on the Dwars Kill at the end of Anderson Avenue in Alpine. No TMDL's are anticipated to be established at this time for the Sublist 1 and 2 watercourse impairments

The County executive announced on December 6, 2004 that the County Department of Health Services will be conducting a study to evaluate the water quality of the Tenakill Brook. Funding for the study will be provided by the New Jersey Department of Environmental Protection. The role of the Health Department has been to establish and oversee a Public Advisory Committee, whose purpose is to encourage good watershed management practices.

The Public Advisory Committee has endorsed the selection of the Tenakill Brook for the study, which was originally recommended by the Technical Advisory Committee. The study is prompted by the fact that the Tenakill Brook is deemed a fecal coliform-impaired stream for which a TMDL is required to be established.

Aside from the above noted water quality issues as determined via stream monitoring and testing, the Borough has no independent determinations regarding water quality impairments (chemical or biological). The physical impairments to the watercourses (stream bank erosion) are discussed later in this Plan.

In addition to the above noted water quality problems, the Borough has experienced severe water quantity problems, primarily stream bank erosion and diminished base flow in its streams. Due to its location at the top of the Palisades, the Borough serves as the headwaters of the seven watercourses that run through the Borough. The topography (steep) and geology (rock at shallow depths) diminishes the amount of groundwater recharge, instead directing the runoff towards the watercourses. Once in the channels, the runoff attains a high velocity, creating severe stream bank erosion. The capacities of the culverts at road crossings become severely reduced when stream bank erosion deposits the soils, rocks, and other debris in the culvert openings, creating an area restriction. During the most recent severe rainfall event (Tropical Storm Floyd, September, 1999), two culverts in the Borough along the Cresskill Brook failed structurally, requiring replacement. Another culvert along the Dwars Kill failed structurally and a fourth culvert along the Demarest Brook experienced stream bank

erosion to the extent that the culvert opening (42-inch diameter) became 100% obstructed with soil and rocks from the immediate upstream channel.

Although the Borough receives certain benefits due to its steep topography, namely the lack of flooding due to undersized culverts, the offsetting negative is the stream bank erosion. The natural channels have experienced severe erosion as a result of the unchecked impervious areas created during development over the last forty years. Development that occurred prior to 1980 was without any stormwater management of water quality or quantity. Development occurring after that date did provide certain measures (detention/retention basins). These measures, however, were designed to address stormwater runoff quantity concerns and only for the most severe rainfall events (i.e. 100-year storm). Subsequent to the adoption of the Residential Site Improvement Standards (RSIS) in 1997 and especially after the Borough adopted the RSIS standards found at N.J.A.C. 5:21-7 as its stormwater requirements for all residential development (including single family, stand-alone residences), the development requirements began to address the stormwater quantity.

Since April, 2001 (adoption of Borough Ordinance 587), all development within the Borough has been required to reduce the volume and/or peak rate of stormwater runoff in accordance with the requirements of RSIS. This requirement (under Ordinance 587) made the RSIS applicable to all development and redevelopment within the Borough, including stand-alone residential lots and non-residential development. The reductions, however, are based on existing conditions at the time of the adoption of the Ordinance. While this is significant with respect to new development of vacant land, the impact is less significant with regard to redevelopment of properties resulting from tear-downs, since the property has already been developed with unchecked improvements.

The Borough of Alpine has not conducted any groundwater assessment determination. Most recent developments within the Borough (since 1995) regarding single family, stand-alone lots have addressed the increase in the volume of stormwater runoff with the installation of seepage pits. The preponderance of the seepage pits installed collect the roof runoff, thereby recharging the groundwater table with, what the Department has deemed to be, clean stormwater runoff. Although these prior stormwater management controls were not installed specifically with groundwater recharge in mind, the end result is the same.

Ground water recharge within the Borough is periodically difficult to achieve due to its location at the top of the Palisades. The presence of rock at relatively shallow depths tends to promote horizontal subsurface water movement (along the rock layer) as opposed to vertical movement. This is evidenced by the need to conduct rock removal (either through hydraulic hammers or blasting) for much of the development and redevelopment within the Borough. The presence of rock at shallow depths also creates the need to perform an extensive amount of filling during development of sites, in order

to construct certain improvements, whether new homes or septic systems, clear of potential ground water

In order to attempt to address the water quantity problems and, in turn, the erosion problems, the mitigation plan and projects specified therein, will concentrate on those sections of the Borough where development occurred prior to 1980. These areas were developed without any requirement to mitigate the increase in stormwater runoff rate or volume, and redevelopment of these areas will only provide marginal relief.

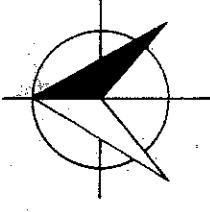
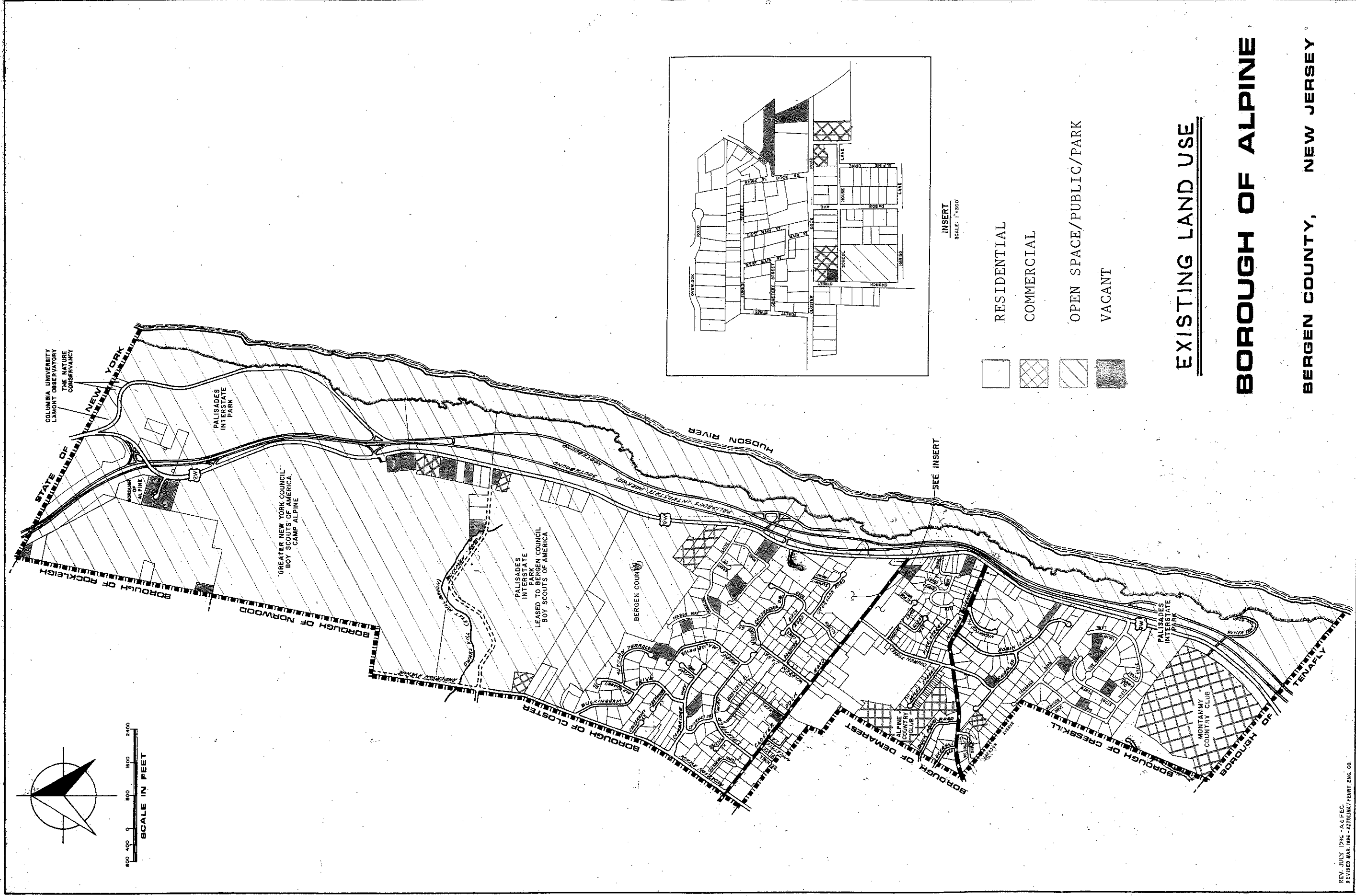
### **Design and Performance Standards**

The Borough will adopt the design and performance standards for stormwater management measures as presented at 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 to receiving water bodies. The Borough had previously amended its stormwater management requirements for all development and redevelopment, including single family residential development, in April 2001 with Ordinance No. 587. This ordinance required all development to satisfy the stormwater runoff quantity requirements as specified at N.J.A.C. 5:21-7, Residential Site Improvements Standards (RSIS). Since the adoption of Ordinance 587, all development has been required to reduce the peak rates of runoff for the two, ten, and one-hundred years storms to 50%, 75%, and 80% respectively for the pre-development rates, similar to the requirements of the RSIS.

Groundwater recharge requirements will be implemented and will be a requirement for all new development and redevelopment projects that are within the jurisdiction of NJAC 5:21 (RSIS) or NJAC 7:8 (major development). It will be the applicant's responsibility to provide the necessary calculations to demonstrate (a) the groundwater recharge volume required for the development of the site, and (b) to adequately detail the structural and/or non-structural technique to provide the minimum recharge volume as determined in the calculations. A range of surface and subsurface techniques would be acceptable, subject only to satisfying the volume requirement as well as demonstrating adequate subsurface soil permeability.

The Borough of Alpine has been designated as Metropolitan Planning Area (PA-1). This designation is included in the overall category of Urban Redevelopment Area. NJAC 7:8-5.4-a-2 specifically exempts Urban Redevelopment Areas from having to comply with the groundwater recharge requirements. The Borough will, however, continue to request that applicants address the groundwater recharge requirements as a part of the overall stormwater management consideration for site development and redevelopment. As an aside, the Borough, in the Master Plan had indicated its objection to the PA-1 designation.

