

Options for Town Stormwater Management Standards
An Engineering Department Staff Report
September 18, 2002

This summary and the following tables outline three alternative sets of standards for the Town Stormwater Management Program. The standards are classified as Minimum, Moderate and High. The tables include general implications or impacts of each standard. The clearest impacts are related to staff resources and development costs.

Minimum Standards represent what is required by the National Pollutant Discharge Elimination System (NPDES Phase 2), which are considerably more stringent than current Town requirements. Moderate Standards represent what is included in the Third Draft of the Land Use Management Ordinance. High Standards would be more stringent.

Introduction

The Town's Development Ordinance currently addresses stormwater management for infrequent, larger storm events and requires control measures on commercial and institutional development. However, we do not currently manage stormwater for all types of new development or for the more frequent, smaller storm events.

By March 10, 2003, the Town of Chapel Hill will need to meet mandates resulting from the Clean Water Act, National Pollutant Discharge Elimination System (NPDES Phase 2) with stormwater runoff controls for water quality treatment. A revised stormwater management program, based on reasonable regulations and standards, is needed to effectively meet these mandates and the community's desire for improved stormwater management.

The attached Minimum Standards are more stringent than the Town Development Ordinance's present stormwater management standards. The standards in the Third Draft Land Use Management Ordinance are even more stringent than those, and include additional standards related to peak discharge rate and volume management.

Service Categories

The proposed Stormwater Management Program has three service categories:

- Water Quality Treatment
- Peak Discharge Rate
- Volume

Water Quality Treatment

Water quality treatment is required under the NPDES Phase 2 regulations. This mandate is intended to improve surface water quality primarily by removing the suspended

pollutants from non-point source stormwater runoff and by reducing erosive forces on stream banks.

Non-point source pollution is defined as pollution that is not created from a specific outfall, such as a wastewater treatment plant or industrial waste. Non-point source pollution is carried in stormwater runoff from all developed areas including residential sub-divisions, office parks, schools, shopping centers, lawns, parks, golf courses and parking lots.

Engineered best management practices (or integrated management practices) provide a variety of options to manage non-point source stormwater runoff and meet the water quality treatment requirement. Vegetated swales, sheet flow through buffers and rain gardens are examples of integrated management practices. Such provisions must be included in site development plans.

Under NPDES Phase 2, the Town must meet six measures that require the following general programs:

1. A public education and outreach program
2. A public involvement and participation program
3. A program to detect and eliminate illicit discharges in the storm drainage system
4. A program to reduce pollutants from construction activities
5. A program to address post-construction stormwater runoff from new development and redevelopment projects that cumulatively disturb one acre or greater
6. A pollution prevention/good housekeeping program for municipal operations and maintenance facilities

The NPDES water quality treatment standards described above are included in the attached Minimum Standards table. These new standards alone will have a significant impact on the Town's responsibilities and on development requirements for stormwater management.

Higher water quality standards are included in the attached Moderate Standards and High Standards tables. These standards include current regulations such as the Resource Conservation District Ordinance and the Water Supply Watershed Rules.

Peak Discharge Rate

Managing the peak discharge rate requires collecting stormwater (in a basin, temporary pond, underground structure, or by other means) and metering its release so that the rate at which it leaves the site after development is no greater than the rate at which it left the site before development.

The Town currently requires that commercial and industrial development manage the 10-year or the 25-year storm event (storms with a 10% and 4% chance, respectively, of occurring in any one year.) While we are managing these rare events now, more frequent storm events are not currently managed for peak discharge rate. The 10-year or 25-year storm event management practice is effective for water quantity or flood control purposes only.

We expect that NPDES Phase 2 will mandate management of the more frequent 1-year, 24-hour storm event (99% or greater chance of occurring in any one year) as a part of the NPDES required measures. This post-construction standard is included in the attached Minimum Standards table for the peak discharge rate, and is intended to protect stream channels from erosion and improve water quality by removing suspended solids.

In addition to meeting the minimum NPDES Phase 2 standards, the Town may wish to implement a higher standard for peak discharge rate, as is proposed in the Third Draft Land Use Management Plan. The proposed standards include the 2-year and 25-year storm events, as well as the 1-year storm. The intent would be to maintain pre-development runoff characteristics in the post-development environment to better protect streams, drainage systems and properties from more frequent and/or higher pollutant loads, discharge rates, volumes and velocities.

It is important to note that the Town is already near build-out, and existing flood risks will not be significantly reduced by regulating new development for discharge rate and volume. Reduction of actual flood damages and losses in Chapel Hill requires long term measures beyond what could be included in the Land Use Management Ordinance. The Town's adopted Hazard Mitigation Plan describes measures applicable to both new and existing development that can be implemented over a period of time.