The design and performance standards to be adopted by the Borough will include the language for maintenance of stormwater management measures consistent with the



SCALE IN FEET  
0 900 1800 2400

INSERT  
SCALE: 1"=200'

- RESIDENTIAL
- COMMERCIAL
- OPEN SPACE/PUBLIC/PARK
- VACANT

**EXISTING LAND USE**

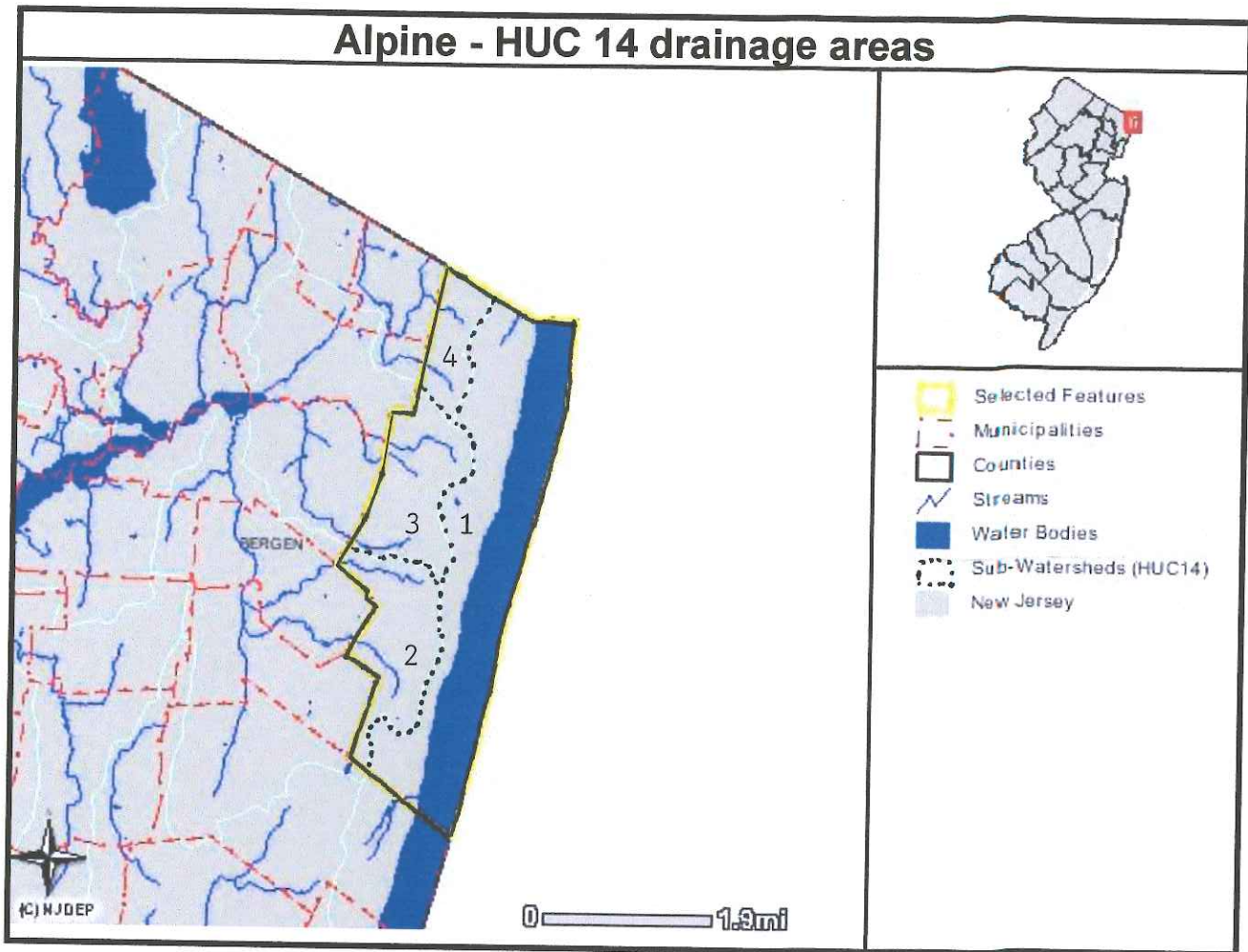
**BOROUGH OF ALPINE**

**BERGEN COUNTY, NEW JERSEY**

REV. JULY 1996 - A&F EC  
REVISED MAR. 1991 - HEDOLINI/FEINERT, INC. CO.

Figure 4





**Figure 5**

Hydrologic Unit Code (14 digit)

|   |                |                |
|---|----------------|----------------|
| 1 | Hudson River   | 02030101170010 |
| 2 | Tenakill Brook | 02030103170040 |
| 3 | Dwars Kill     | 02030103170050 |
| 4 | Sparkill Brook | 02030101170020 |

Source – NJDEP website

[www.state.nj.us/dep/gis/newmapping.htm](http://www.state.nj.us/dep/gis/newmapping.htm)

(i-MAPNJ DEP)

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.

In the Borough of Alpine, the general policy has been to relegate the primary maintenance responsibility for stormwater management features at larger developments (subdivisions) to the homeowner of the property on which the feature is situated. Since this policy is prohibited under the Stormwater Rules, the Borough's policy will need to be modified. The policy will need to be replaced with a requirement that subdivision developments will be required to establish a homeowner's association whenever there will be stormwater management maintenance responsibilities, due to the design of the stormwater management improvements. This responsibility will be required to be noted on the deed and/or subdivision map for the development and will also be noted in the memorializing resolution and developer's agreement. Easements will be required to permit the Borough to access the feature and to perform any normal maintenance or remedial work in the event that the primary responsible party (association) fails to perform the required work. If, after notification, the responsible party does not perform the required work, the Borough DPW will address the situation and the association will be charged for the services. Individual homeowners will no longer be required to be responsible for maintenance of any stormwater management improvements on their property.

For those features where the Borough has primary responsibility, the Borough personnel (DPW) will adhere to the operation and maintenance procedures found at NJAC 7:8-5.8. These procedures will include but are not limited to:

- Quarterly inspections for clogging and excessive debris buildup. Inspections will also be performed after any intense rainfall (exceeding one inch in a twenty-four hour period).
- Grass surfaces to be properly maintained.
- Annual inspection of structural components for cracking, settlement, erosion, deterioration, etc.

The Municipal Stormwater Control Ordinance for the Borough of Alpine shall be prepared, utilizing the Model Stormwater Control Ordinance for Municipalities, found in Appendix D of the New Jersey Stormwater Best Management Practices Manual. The Borough Attorney has been provided with a copy of the model for review. A copy of the proposed Municipal Stormwater Control Ordinance, which is scheduled for introduction at the February regular meeting of the Governing Body, is included herein, as Appendix A. The Ordinance will be submitted to the County for review prior to adoption by the Governing Body. The adoption of a Municipal Stormwater Control Ordinance, incorporating the findings and recommendations of this Plan, will occur within twelve months of the adoption of this Plan, but no later than April 1, 2006.

During construction, Borough inspectors, such as the Borough Engineer's office and/or the Construction Official, will observe the construction of new or redevelopment projects to ensure that the stormwater management measures are constructed and function as designed.

### **Plan Consistency**

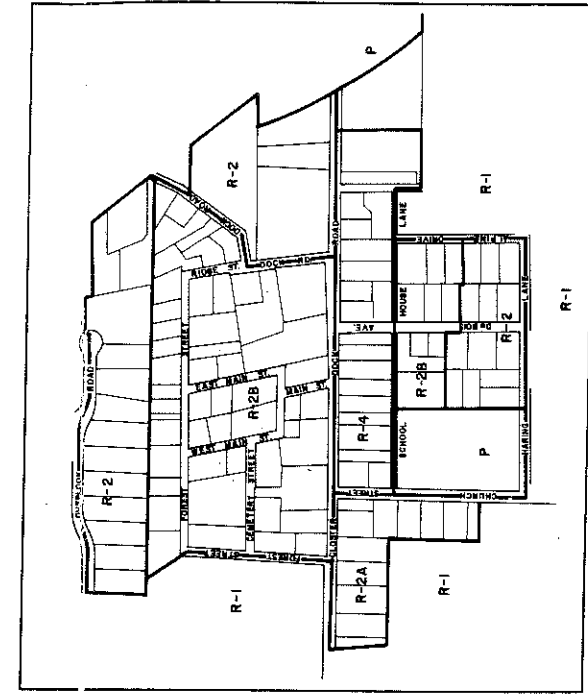
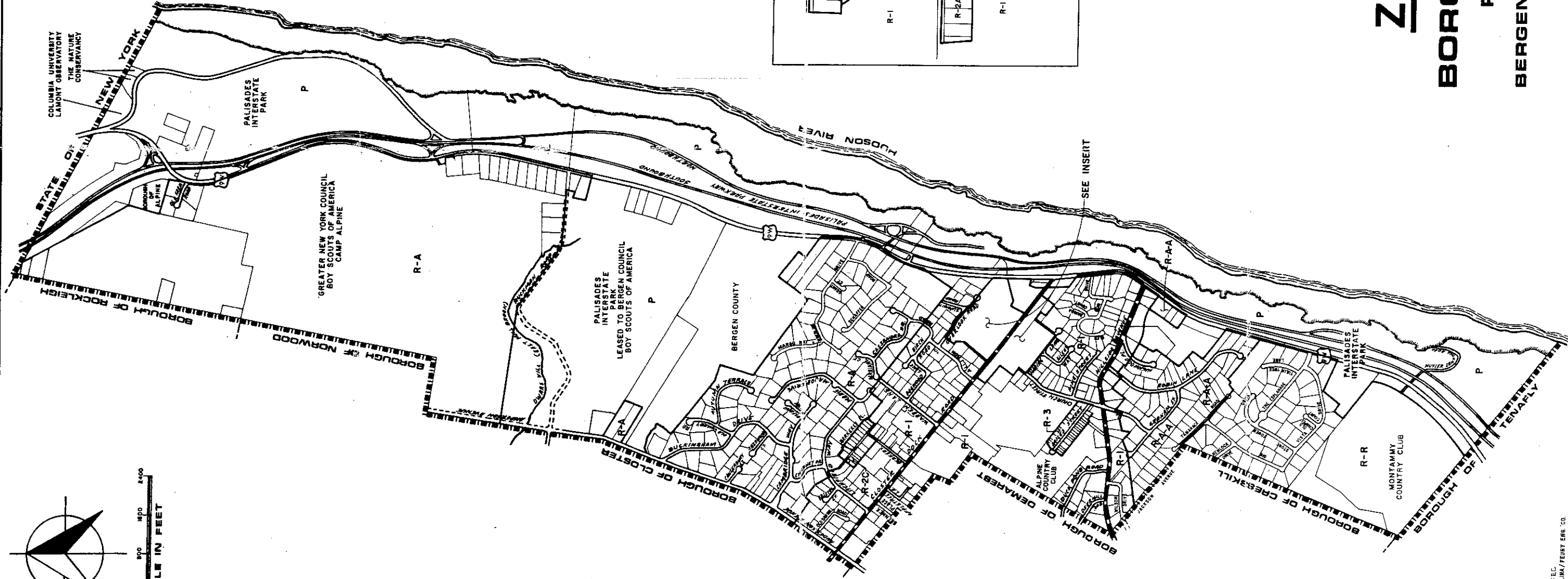
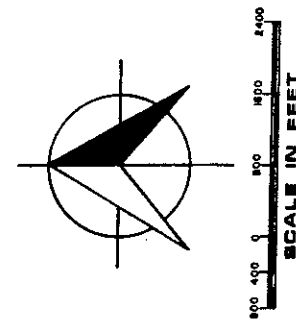
The Borough is not within any Regional Stormwater Management Planning Area. Total Maximum Daily Loads (TMDLs) for fecal coliform are in the process of being established for the Tenakill Brook at Cedar Lane in Closter. These TMDL's would apply not only to the Tenakill Brook but also to the two tributary watercourses – Demarest Brook and Cresskill Brook.

Currently, this plan does not need to be consistent with any regional stormwater management plans (RSWMPs), nor any TMDLs. If either or both of the above are developed in the future, this Plan will be updated to be consistent.

As a result of continual complaints regarding stormwater-related problems, the Borough adopted the RSIS stormwater management, quantity, and rate-of-runoff standards as the standards to be used for all residential development, including stand-alone single family residences. These standards were adopted by ordinance in April, 2001. The regulations were adopted since most of the development in the Borough did not fall under the jurisdiction of RSIS, and it was clear that more stringent standards were needed to address the stormwater runoff concerns.

This Plan is consistent with the Residential Site Improvement Standards (RSIS) at NJAC 5:21. The municipality will utilize the most current update of the RSIS in the stormwater management review of residential developments and the review will include verification that the design addresses stormwater quantity, stormwater quality, and groundwater recharge requirements in accordance with these standards and, by reference therein, NJAC 7:8. These regulations for quantity, quality, and recharge will also apply to "major development" projects, including stand-alone single family lots. This Plan will be updated, when necessary, to be consistent with future revisions to the RSIS.

The Borough's current Stormwater Management Ordinance requires all new development and redevelopment plans to comply with New Jersey's Soil Erosion and Sediment Control Standards. During construction, Borough inspectors will observe on-site erosion control measures and report any inconsistencies to the local Soil Conservation District. For those projects that fall under their jurisdiction, Soil Conservation District personnel will also be inspecting construction sites for compliance with the erosion control standards.



INSERT  
SCALE: 1"=300'

**LEGEND**

|       |  |             |
|-------|--|-------------|
| R-A   | RESIDENTIAL                            | 87,120 S.F. |
| R-A-A | RESIDENTIAL                            | 65,340 S.F. |
| R-1   | RESIDENTIAL                            | 40,000 S.F. |
| R-2   | RESIDENTIAL                            | 20,000 S.F. |
| R-2A  | RESIDENTIAL                            | 14,000 S.F. |
| R-2B  | RESIDENTIAL                            | 10,000 S.F. |
| R-2C  | RESIDENTIAL                            | 15,000 S.F. |
| R-3   | RESIDENTIAL                            | 7,500 S.F.  |
| R-4   | RESIDENTIAL                            | 10,000 S.F. |
| R-R   | RESIDENTIAL (AS A GOLF COURSE-100 AC.) | 87,120 S.F. |
| P     | PUBLIC                                 |             |

# ZONING MAP

## BOROUGH OF ALPINE

### PLANNING BOARD

### BERGEN COUNTY, NEW JERSEY

REV. JULY, 1996 - A-6/F-6  
REVISED MAR. 1995 - A-22/01/04/FEURY ENG. CO.

Figure 6  
A. B. F. JOB No. ALP-370





Figure 7  
Soils Mapping in the  
Borough of Alpine  
1"=2000'

Soil Survey of  
Bergen County, N.J.  
(1995)  
US Dept. of Agriculture  
Soil Conservation Service



**Figure 7a**

Mapped Soils – Borough of Alpine  
(legend)

BsB, BsC, BsD, BsE

BUB, BUC, BUD

DuC

DVB, DVC

FL

HbB

HUB

HzB

Ue

UR

WeC

WsB, WsC, WsD, WsE

WUB, WUC, WUD

Boonton Rock Outcrop

Boonton Urban Land

Dunellen loam

Dunellen Urban Land

Fluaquents

Haledon gravelly loam

Haledon – Urban land

Hibernia loam

Udorthents

Urban land

Wethersfield gravelly loam

Wethersfield Road outcrop

Wethersfield Urban land

### Nonstructural Stormwater Management Strategies

The Master Plan for the Borough of Alpine was most recently updated in 2002. As a part of this update, the Master Plan reviewed the existing land uses to determine the amount of vacant, developable land available. The Master Plan had determined that approximately 138 acres of vacant, developable land was available in the Borough. Subsequent to the preparation of the plan, a significant amount of the vacant land has been or is currently under development. Approximately 64 acres of the 138 acres has been or is currently under development, reducing the vacant land total to approximately 74 acres, or less than 1/8 square mile.

In addition to the 74 acres of vacant land noted above, two private golf courses are situated either partially or completely in the Borough – Alpine Country Club and Montammy Country Club. The land area of these two golf courses totals 171 acres. These golf courses are currently active as golf courses, but are within residentially zoned areas. If the current use is abandoned, the area could potentially be developed as single family residential housing.

Finally, a large tract situated in the northerly section of the Borough is currently used as a scout camp owned by Camp Alpine of Greater New York Councils Boy Scouts of America. The Area is zoned for two acre residential use. The tax basis for the parcel, however, is not based on its potential use but on its current use. Furthermore, the agreement between the owner and the Borough of Alpine provides the Borough and the Palisades Interstate Park Commission with the right of first refusal if the New York Council desires to give up the parcel. This parcel, therefore, is not considered vacant, developable land.

Therefore, the amount of vacant land in the Borough is determined to be 245 acres.

Since the vacant land area is less than one square mile or 640 acres, the Municipal Stormwater Management Plan is not required to perform a Master Plan review or to provide a build-out analysis. Several areas of the Borough Ordinances have been reviewed to evaluate the potential for incorporating nonstructural stormwater management strategies into the ordinances pertaining to land development. Utilization of low impact development techniques was deemed important to investigate due to the continual redevelopment of residential sites in the Borough (due to tear-downs) and also due to the size of the properties involved (nearly all are over one acre).

The current development and redevelopment ongoing in the Borough primarily involves single, stand-alone residential lots. The Borough does not have any areas zoned for commercial or industrial uses and only one small area of the Borough contains pre-existing commercial uses. The most current Master Plan (2002) does offer some goals and policies that are consistent with the recommended nonstructural stormwater

strategies. The Borough intends to revisit the recommended goals and policies proffered in the Master Plan to encourage, if not mandate, the use of nonstructural stormwater management techniques as a first option.

The Borough is best characterized as a semi-rural, wooded, open space community. The open space feature, with greenbelts between adjoining properties, is a goal set forth in the Master Plan. The Borough will revisit this goal with the primary objective being to set aside certain areas of each tract to remain undisturbed in its natural, wooded state. By requiring a vegetated border (either natural or, in the case of redevelopment, construction), the Borough can achieve its goal of providing a greenbelt between adjoining properties. In furtherance of the low impact development strategies, the wooded border would not only limit the amount of impervious area but would also limit the amount of open lawn areas and replace it with wooded areas. These areas would require less fertilizer and pesticides to be used. The wooded areas would also decrease the stormwater runoff attributed to lawns and encourage a higher rate of infiltration of stormwater. In those instances where the site is a redevelopment due to a tear down of an existing residence, the redevelopment plan should be encouraged to redevelop the buffer area with native, indigenous vegetative species in order to recreate the greenbelt appearance. Lawn areas within the buffers would be discouraged.

Another goal set forth in the recent Master Plan recommended modifications to Chapter 205, Trees and Shrubs, of the Borough Ordinances. Borough ordinances currently require approval, by the Alpine Environmental Commission, for the removal of any tree with a trunk diameter of nine inches or greater. Trees of this caliper within fifteen feet of the limits of proposed improvements are permitted to be removed. The recommendation is to require replacement trees similar in species to those removed for all improvements other than the primary residence. The recommendation is meant to encourage a creative design approach to site improvements in order to preserve mature trees. In addition, the Plan recommends an aggressive approach to unauthorized removal of trees during site development, requiring substantial replacement vegetation for each tree removed or damaged that was not previously approved for removal.

Due to the current zoning within the Borough (residential), the lack of large developable land areas, and the predominant type of development (stand-alone, single family residential), many of the non-structural or low impact development strategies do not apply. This Plan has reviewed the BMP techniques identified in Chapter 2 of the Best Management Practices Manual and has concluded that the following low impact development strategies are not applicable:

- Parking and Driveway areas: This strategy is primarily directed towards mixed use developments or non-residential uses.
- Pervious paving materials: While many new homes do utilize pavers in lieu of asphalt for driveways, this strategy is more directed towards commercial or multi-family developments.



- Unconnected impervious areas: This is more suitable for developments with parking lot requirements; not single family.
- Vegetated roofs: Clearly, this strategy is not applicable to single family residential housing.
- Time of concentration modification: Due to the relatively small size of parcels involved in single family residential development, the changes in time of concentration from pre-development to post-development are negligible.

The Borough Ordinances shall also be reviewed in detail to insure that all references to stormwater management and drainage requirements are amended to comply with the requirements of N.J.A.C. 7:8-5. Those areas of the ordinances that have been identified for revision are Chapters 161 (Parks), 179 (Site Plan Review), 185 (Soil Fill and Soil Removal), 192 (Streets and Sidewalks), 195 (Subdivision of Lands), 198 (Swimming Pools), and 220 (Zoning). The ordinances shall be amended to present one method of addressing stormwater management issues, with particular references to stormwater quantity control, stormwater quality control, and groundwater recharge.

### **Mitigation Plans**

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

Mitigation Project Criteria:

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

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

### **Water Quantity**

- a. Increase the available storage volume in the existing Glen Goin detention basins and retrofit the street drainage systems to receive lower elevation detention basin discharge pipes. The additional storage volumes and reconstructed outlet controls shall be designed to reduce the peak rates of discharge from the basins. The increase in storage volume will reduce peak rates or runoff into downstream watercourses, thereby reducing the stream bank erosion potential.
- b. Retrofit the existing outlet control structures at the three stormwater detention basins at Timberline Drive and Margo Way to reduce the peak runoff rates for the two- and ten-year storm intensities, thereby reducing downstream erosion potential.
- c. Installation of a stormwater management detention basin on private property at the northeasterly corner of Graham Street and Church Street. The detention basin shall provide water quantity control as a primary function, reducing the rate of runoff to mitigate downstream stream bank erosion problems.