Volume

Volume control in Chapel Hill is currently required only within the Water Supply Watershed area, which includes the land area within five miles of Jordan Lake. Under this requirement, runoff from the first inch of precipitation falling on an area with greater than 24% impervious surface must be temporarily detained in an engineered facility. The actual storage volume over a multi-hour period depends upon the size of the area draining to the facility and the allowable draw-down time.

We think that the requirement to manage runoff volume from the first inch of precipitation is likely to be included in the NPDES Phase 2 standards, as one way to achieve the 85% average annual suspended solids removal requirement. In most cases, the volume of runoff resulting from the first inch of precipitation would be less than the volume resulting from the 2-year, 24-hour storm event as proposed in the Third Draft Land Use Management Ordinance.

The proposed standard would require that the increased runoff volume resulting from new development be temporarily stored and managed for an unspecified period of time by hydrologic abstraction, re-use or recycling. Hydrologic abstraction is the uptake of

precipitation-induced runoff by soil, plants, and evaporative processes. Uptake rates of these processes depend on many factors such as soil conditions and types, plant species and density, and weather conditions.

The actual 2-year, 24-hour equivalent volume storage requirement depends upon several factors such as drainage area, existing and proposed site conditions and allowable draw-down time. Generally, the longer the draw-down time, the greater the storage capacity requirement. Standard engineering practices typically specify draw-down times between 24-120 hours for water quality purposes. Considerations such as mosquito larvae development and site constraints must also be considered in determining an acceptable draw-down time.

Additionally, managing runoff volume on small properties and typical residential lots may be difficult or impossible due to space and grade limitations, Resource Conservation District requirements, and tree protection regulations. Because of the variability in most of the factors regarding management of stormwater runoff volume, we are unable to predict exactly how or if runoff volume from the 2-year, 24-hour storm event can practically be managed on all development sites.

Conclusions

The Town of Chapel Hill does not have stormwater management standards for water quality treatment and minimum flood control in the current Development Ordinance. If the new Land Use Management Ordinance includes the minimum standards required to meet the NPDES Phase 2 rules, it will represent a significant increase in stormwater management regulation. The standards proposed in the Third Draft represent the Moderate Standards listed in the attached Table Two, which is a still higher level of regulation..

Each standard identified and described in the attached tables has implications for the Town and for property owners. These include the potential cost for additional staff resources and/or contract services; the possibility of increased development and housing costs; the practicality of implementing regulations on all properties regardless of size and; the combined effect and compatibility of the extensive set of new regulations.

**Stormwater Management Program
Minimum Standards**

Service Categories	Standards	Regulatory Mandates	Town Impacts	Property Owner Impacts
<p>Prepare and submit NPDES Phase 2 Permit application</p>	<p>National Pollutant Discharge Elimination System Permit (NPDES Phase 2)</p>	<p>\$6,000 cost for permit application template. Allocate current Town staff resources for preparation of application.</p>	<p>No direct impacts</p>	
<p>Implement and enforce requirement for 85% average annual total suspended solids removal.</p>	<p>"</p>	<p>Implementation of NPDES Phase 2 requirements will require addition of staff resources for permit administration and implementation of pollution prevention, public education and public participation programs; and additional staff resources to identify illicit connections & pollutant discharges, & to inspect & approve pollutant mitigation measures.</p>	<p>Developers will be required to design and install facilities to meet water quality standards. Owners will be required to assume responsibility for operation & maintenance of such facilities.</p>	
<p>Develop & implement a pollution prevention/good housekeeping program for all municipal operations</p>	<p>"</p>	<p>"</p>	<p>None</p>	
<p>Map and manage town storm sewer drainage infrastructure on Geographic Information System (GIS)</p>	<p>"</p>	<p>"</p>	<p>None</p>	
<p>Identify and eliminate illicit connections and other pollutant discharges.</p>	<p>"</p>	<p>"</p>	<p>Identified sources of pollutants and/or illicit connections would require corrective action approved by the Town.</p>	
<p>Develop & implement a public education & participation program</p>	<p>"</p>	<p>"</p>	<p>None</p>	
<p>Implement & enforce water supply watershed rules</p>	<p>NC Department of Environment and Natural Resources, Division of Water Quality</p>	<p>Allocate current Town staff resources to monitor and enforce this standard.</p>	<p>Depending on impervious surface percentage, developers are required to install permanent retention ponds for water quality protection. Owners are required to post perpetual maintenance bonds, provide annual inspections, & maintain/operate ponds.</p>	