### **Water Quality**

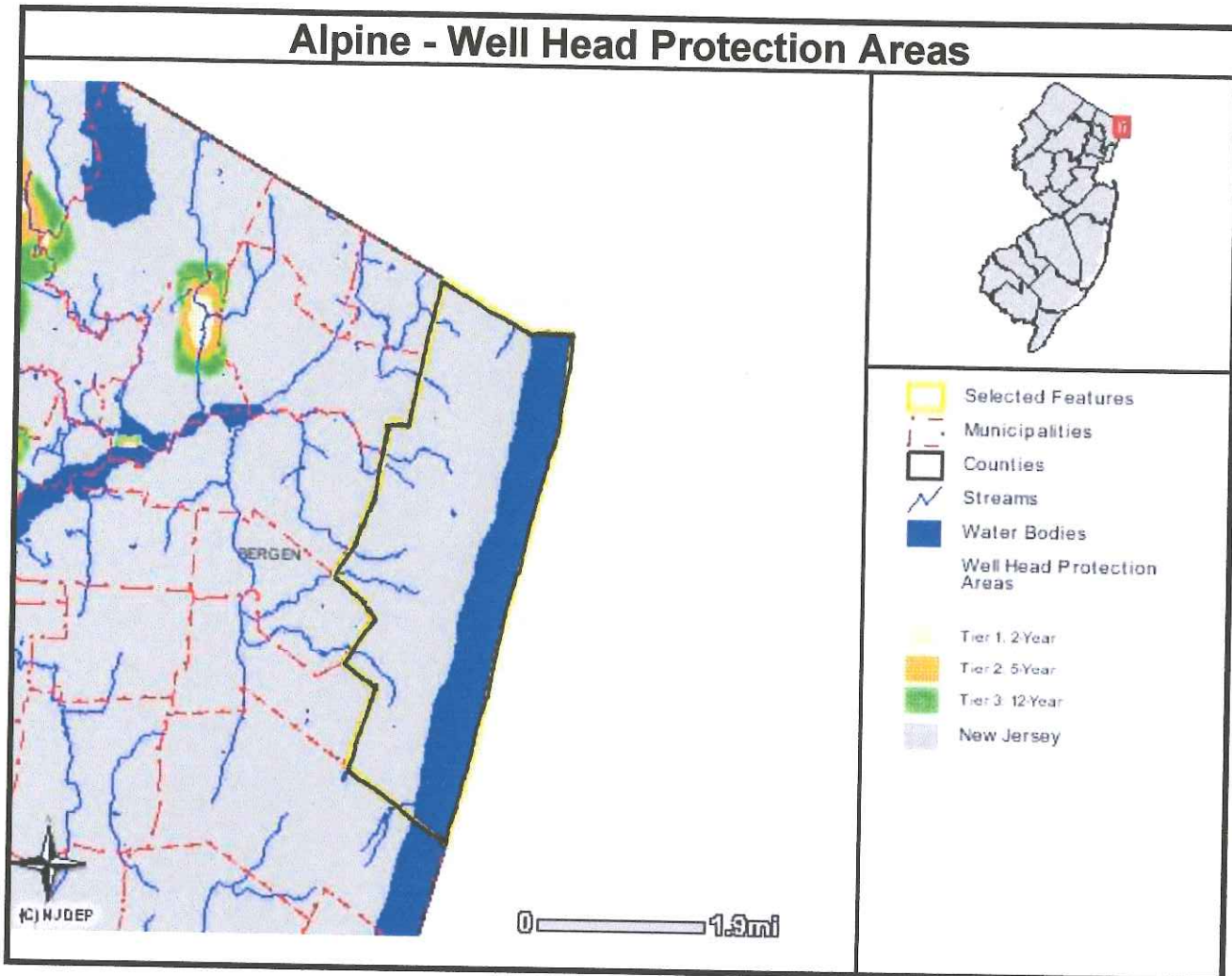
- d. Retrofit the existing stormwater management system at the municipal building parking lot to provide for the removal of 80% of the total suspended solids.
- e. Retrofit the existing stormwater management system at the Alpine elementary school to provide for the removal of 80% of the total suspended solids from the parking lot runoff.

### **Groundwater Recharge**

- f. Install/retrofit a stormwater management system at the Alpine fire department parking lot area to provide groundwater recharge of the stormwater runoff of the building and parking lot. Retrofitting of the drainage system runoff from this site will be predicated on the suitability of the soil characteristics (permeability). As an aside, although the former gas station site situated approximately 600 feet north of this location did cause a groundwater contamination condition, the plume of contamination does not impact this location.

Retrofitting for the water quality projects will utilize a manufactured treatment device that satisfies the treatment requirements at the least cost and, more importantly, limits the amount of upkeep and maintenance. The device will need to be certified by NJDEP to verify the TSS removal rates. The Borough will maintain a current list of certified manufactured treatment devices.

The Borough may allow a developer to provide funding or partial funding to the municipality for an environmental enhancement project that has been identified in a Municipal Stormwater Management Plan or towards the development of a Regional Stormwater Management Plan. The funding may also be utilized for studies to identify and/or remedy other problem areas (stream culvert capacities, stream bank erosion stabilization, etc.). The funding must be equal to or greater than the cost to implement the mitigation outlined above, including the costs associated with purchasing the property or easement for mitigation, and the cost associated with the long-term maintenance requirements of the mitigation measure.

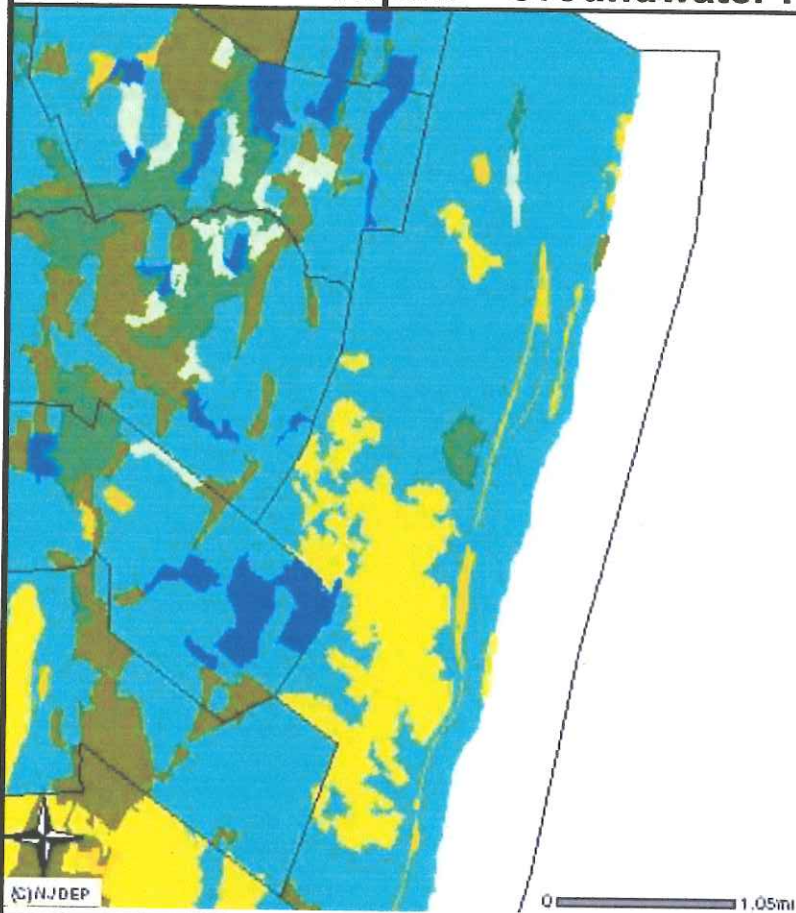


**Figure 8**

- 1 There are no wellhead protection areas identified in Alpine from this website.
- 2 There are some privately-owned water supply wells in the Borough, serving private residences. These well are located in the northeasterly quadrant of the Borough.

Source – NJDEP website  
[www.state.nj.us/dep/gis/newmapping.htm](http://www.state.nj.us/dep/gis/newmapping.htm)  
 (i-MAPNJ DEP)

# Alpine - Groundwater Recharge



- Municipalities
- Ground-Water Recharge
  - 16 to 23 in/yr
  - 11 to 15 in/yr
  - 8 to 10 in/yr
  - 1 to 7 in/yr
  - 0 in/yr
- Hydroic Soils
- Wetlands and Open Water
- No Recharge Calculated

**Figure 9**

Source – NJDEP website  
[www.state.nj.us/dep/gis/newmapping.htm](http://www.state.nj.us/dep/gis/newmapping.htm)  
(i-MAPNJ - Geology)

### **References/Sources**

NJDEP – Division of Watershed Management  
mapping  
Best Management Practices Manual  
Northeast Water Quality Management Plan  
Soil Survey of Bergen County  
Borough of Alpine, 2002 Master Plan  
United States Geological Survey  
New Jersey Integrated Water Quality Monitoring  
and Assessment Report

**APPENDIX A**

**MUNICIPAL STORMWATER CONTROL ORDINANCE**

**Borough of Alpine  
Bergen County, New Jersey**

**BOROUGH OF ALPINE**

**ORDINANCE NO. 662**

**AN ORDINANCE AMENDING CHAPTER 179 OF THE BOROUGH  
CODE ENTITLED SITE PLAN REVIEW TO ADD SUBSECTION  
179-6.5 ENTITLED "STORMWATER MANAGEMENT"**

**BE IT ORDAINED** by the Mayor and Council of the Borough of Alpine, Bergen County,  
New Jersey as follows:

**WHEREAS**, the State of New Jersey recently enacted new regulations related to Stormwater  
Management; and

**WHEREAS**, the governing body of the Borough of Alpine in order to comply with the new  
Stormwater Management controls is hereby amending the Municipal Code:

**NOW THEREFORE, BE IT ORDAINED** by the Mayor and Council and the Borough of  
Alpine as follows:

**Chapter 179-6.5** of the Borough of Alpine Code is hereby enacted to read as follows;.

Section 1: Scope and Purpose

A. Policy Statement

Flood control, groundwater recharge, and pollutant reduction through nonstructural or low impact techniques shall be explored before relying on structural BMPs (Best Management Practices). Structural BMPs should be integrated with nonstructural stormwater management strategies and proper maintenance plans. Nonstructural strategies include both environmentally sensitive site design and source controls that prevent pollutants from being placed on the site or from being exposed to stormwater. Source control plans should be developed based upon physical site conditions and the origin, nature, and the anticipated quantity or amount of potential pollutants. Multiple stormwater management BMPs may be necessary to achieve the established performance standards for water quality, quantity, and groundwater recharge.

B. Purpose

It is the purpose of this ordinance to establish minimum stormwater management requirements and controls for "major development," as defined in Section 2.



### C. Applicability

1. This ordinance shall be applicable to all site plans and subdivisions for the following major developments that require preliminary or final site plan or subdivision review:
  - a. Non-residential major developments; and
  - b. Aspects of residential major developments that are not pre-empted by the Residential Site Improvement Standards at N.J.A.C. 5:21.
2. This ordinance shall also be applicable to all major developments undertaken by the Borough of Alpine.
3. The adoption of this ordinance shall not negate the requirements of Borough Ordinance No. 587, which requires that all developments within the Borough shall comply with the requirements of N.J.A.C. 5:21, even if the development is not classified as a major development. This requirement includes the development and/or redevelopment of single, stand alone lots.

### D. Compatibility with Other Permit and Ordinance Requirements

Development approvals issued for subdivisions and site plans 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 except that, where any provision of this ordinance imposes restrictions different from those imposed by any other ordinance, rule or regulation, or other provision of law, the more restrictive provisions or higher standards shall control.

## Section 2: Definitions

Unless specifically defined below, 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. The definitions below are the same as or based on the corresponding definitions in the Stormwater Management Rules at N.J.A.C. 7:8-1.2.

“CAFRA Planning Map” means the geographic depiction of the boundaries for Coastal Planning Areas, CAFRA Centers, CAFRA Cores and CAFRA Nodes pursuant to N.J.A.C. 7:7E-5B.3.

“CAFRA Centers, Cores or Nodes” means those areas within boundaries accepted by the Department pursuant to N.J.A.C. 7:8E-5B.

“Compaction” means the increase in soil bulk density.

“Core” means a pedestrian-oriented area of commercial and civic uses serving the surrounding municipality, generally including housing and access to public transportation.

“County review agency” means an agency designated by the County Board of Chosen Freeholders to review municipal stormwater management plans and implementing ordinance(s). The county review agency may either be:

A county planning agency; or

A county water resource association created under N.J.S.A 58:16A-55.5, if the ordinance or resolution delegates authority to approve, conditionally approve, or disapprove municipal stormwater management plans and implementing ordinances.

“Department” means the New Jersey Department of Environmental Protection.

“Designated Center” means a State Development and Redevelopment Plan Center as designated by the State Planning Commission such as urban, regional, town, village, or hamlet.

“Design engineer” means a person professionally qualified and duly licensed in New Jersey to perform engineering services that may include, but not necessarily be limited to, development of project requirements, creation and development of project design and preparation of drawings and specifications.

“Development” means the division of a parcel of land into two or more parcels, the construction, reconstruction, conversion, structural alteration, relocation or enlargement of any building or structure, any mining excavation or landfill, and any use or change in the use of any building or other structure, or land or extension of use of land, by any person, for which permission is required under the Municipal Land Use Law , N.J.S.A. 40:55D-1 et seq. In the case of development of agricultural lands, development means: any activity that requires a State permit; any activity reviewed by the County Agricultural Board (CAB) and the State Agricultural Development Committee (SADC), and municipal review of any activity not exempted by the Right to Farm Act , N.J.S.A 4:1C-1 et seq.

“Drainage area” means a geographic area within which stormwater, sediments, or dissolved materials drain to a particular receiving waterbody or to a particular point along a receiving waterbody.

“Environmentally critical areas” means an area or feature which is of significant environmental value, including but not limited to: stream corridors; natural heritage priority sites; habitat of endangered or threatened species; large areas of contiguous open space or upland forest; steep slopes; and well head protection and groundwater recharge areas. Habitats of endangered or threatened species are identified using the Department’s Landscape Project as approved by the Department’s Endangered and Nongame Species Program.

“Empowerment Neighborhood” means a neighborhood designated by the Urban Coordinating Council “in consultation and conjunction with” the New Jersey Redevelopment Authority pursuant to N.J.S.A 55:19-69.

“Erosion” means the detachment and movement of soil or rock fragments by water, wind, ice or gravity.

“Impervious surface” means a surface that has been covered with a layer of material so that it is highly resistant to infiltration by water.

"Infiltration" is the process by which water seeps into the soil from precipitation.

"Major development" means any "development" that provides for ultimately disturbing one or more acres of land. Disturbance for the purpose of this rule is the placement of impervious surface or exposure and/or movement of soil or bedrock or clearing, cutting, or removing of vegetation.

"Municipality" means any city, borough, town, township, or village.

"Node" means an area designated by the State Planning Commission concentrating facilities and activities which are not organized in a compact form.

"Nutrient" means a chemical element or compound, such as nitrogen or phosphorus, which is essential to and promotes the development of organisms.

"Person" means any individual, corporation, company, partnership, firm, association, [*Borough of Alpine*], or political subdivision of this State subject to municipal jurisdiction pursuant to the Municipal Land Use Law, N.J.S.A. 40:55D-1 et seq.

"Pollutant" means any dredged spoil, solid waste, incinerator residue, filter backwash, sewage, garbage, refuse, oil, grease, sewage sludge, munitions, chemical wastes, biological materials, medical wastes, radioactive substance (except those regulated under the Atomic Energy Act of 1954, as amended (42 U.S.C. 2011 et seq.)), thermal waste, wrecked or discarded equipment, rock, sand, cellar dirt, industrial, municipal, agricultural, and construction waste or runoff, or other residue discharged directly or indirectly to the land, ground waters or surface waters of the State, or to a domestic treatment works. "Pollutant" includes both hazardous and nonhazardous pollutants.

"Recharge" means the amount of water from precipitation that infiltrates into the ground and is not evapotranspired.

"Sediment" means solid material, mineral or organic, that is in suspension, is being transported, or has been moved from its site of origin by air, water or gravity as a product of erosion.

"Site" means the lot or lots upon which a major development is to occur or has occurred.

"Soil" means all unconsolidated mineral and organic material of any origin.

"State Development and Redevelopment Plan Metropolitan Planning Area (PA1)" means an area delineated on the State Plan Policy Map and adopted by the State Planning Commission that is intended to be the focus for much of the state's future redevelopment and revitalization efforts.

"State Plan Policy Map" is defined as the geographic application of the State Development and Redevelopment Plan's goals and statewide policies, and the official map of these goals and policies.

"Stormwater" means water resulting from precipitation (including rain and snow) that runs off the land's surface, is transmitted to the subsurface, or is captured by separate storm sewers or other sewage or drainage facilities, or conveyed by snow removal equipment.

"Stormwater runoff" means water flow on the surface of the ground or in storm sewers, resulting from precipitation.

“Stormwater management basin” means an excavation or embankment and related areas designed to retain stormwater runoff. A stormwater management basin may either be normally dry (that is, a detention basin or infiltration basin), retain water in a permanent pool (a retention basin), or be planted mainly with wetland vegetation (most constructed stormwater wetlands).

“Stormwater management measure” means any structural or nonstructural strategy, practice, technology, process, program, or other method intended to control or reduce stormwater runoff and associated pollutants, or to induce or control the infiltration or groundwater recharge of stormwater or to eliminate illicit or illegal non-stormwater discharges into stormwater conveyances.

“Tidal Flood Hazard Area” means a flood hazard area, which may be influenced by stormwater runoff from inland areas, but which is primarily caused by the Atlantic Ocean.

“Urban Coordinating Council Empowerment Neighborhood” means a neighborhood given priority access to State resources through the New Jersey Redevelopment Authority.

“Urban Enterprise Zones” means a zone designated by the New Jersey Enterprise Zone Authority pursuant to the New Jersey Urban Enterprise Zones Act, N.J.S.A. 52:27H-60 et. seq.

“Urban Redevelopment Area” is defined as previously developed portions of areas:

- (1) Delineated on the State Plan Policy Map (SPPM) as the Metropolitan Planning Area (PA1), Designated Centers, Cores or Nodes;
- (2) Designated as CAFRA Centers, Cores or Nodes;
- (3) Designated as Urban Enterprise Zones; and
- (4) Designated as Urban Coordinating Council Empowerment Neighborhoods.

“Waters of the State” means the ocean and its estuaries, all springs, streams, wetlands, and bodies of surface or ground water, whether natural or artificial, within the boundaries of the State of New Jersey or subject to its jurisdiction.

“Wetlands” or “wetland” means an area that is inundated or saturated by surface water or ground water 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.

### Section 3: General Standards

#### A. Design and Performance Standards for Stormwater Management Measures

1. Stormwater management measures for major development shall be developed to meet the erosion control, groundwater recharge, stormwater runoff quantity, and stormwater runoff quality standards in Section 4. To the maximum extent practicable, these standards shall be met by incorporating nonstructural stormwater management strategies into the design. If these strategies alone are not sufficient to meet these standards, structural stormwater management measures necessary to meet these standards shall be incorporated into the design.

2. The standards in this ordinance apply only to new major development and are intended to minimize the impact of stormwater runoff on water quality and water quantity in receiving water bodies and maintain groundwater recharge. The standards do not apply to new major development to the extent that alternative design and performance standards are applicable under a regional stormwater management plan or Water Quality Management Plan adopted in accordance with Department rules.

#### Section 4: Stormwater Management Requirements for Major Development

- A. The development shall incorporate a maintenance plan for the stormwater management measures incorporated into the design of a major development in accordance with Section 10.
- B. Stormwater management measures shall avoid adverse impacts of concentrated flow on habitat for threatened and endangered species as documented in the Department' Landscape Project or Natural Heritage Database established under N.J.S.A. 13:1B-15.147 through 15.150, particularly *Helonias bullata* (swamp pink) and/or *Clemmys muhlnebergi* (bog turtle).
- C. The following linear development projects are exempt from the groundwater recharge, stormwater runoff quantity, and stormwater runoff quality requirements of Sections 4.F and 4.G:
1. The construction of an underground utility line provided that the disturbed areas are revegetated upon completion;
  2. The construction of an aboveground utility line provided that the existing conditions are maintained to the maximum extent practicable; and
  3. The construction of a public pedestrian access, such as a sidewalk or trail with a maximum width of 14 feet, provided that the access is made of permeable material.
- D. A waiver from strict compliance from the groundwater recharge, stormwater runoff quantity, and stormwater runoff quality requirements of Sections 4.F and 4.G may be obtained for the enlargement of an existing public roadway or railroad; or the construction or enlargement of a public pedestrian access, provided that the following conditions are met:
1. The applicant demonstrates that there is a public need for the project that cannot be accomplished by any other means;
  2. The applicant demonstrates through an alternatives analysis, that through the use of nonstructural and structural stormwater management strategies and measures, the option selected complies with the requirements of Sections 4.F and 4.G to the maximum extent practicable;
  3. The applicant demonstrates that, in order to meet the requirements of Sections 4.F and 4.G, existing structures currently in use, such as homes and buildings, would need to be condemned; and

4. The applicant demonstrates that it does not own or have other rights to areas, including the potential to obtain through condemnation lands not falling under D.3 above within the upstream drainage area of the receiving stream, that would provide additional opportunities to mitigate the requirements of Sections 4.F and 4.G that were not achievable on-site.

#### E. Nonstructural Stormwater Management Strategies

1. To the maximum extent practicable, the standards in Sections 4.F and 4.G shall be met by incorporating nonstructural stormwater management strategies set forth at Section 4.E into the design. The applicant shall identify the nonstructural measures incorporated into the design of the project. If the applicant contends that it is not feasible for engineering, environmental, or safety reasons to incorporate any nonstructural stormwater management measures identified in Paragraph 2 below into the design of a particular project, the applicant shall identify the strategy considered and provide a basis for the contention.
2. Nonstructural stormwater management strategies incorporated into site design shall:
  - a. Protect areas that provide water quality benefits or areas particularly susceptible to erosion and sediment loss;
  - b. Minimize impervious surfaces and break up or disconnect the flow of runoff over impervious surfaces;
  - c. Maximize the protection of natural drainage features and vegetation;
  - d. Minimize the decrease in the "time of concentration" from pre-construction to post construction. "Time of concentration" is defined as the time it takes for runoff to travel from the hydraulically most distant point of the watershed to the point of interest within a watershed;
  - e. Minimize land disturbance including clearing and grading;
  - f. Minimize soil compaction;
  - g. Provide low-maintenance landscaping that encourages retention and planting of native vegetation and minimizes the use of lawns, fertilizers and pesticides;
  - h. Provide vegetated open-channel conveyance systems discharging into and through stable vegetated areas;
  - i. Provide other source controls to prevent or minimize the use or exposure of pollutants at the site, in order to prevent or minimize the release of those pollutants into stormwater runoff. Such source controls include, but are not limited to:
    - (1) Site design features that help to prevent accumulation of trash and debris in drainage systems, including features that satisfy Section 4.E.3. below;
    - (2) Site design features that help to prevent discharge of trash and debris from drainage systems;

- (3) Site design features that help to prevent and/or contain spills or other harmful accumulations of pollutants at industrial or commercial developments; and
  - (4) When establishing vegetation after land disturbance, applying fertilizer in accordance with the requirements established under the Soil Erosion and Sediment Control Act, N.J.S.A. 4:24-39 et seq., and implementing rules.
3. Site design features identified under Section 4.E.2.i.(2) above shall comply with the following standard to control passage of solid and floatable materials through storm drain inlets. For purposes of this paragraph, "solid and floatable materials" means sediment, debris, trash, and other floating, suspended, or settleable solids. For exemptions to this standard see Section 4.E.3.c below.
- a. Design engineers shall use either of the following grates whenever they use a grate in pavement or another ground surface to collect stormwater from that surface into a storm drain or surface water body under that grate:
    - (1) The New Jersey Department of Transportation (NJDOT) bicycle safe grate, which is described in Chapter 2.4 of the NJDOT Bicycle Compatible Roadways and Bikeways Planning and Design Guidelines (April 1996); or
    - (2) A different grate, if each individual clear space in that grate has an area of no more than seven (7.0) square inches, or is no greater than 0.5 inches across the smallest dimension.