**Stormwater Management Program
Minimum Standards**

Service Categories	Standards	Regulatory Mandates	Town Impacts	Property Owner Impacts
Discharge Rate	<p>Post-construction peak discharge rate shall not exceed pre-construction peak discharge rate for the 1-yr., 24-hour frequency event</p>	<p>National Pollutant Discharge Elimination System Permit (NPDES Phase 2)</p>	<p>Additional Town staff resources noted above would monitor and enforce this standard.</p>	<p>Developers will be required to design and install facilities to meet stormwater discharge rate standards. Owners will be required to assume responsibility for operation & maintenance of such facilities.</p>
Volume	<p>First 1" of precipitation equivalent volume (required by water supply watershed regulations under some circumstances)</p>	<p>NC Department of Environment and Natural Resources, Division of Water Quality</p>	<p>Additional Town staff resources noted above would monitor and enforce this standard.</p>	<p>Depending on impervious surface percentage, developers are required to install permanent retention ponds for water quality protection. Owners are required to post perpetual maintenance bonds, provide annual inspections, & maintain/operate ponds.</p>

**Stormwater Management Program
Moderate Standards**

Note: Standards and Information in this table are in addition to those identified in Table One.

Service Categories	Standards	Regulatory Mandates	Town Impacts	Property Owner Impacts
Water Quality Treatment	Expand illicit connection & pollutant discharge identification and elimination program	National Pollutant Discharge Elimination System Permit (NPDES Phase 2)	Additional staff resources noted in Table One would implement and enforce this standard.	Enforcement activities of detected illicit discharges from private property requires elimination action.
	Implement water quality testing program	None	A moderate sampling program is already in place using current Town staff & equipment.	Analysis of testing results may identify pollutants requiring mitigation by developers/business/property owners.
	Apply Resource Conservation District Regulations	Town Land Use Management Ordinance	Re-allocate current Town staff resources to provide for increased number of field determinations & enforcement of expanded regulations.	Key impacts would be associated with the increase in RCD protected areas and how that would affect the land use and design. (Refer to separate discussion on RCD impacts in the Land Use Management Ordinance discussion.)
Discharge Rate	Post-construction peak discharge rate shall not exceed pre-construction peak discharge rate for the 2-yr. and 25-yr., 24-hour frequency storm event.	Town Land Use Management Ordinance	Additional Town staff resources noted in Table One would monitor and enforce this standard.	Developers would be required to design and install facilities to meet stormwater discharge rate standards. Owners would be required to assume responsibility for operation & maintenance of such facilities.

**Stormwater Management Program
Moderate Standards**

Service Categories	Standards	Regulatory Mandates	Town Impacts	Property Owner Impacts
Volume	<p>Post-construction runoff volume shall not exceed pre-construction runoff volume for the 2-yr., 24-hour frequency</p>	<p>Town Land Use Management Ordinance</p>	<p>Additional Town staff resources noted in Table One would monitor and enforce this standard.</p>	<p>Significant land area would need to be dedicated to capture & hold runoff volume. Depending on land topography, this standard could significantly impact development feasibility for many properties.</p>

**Stormwater Management Program
High Standards**

Note: Standards and Information in this table are in addition to those identified in Table One and Table Two.

Service Categories	Standards	Regulatory Mandates	Town Impacts	Property Owner Impacts
Water Quality Treatment	Implement Stream and Riparian Restoration Program	None	Additional Town staff resources and necessary field equipment would be required.	Would require private property owner cooperation
Expand water quality testing/improvement program & establish/enforce local standards for pollutant levels.	Existing standards for Waters of the State and, potentially, future Total Maximum Daily Loads (TMDL's) and Cape Fear River Basin requirements.	Additional Town staff resources noted above & in Table One would implement & enforce this standard.	A wider range of identified sources of pollutants and/or illicit connections would require corrective action as directed by the Town.	
Perform comprehensive watershed modeling and planning	None	Additional Town staff resources and computer modeling equipment would be required.	None	
Post-construction peak discharge rate shall not exceed pre-construction peak discharge rate for the 50-yr. and 100-yr., 24-hour frequency storm event(s).	Town Land Use Management Ordinance	Additional Town staff resources noted above & in Table One would monitor & enforce this standard.	Developers would be required to design and install facilities to meet stormwater discharge rate standards. Owners would be required to assume responsibility for operation & maintenance of such facilities.	

Discharge Rate

Stormwater Management Program
High Standards

Service Categories	Standards	Regulatory Mandates	Town Impacts	Property Owner Impacts
<p>Volume</p>	<p>Post-construction runoff volume storm events greater than the 2-yr., 24-hr. frequency event.</p>	<p>Town Land Use Management Ordinance</p>	<p>Additional Town staff noted above & in Table One would monitor & enforce this standard.</p>	<p>Significant land area would need to be dedicated to capture & hold runoff volume. Depending on land topography, this standard could significantly impact development feasibility for many properties.</p>