Examples of grates subject to this standard include grates in grate inlets, the grate portion (non-curb-opening portion) of combination inlets, grates on storm sewer manholes, ditch grates, trench grates, and grates of spacer bars in slotted drains. Examples of ground surfaces include surfaces of roads (including bridges), driveways, parking areas, bikeways, plazas, sidewalks, lawns, fields, open channels, and stormwater basin floors.

- b. Whenever design engineers use a curb-opening inlet, the clear space in that curb opening (or each individual clear space, if the curb opening has two or more clear spaces) shall have an area of no more than seven (7.0) square inches, or be no greater than two (2.0) inches across the smallest dimension.
- c. This standard does not apply:
  - (1) Where the review agency determines that this standard would cause inadequate hydraulic performance that could not practicably be overcome by using additional or larger storm drain inlets that meet these standards;
  - (2) Where flows from the water quality design storm as specified in Section 4.G.1 are conveyed through any device (e.g., end of pipe netting facility, manufactured treatment device, or a catch basin hood) that is designed, at a minimum, to prevent delivery of all solid and floatable materials that could not pass through one of the following:
    - (a) A rectangular space four and five-eighths inches long and one and one-half inches wide (this option does not apply for outfall netting facilities); or

- (b) A bar screen having a bar spacing of 0.5 inches.
  - (3) Where flows are conveyed through a trash rack that has parallel bars with one-inch (1") spacing between the bars, to the elevation of the water quality design storm as specified in Section 4.G.1; or
  - (4) Where the New Jersey Department of Environmental Protection determines, pursuant to the New Jersey Register of Historic Places Rules at N.J.A.C. 7:4-7.2(c), that action to meet this standard is an undertaking that constitutes an encroachment or will damage or destroy the New Jersey Register listed historic property.
4. Any land area used as a nonstructural stormwater management measure to meet the performance standards in Sections 4.F and 4.G shall be dedicated to a government agency, subjected to a conservation restriction filed with the appropriate County Clerk's office, or subject to an approved equivalent restriction that ensures that measure or an equivalent stormwater management measure approved by the reviewing agency is maintained in perpetuity.
5. Guidance for nonstructural stormwater management strategies is available in the New Jersey Stormwater Best Management Practices Manual. The BMP Manual may be obtained from the address identified in Section 7, or found on the Department's website at [www.njstormwater.org](http://www.njstormwater.org).

#### F. Erosion Control, Groundwater Recharge and Runoff Quantity Standards

1. This subsection contains minimum design and performance standards to control erosion, encourage and control infiltration and groundwater recharge, and control stormwater runoff quantity impacts of major development.
- a. The minimum design and performance standards for erosion control are those established under the Soil Erosion and Sediment Control Act, N.J.S.A. 4:24-39 et seq. and implementing rules.
  - b. The minimum design and performance standards for groundwater recharge are as follows:
    - (1) The design engineer shall, using the assumptions and factors for stormwater runoff and groundwater recharge calculations at Section 5, either:
      - (a) Demonstrate through hydrologic and hydraulic analysis that the site and its stormwater management measures maintain 100 percent of the average annual pre-construction groundwater recharge volume for the site; or
      - (b) Demonstrate through hydrologic and hydraulic analysis that the increase of stormwater runoff volume from pre-construction to post-construction for the 2-year storm is infiltrated.
    - (2) This groundwater recharge requirement does not apply to projects within the "urban redevelopment area," or to projects subject to (3) below.
    - (3) The following types of stormwater shall not be recharged:



- (a) Stormwater from areas of high pollutant loading. High pollutant loading areas are areas in industrial and commercial developments where solvents and/or petroleum products are loaded/unloaded, stored, or applied, areas where pesticides are loaded/unloaded or stored; areas where hazardous materials are expected to be present in greater than "reportable quantities" as defined by the United States Environmental Protection Agency (EPA) at 40 CFR 302.4; areas where recharge would be inconsistent with Department approved remedial action work plan or landfill closure plan and areas with high risks for spills of toxic materials, such as gas stations and vehicle maintenance facilities; and
- (b) Industrial stormwater exposed to "source material." "Source material" means any material(s) or machinery, located at an industrial facility that is directly or indirectly related to process, manufacturing or other industrial activities, which could be a source of pollutants in any industrial stormwater discharge to groundwater. Source materials include, but are not limited to, raw materials; intermediate products; final products; waste materials; by-products; industrial machinery and fuels, and lubricants, solvents, and detergents that are related to process, manufacturing, or other industrial activities that are exposed to stormwater.
- (4) The design engineer shall assess the hydraulic impact on the groundwater table and design the site so as to avoid adverse hydraulic impacts. Potential adverse hydraulic impacts include, but are not limited to, exacerbating a naturally or seasonally high water table so as to cause surficial ponding, flooding of basements, or interference with the proper operation of subsurface sewage disposal systems and other subsurface structures in the vicinity or downgradient of the groundwater recharge area.
- c. In order to control stormwater runoff quantity impacts, the design engineer shall, using the assumptions and factors for stormwater runoff calculations at Section 5, complete one of the following:
- (1) Demonstrate through hydrologic and hydraulic analysis that for stormwater leaving the site, post-construction runoff hydrographs for the two, 10, and 100-year storm events do not exceed, at any point in time, the pre-construction runoff hydrographs for the same storm events;
  - (2) Demonstrate through hydrologic and hydraulic analysis that there is no increase, as compared to the pre-construction condition, in the peak runoff rates of stormwater leaving the site for the two, 10, and 100-year storm events and that the increased volume or change in timing of stormwater runoff will not increase flood damage at or downstream of the site. This analysis shall include the analysis of impacts of existing land uses and projected land uses assuming full development under existing zoning and land use ordinances in the drainage area;
  - (3) Design stormwater management measures so that the post-construction peak runoff rates for the 2, 10 and 100 year storm events are 50, 75 and 80 percent, respectively, of the pre-construction peak runoff rates. The percentages apply only to the post-construction stormwater runoff that is attributable to the portion of the site on which the proposed development or project is to be constructed. The

percentages shall not be applied to post-construction stormwater runoff into tidal flood hazard areas if the increased volume of stormwater runoff will not increase flood damages below the point of discharge; or

- (4) In tidal flood hazard areas, stormwater runoff quantity analysis in accordance with (1), (2) and (3) above shall only be applied if the increased volume of stormwater runoff could increase flood damages below the point of discharge.
2. Any application for a new agricultural development that meets the definition of major development at Section 2 shall be submitted to the appropriate Soil Conservation District for review and approval in accordance with the requirements of this section and any applicable Soil Conservation District guidelines for stormwater runoff quantity and erosion control. For the purposes of this section, "agricultural development" means land uses normally associated with the production of food, fiber and livestock for sale. Such uses do not include the development of land for the processing or sale of food and the manufacturing of agriculturally related products.

#### G. Stormwater Runoff Quality Standards

1. Stormwater management measures shall be designed to reduce the post-construction load of total suspended solids (TSS) in stormwater runoff by 80 percent of the anticipated load from the developed site, expressed as an annual average. Stormwater management measures shall only be required for water quality control if an additional 1/4 acre of impervious surface is being proposed on a development site. The requirement to reduce TSS does not apply to any stormwater runoff in a discharge regulated under a numeric effluent limitation for TSS imposed under the New Jersey Pollution Discharge Elimination System (NJPDES) rules, N.J.A.C. 7:14A, or in a discharge specifically exempt under a NJPDES permit from this requirement. The water quality design storm is 1.25 inches of rainfall in two hours. Water quality calculations shall take into account the distribution of rain from the water quality design storm, as reflected in Table 1. The calculation of the volume of runoff may take into account the implementation of non-structural and structural stormwater management measures.

| Table 1: Water Quality Design Storm Distribution |                              |                |                              |
|--|------------------------------|----------------|------------------------------|
| Time (Minutes)                                   | Cumulative Rainfall (Inches) | Time (Minutes) | Cumulative Rainfall (Inches) |
| 0  | 0.0000                       | 65             | 0.8917                       |
| 5  | 0.0083                       | 70             | 0.9917                       |
| 10   | 0.0166                       | 75             | 1.0500                       |
| 15   | 0.0250                       | 80             | 1.0840                       |
| 20   | 0.0500                       | 85             | 1.1170                       |
| 25   | 0.0750                       | 90             | 1.1500                       |
| 30   | 0.1000                       | 95             | 1.1750                       |
| 35   | 0.1330                       | 100            | 1.2000                       |
| 40   | 0.1660                       | 105            | 1.2250                       |
| 45   | 0.2000                       | 110            | 1.2334                       |
| 50   | 0.2583                       | 115            | 1.2417                       |
| 55   | 0.3583                       | 120            | 1.2500                       |
| 60   | 0.6250                       |                |                              |

2. For purposes of TSS reduction calculations, Table 2 below presents the presumed removal rates for certain BMPs designed in accordance with the New Jersey Stormwater Best Management Practices Manual. The BMP Manual may be obtained from the address identified in Section 7, or found on the Department's website at [www.njstormwater.org](http://www.njstormwater.org). The BMP Manual and other sources of technical guidance are listed in Section 7. TSS reduction shall be calculated based on the removal rates for the BMPs in Table 2 below. Alternative removal rates and methods of calculating removal rates may be used if the design engineer provides documentation demonstrating the capability of these alternative rates and methods to the review agency. A copy of any approved alternative rate or method of calculating the removal rate shall be provided to the Department at the following address: Division of Watershed Management, New Jersey Department of Environmental Protection, PO Box 418 Trenton, New Jersey, 08625-0418.
3. If more than one BMP in series is necessary to achieve the required 80 percent TSS reduction for a site, the applicant shall utilize the following formula to calculate TSS reduction:

$$R = A + B - (AXB)/100$$

Where

R = total TSS percent load removal from application of both BMPs, and

A = the TSS percent removal rate applicable to the first BMP

B = the TSS percent removal rate applicable to the second BMP

| Best Management Practice       | TSS Percent Removal Rate |
|--------------------------------|--------------------------|
| Bioretention Systems           | 90                       |
| Constructed Stormwater Wetland | 90                       |
| Extended Detention Basin       | 40-60                    |
| Infiltration Structure         | 80                       |
| Manufactured Treatment Device  | See Section 6.C          |
| Sand Filter                    | 80                       |
| Vegetative Filter Strip        | 60-80                    |
| Wet Pond                       | 50-90                    |

4. If there is more than one onsite drainage area, the 80 percent TSS removal rate shall apply to each drainage area, unless the runoff from the subareas converge on site in which case the removal rate can be demonstrated through a calculation using a weighted average.
5. Stormwater management measures shall also be designed to reduce, to the maximum extent feasible, the post-construction nutrient load of the anticipated load from the developed site in stormwater runoff generated from the water quality design storm. In achieving reduction of nutrients to the maximum extent feasible, the design of the site shall include nonstructural strategies and structural measures that optimize nutrient removal while still achieving the performance standards in Sections 4.F and 4.G.
6. Additional information and examples are contained in the New Jersey Stormwater Best Management Practices Manual, which may be obtained from the address identified in Section 7.
7. In accordance with the definition of FW1 at N.J.A.C. 7:9B-1.4, stormwater management measures shall be designed to prevent any increase in stormwater runoff to waters classified as FW1.
8. Special water resource protection areas shall be established along all waters designated Category One at N.J.A.C. 7:9B, and perennial or intermittent streams that drain into or upstream of the Category One waters as shown on the USGS Quadrangle Maps or in the County Soil Surveys, within the associated HUC14 drainage area. These areas shall be established for the protection of water quality, aesthetic value, exceptional ecological significance, exceptional recreational significance, exceptional water supply significance,



and exceptional fisheries significance of those established Category One waters. These areas shall be designated and protected as follows:

a. The applicant shall preserve and maintain a special water resource protection area in accordance with one of the following:

(1) A 300-foot special water resource protection area shall be provided on each side of the waterway, measured perpendicular to the waterway from the top of the bank outwards or from the centerline of the waterway where the bank is not defined, consisting of existing vegetation or vegetation allowed to follow natural succession is provided. (2) Encroachment within the designated special water resource protection area under Subsection (1) above shall only be allowed where previous development or disturbance has occurred (for example, active agricultural use, parking area or maintained lawn area). The encroachment shall only be allowed where applicant demonstrates that the functional value and overall condition of the special water resource protection area will be maintained to the maximum extent practicable. In no case shall the remaining special water resource protection area be reduced to less than 150 feet as measured perpendicular to the top of bank of the waterway or centerline of the waterway where the bank is undefined. All encroachments proposed under this subparagraph shall be subject to review and approval by the Department.

b. All stormwater shall be discharged outside of and flow through the special water resource protection area and shall comply with the Standard for Off-Site Stability in the "Standards For Soil Erosion and Sediment Control in New Jersey," established under the Soil Erosion and Sediment Control Act, N.J.S.A. 4:24-39 et seq.

c. If stormwater discharged outside of and flowing through the special water resource protection area cannot comply with the Standard For Off-Site Stability in the "Standards for Soil Erosion and Sediment Control in New Jersey," established under the Soil Erosion and Sediment Control Act, N.J.S.A. 4:24-39 et seq., then the stabilization measures in accordance with the requirements of the above standards may be placed within the special water resource protection area, provided that:

(1) Stabilization measures shall not be placed within 150 feet of the Category One waterway;

(2) Stormwater associated with discharges allowed by this section shall achieve a 95 percent TSS post-construction removal rate;

(3) Temperature shall be addressed to ensure no impact on the receiving waterway;

(4) The encroachment shall only be allowed where the applicant demonstrates that the functional value and overall condition of the special water resource protection area will be maintained to the maximum extent practicable;

(5) A conceptual project design meeting shall be held with the appropriate Department staff and Soil Conservation District staff to identify necessary stabilization measures; and

(6) All encroachments proposed under this section shall be subject to review and approval by the Department.

- d. A stream corridor protection plan may be developed by a regional stormwater management planning committee as an element of a regional stormwater management plan, or by a municipality through an adopted municipal stormwater management plan. If a stream corridor protection plan for a waterway subject to Section 4.G(8) has been approved by the Department of Environmental Protection, then the provisions of the plan shall be the applicable special water resource protection area requirements for that waterway. A stream corridor protection plan for a waterway subject to G.8 shall maintain or enhance the current functional value and overall condition of the special water resource protection area as defined in G.8.a.(1) above. In no case shall a stream corridor protection plan allow the reduction of the Special Water Resource Protection Area to less than 150 feet as measured perpendicular to the waterway subject to this subsection.
- e. Paragraph G.8 does not apply to the construction of one individual single family dwelling that is not part of a larger development on a lot receiving preliminary or final subdivision approval on or before February 2, 2004 , provided that the construction begins on or before February 2, 2009.
- f. The following watercourses in the Borough of Alpine have been identified as Category One watercourses; Cresskill Brook, Demarest Brook, Anderson Brook, Dwars Kill Brook, and Sparkill Brook.

#### Section 5: Calculation of Stormwater Runoff and Groundwater Recharge

- A. Stormwater runoff shall be calculated in accordance with the following:
  1. The design engineer shall calculate runoff using one of the following methods:
    - a. The USDA Natural Resources Conservation Service (NRCS) methodology, including the NRCS Runoff Equation and Dimensionless Unit Hydrograph, as described in the NRCS National Engineering Handbook Section 4 – Hydrology and Technical Release 55 – Urban Hydrology for Small Watersheds; or
    - b. The Rational Method for peak flow and the Modified Rational Method for hydrograph computations.
  2. For the purpose of calculating runoff coefficients and groundwater recharge, there is a presumption that the pre-construction condition of a site or portion thereof is a wooded land use with good hydrologic condition. The term “runoff coefficient” applies to both the NRCS methodology at Section 5.A.1.a and the Rational and Modified Rational Methods at Section 5.A.1.b. A runoff coefficient or a groundwater recharge land cover for an existing condition may be used on all or a portion of the site if the design engineer verifies that the hydrologic condition has existed on the site or portion of the site for at least five years without interruption prior to the time of application. If more than one land cover have existed on the site during the five years immediately prior to the time of application, the land cover with the lowest runoff potential shall be used for the computations. In addition, there is the presumption that the site is in good hydrologic condition (if the land use type is pasture, lawn, or park), with good cover (if the land use type is woods), or with good hydrologic condition and conservation treatment (if the land use type is cultivation).

3. In computing pre-construction stormwater runoff, the design engineer shall account for all significant land features and structures, such as ponds, wetlands, depressions, hedgerows, or culverts that may reduce pre-construction stormwater runoff rates and volumes.
4. In computing stormwater runoff from all design storms, the design engineer shall consider the relative stormwater runoff rates and/or volumes of pervious and impervious surfaces separately to accurately compute the rates and volume of stormwater runoff from the site. To calculate runoff from unconnected impervious cover, urban impervious area modifications as described in the NRCS Technical Release 55 – Urban Hydrology for Small Watersheds and other methods may be employed.
5. If the invert of the outlet structure of a stormwater management measure is below the flood hazard design flood elevation as defined at N.J.A.C. 7:13, the design engineer shall take into account the effects of tailwater in the design of structural stormwater management measures.

B. Groundwater recharge may be calculated in accordance with the following:

1. The New Jersey Geological Survey Report GSR-32 A Method for Evaluating Groundwater Recharge Areas in New Jersey, incorporated herein by reference as amended and supplemented. Information regarding the methodology is available from the New Jersey Stormwater Best Management Practices Manual; at <http://www.state.nj.us/dep/njgs/>; or at New Jersey Geological Survey, 29 Arctic Parkway, P.O. Box 427 Trenton, New Jersey 08625-0427; (609) 984-6587.

## Section 6: Standards for Structural Stormwater Management Measures

A. Standards for structural stormwater management measures are as follows:

1. Structural stormwater management measures shall be designed to take into account the existing site conditions, including, for example, environmentally critical areas, wetlands; flood-prone areas; slopes; depth to seasonal high water table; soil type, permeability and texture; drainage area and drainage patterns; and the presence of solution-prone carbonate rocks (limestone).
2. Structural stormwater management measures shall be designed to minimize maintenance, facilitate maintenance and repairs, and ensure proper functioning. Trash racks shall be installed at the intake to the outlet structure as appropriate, and shall have parallel bars with one-inch (1") spacing between the bars to the elevation of the water quality design storm. For elevations higher than the water quality design storm, the parallel bars at the outlet structure shall be spaced no greater than one-third (1/3) the width of the diameter of the orifice or one-third (1/3) the width of the weir, with a minimum spacing between bars of one-inch and a maximum spacing between bars of six inches. In addition, the design of trash racks must comply with the requirements of Section 8.D.
3. Structural stormwater management measures shall be designed, constructed, and installed to be strong, durable, and corrosion resistant. Measures that are consistent with the relevant portions of the Residential Site Improvement Standards at N.J.A.C. 5:21-7.3, 7.4, and 7.5 shall be deemed to meet this requirement.

4. At the intake to the outlet from the stormwater management basin, the orifice size shall be a minimum of two and one-half inches in diameter.

5. Stormwater management basins shall be designed to meet the minimum safety standards for stormwater management basins at Section 8.

B. Stormwater management measure guidelines are available in the New Jersey Stormwater Best Management Practices Manual. Other stormwater management measures may be utilized provided the design engineer demonstrates that the proposed measure and its design will accomplish the required water quantity, groundwater recharge and water quality design and performance standards established by Section 4 of this ordinance.

C. Manufactured treatment devices may be used to meet the requirements of Section 4 of this ordinance, provided the pollutant removal rates are verified by the New Jersey Corporation for Advanced Technology and certified by the Department.

#### Section 7: Sources for Technical Guidance

A. Technical guidance for stormwater management measures can be found in the documents listed at 1 and 2 below, which are available from Maps and Publications, New Jersey Department of Environmental Protection, 428 East State Street, P.O. Box 420, Trenton, New Jersey, 08625; telephone (609) 777-1038.

1. Guidelines for stormwater management measures are contained in the New Jersey Stormwater Best Management Practices Manual, as amended. Information is provided on stormwater management measures such as: bioretention systems, constructed stormwater wetlands, dry wells, extended detention basins, infiltration structures, manufactured treatment devices, pervious paving, sand filters, vegetative filter strips, and wet ponds.

2. The New Jersey Department of Environmental Protection Stormwater Management Facilities Maintenance Manual, as amended.

B. Additional technical guidance for stormwater management measures can be obtained from the following:

1. The "Standards for Soil Erosion and Sediment Control in New Jersey" promulgated by the State Soil Conservation Committee and incorporated into N.J.A.C. 2:90. Copies of these standards may be obtained by contacting the State Soil Conservation Committee or any of the Soil Conservation Districts listed in N.J.A.C. 2:90-1.3(a)4. The location, address, and telephone number of each Soil Conservation District may be obtained from the State Soil Conservation Committee, P.O. Box 330, Trenton, New Jersey 08625; (609) 292-5540;

2. The Rutgers Cooperative Extension Service, 732-932-9306; and

3. The Soil Conservation Districts listed in N.J.A.C. 2:90-1.3(a)4. The location, address, and telephone number of each Soil Conservation District may be obtained from the State Soil Conservation Committee, P.O. Box 330, Trenton, New Jersey, 08625, (609) 292-5540.



## Section 8: Safety Standards for Stormwater Management Basins

A. This section sets forth requirements to protect public safety through the proper design and operation of stormwater management basins. This section applies to any new stormwater management basin.

### B. Requirements for Trash Racks, Overflow Grates and Escape Provisions

1. A trash rack is a device designed to catch trash and debris and prevent the clogging of outlet structures. Trash racks shall be installed at the intake to the outlet from the stormwater management basin to ensure proper functioning of the basin outlets in accordance with the following:

- a. The trash rack shall have parallel bars, with no greater than six inch spacing between the bars.
- b. The trash rack shall be designed so as not to adversely affect the hydraulic performance of the outlet pipe or structure.
- c. The average velocity of flow through a clean trash rack is not to exceed 2.5 feet per second under the full range of stage and discharge. Velocity is to be computed on the basis of the net area of opening through the rack.
- d. The trash rack shall be constructed and installed to be rigid, durable, and corrosion resistant, and shall be designed to withstand a perpendicular live loading of 300 lbs/ft sq.

2. An overflow grate is designed to prevent obstruction of the overflow structure. If an outlet structure has an overflow grate, such grate shall meet the following requirements:

- a. The overflow grate shall be secured to the outlet structure but removable for emergencies and maintenance.
- b. The overflow grate spacing shall be no less than two inches across the smallest dimension.
- c. The overflow grate shall be constructed and installed to be rigid, durable, and corrosion resistant, and shall be designed to withstand a perpendicular live loading of 300 lbs./ft sq.

3. For purposes of this paragraph 3, escape provisions means the permanent installation of ladders, steps, rungs, or other features that provide easily accessible means of egress from stormwater management basins. Stormwater management basins shall include escape provisions as follows:

- a. If a stormwater management basin has an outlet structure, escape provisions shall be incorporated in or on the structure. With the prior approval of the reviewing agency identified in Section 8.C a free-standing outlet structure may be exempted from this requirement.

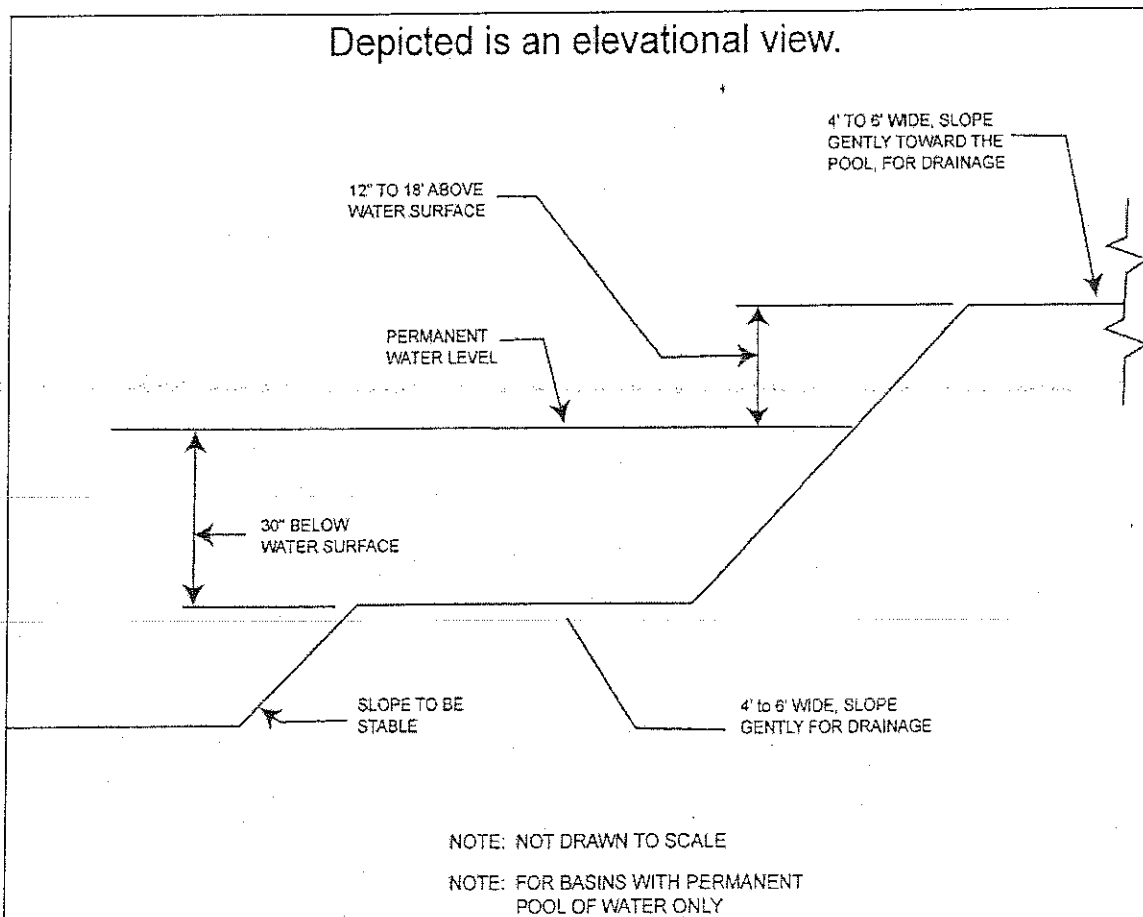
b. Safety ledges shall be constructed on the slopes of all new stormwater management basins having a permanent pool of water deeper than two and one-half feet. Such safety ledges shall be comprised of two steps. Each step shall be four to six feet in width. One step shall be located approximately two and one-half feet below the permanent water surface, and the second step shall be located one to one and one-half feet above the permanent water surface. See Section 8.D for an illustration of safety ledges in a stormwater management basin.

c. In new stormwater management basins, the maximum interior slope for an earthen dam, embankment, or berm shall not be steeper than 3 horizontal to 1 vertical.

### C. Variance or Exemption from Safety Standards

1. A variance or exemption from the safety standards for stormwater management basins may be granted only upon a written finding by the appropriate reviewing agency (municipality, county or Department) that the variance or exemption will not constitute a threat to public safety.

### D. Illustration of Safety Ledges in a New Stormwater Management Basin



## A. 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 at Section 9.C below as part of the submission of the applicant's application for subdivision or site plan approval. These requirements shall be in addition to the requirements specified under Borough Ordinance No. 583 ("Checklist Ordinance").
2. The applicant shall demonstrate that the project meets the standards set forth in this ordinance.
3. The applicant shall submit sixteen (16) copies of the materials listed in the checklist for site development stormwater plans in accordance with Section 9.C of this ordinance.

## B. Site Development Stormwater Plan Approval

The applicant's Site Development project 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 of the checklist requirements have been satisfied and to determine if the project meets the standards set forth in this ordinance.

## C. Checklist Requirements

The following information shall be required:

### 1. Topographic Base Map

The reviewing engineer may require upstream tributary drainage system information as necessary. It is recommended that the topographic base map of the site 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 as appropriate may indicate the following: existing surface water drainage, shorelines, steep slopes, soils, erodible soils, perennial or intermittent streams that drain into or upstream of the Category One waters, wetlands and flood plains along with their appropriate buffer strips, 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.

### 2. Environmental Site Analysis

A written and graphic description of the natural and man-made features of the site and its environs. This description should include a discussion of soil conditions, slopes, wetlands, waterways 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 ground water elevations. A written description of the site plan and justification of proposed changes in natural conditions may also be provided.

#### 4. Land Use Planning and Source Control Plan

This plan shall provide a demonstration of how the goals and standards of Sections 3 through 6 are being met. The focus of this plan shall be to describe how the site is being developed to meet the objective of controlling potential groundwater recharge, stormwater quality and stormwater quantity problems at the source by land management and source controls whenever possible.

#### 5. Stormwater Management Facilities Map

The following information, 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, 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 stormwater.
- 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.

#### 6. Calculations

- a. Comprehensive hydrologic and hydraulic design calculations for the pre-development and post-development conditions for the design storms specified in Section 4 of this ordinance.
- b. 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 onsite 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 soils present at the location of the control measure.

#### 7. Maintenance and Repair Plan

The design and planning of the stormwater management facility shall meet the maintenance requirements of Section 10.

#### 8. Waiver from Submission Requirements

The municipal official or board reviewing an application under this ordinance may, in consultation with the municipal engineer, waive submission of any of the requirements in Sections 9.C.1 through 9.C.6 of this ordinance when it can be demonstrated that the



information requested is impossible to obtain or it would create a hardship on the applicant to obtain and its absence will not materially affect the review process.

## Section 10: Maintenance and Repair

### A. Applicability

1. Projects subject to review as in Section 1.C of this ordinance shall comply with the requirements of Sections 10.B and 10.C.

### B. General Maintenance

1. The design engineer shall prepare a maintenance plan for the stormwater management measures incorporated into the design of a major development.
2. The maintenance plan shall contain specific preventative maintenance tasks and schedules; cost estimates, including estimated cost of sediment, debris, or trash removal; and the name, address, and telephone number of the person or persons responsible for preventative and corrective maintenance (including replacement). Maintenance guidelines for stormwater management measures are available in the New Jersey Stormwater Best Management Practices Manual. If the maintenance plan identifies a person other than the developer (for example, a public agency or homeowners' association) as having the responsibility for maintenance, the plan shall include documentation of such person's agreement to assume this responsibility, or of the developer's obligation to dedicate a stormwater management facility to such person under an applicable ordinance or regulation.
3. Responsibility for maintenance shall not be assigned or transferred to the owner or tenant of an individual property in a residential development or project, unless such owner or tenant owns or leases the entire residential development or project.
4. If the person responsible for maintenance identified under Section 10.B.2 above is not a public agency, the maintenance plan and any future revisions based on Section 10.B.7 below shall be recorded upon the deed of record for each property on which the maintenance described in the maintenance plan must be undertaken.
5. Preventative and corrective maintenance shall be performed to maintain the function of the stormwater management measure, including repairs or replacement to the structure; removal of sediment, debris, or trash; restoration of eroded areas; snow and ice removal; fence repair or replacement; restoration of vegetation; and repair or replacement of nonvegetated linings.
6. The person responsible for maintenance identified under Section 10.B.2 above shall maintain a detailed log of all preventative and corrective maintenance for the structural stormwater management measures incorporated into the design of the development, including a record of all inspections and copies of all maintenance-related work orders.
7. The person responsible for maintenance identified under Section 10.B.2 above shall evaluate the effectiveness of the maintenance plan at least once per year and adjust the plan and the deed as needed.

8. The person responsible for maintenance identified under Section 10.B.2 above shall retain and make available, upon request by any public entity with administrative, health, environmental, or safety authority over the site, the maintenance plan and the documentation required by Sections 10.B.6 and 10.B.7 above.

9. The requirements of Sections 10.B.3 and 10.B.4 do not apply to stormwater management facilities that are dedicated to and accepted by the municipality or another governmental agency.

10. 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 or repair, 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. The municipality, in its discretion, may extend the time allowed for effecting maintenance and repair for good cause. If the responsible person fails or refuses to perform such maintenance and repair, the municipality or County may immediately proceed to do so and shall bill the cost thereof to the responsible person.

B. Nothing in this section shall preclude the municipality in which the major development is located from requiring the posting of a performance or maintenance guarantee in accordance with N.J.S.A. 40:55D-53.

#### Section 11: Penalties

Any person who erects, constructs, alters, repairs, converts, maintains, or uses any building, structure or land in violation of this ordinance shall be subject to up to the maximum penalty prescribed by law.

#### Section 12: Effective Date

This ordinance shall take effect immediately upon the approval by the county review agency, or sixty (60) days from the receipt of the ordinance by the county review agency if the county review agency should fail to act.

#### Section 13: Severability

If the provisions of any 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 section, subsection, paragraph, subdivision, or clause of this ordinance.

**BE IT FURTHER ORDAINED** that this Ordinance shall take effect upon passage and publication as required by law.

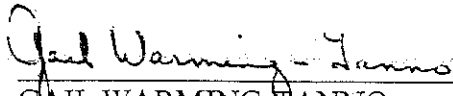
ADOPTED: This 22nd day of March 2006 by roll call vote as follows:

Ayes: Frankel, Garjian, Gerstein, Siegal

Nays:

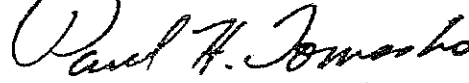
Absent: Cacouris, Merians

ATTEST:



GAIL WARMING-YANNO  
Borough Clerk

APPROVED:



PAUL H. TOMASKO, MAYOR