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PRACTICE WATERSHED PLANNING



Integrating Stormwater Regulation and Urban Design

By Lisa Nisenson

Landmark Supreme Court decisions are the yardsticks by which we judge the constant battle over who can do what and where.

But every once in a while, groundbreaking events in land use are not heralded by headlines, but rather are contained in the tiny font of local newspaper notices, footnotes, or within regulatory bulletins such as the U.S. government's *Federal Register*.

On December 9, 1999, one such final notice was issued by the U.S. Environmental Protection Agency (EPA) in the vernacular of water engineers under the heading "Stormwater." Terms such as "National Pollutant Discharge Elimination System" and "non-structural techniques" are largely unfamiliar to land-use and zoning managers. The EPA regulation contained two curious clauses that are as much land use as they are water quality. First, the notice directed over 5,000 cities across the country to consider for the first time "post-construction" stormwater control. More importantly, the notice instructed that these new post-construction rules be implemented "by ordinance or other regulatory mechanism" (i.e., zoning and land development regulations).

Most cities have engaged in stormwater control for decades though drainage requirements. But the new EPA rules challenge the old engineering approaches of draining a city's runoff into the most convenient local stream. The new approach scrutinizes the capture and handling of stormwater in nearly every site plan proposal to lessen the impacts of development.

This issue of *Zoning Practice* will demystify the new requirements, link them to common zoning and planning efforts already under way, and offer cautionary observations about the potential for unintended results when merging land-use and water regulations.

NATIONAL POLLUTANT DISCHARGE ELIMINATION SYSTEM

The National Pollutant Discharge Elimination System (NPDES) is the section of the Clean



U.S. EPA

➡ (Above) Abacoa, Florida, was developed with greenways to handle stormwater; (Right) Emergency response can be supported in creative ways that eliminate excess pavement.



Dan Burden



USDA

(Above) As streams are scoured by pulses of water, sediment deposits and weak stream banks undermine the waterway's ability to handle stormwater, which can contribute to local flooding.

Water Act that regulates discharge into waterways. In the beginning, NPDES looked mainly at discharges with the highest pollutant loads, which typically came from factories and large pipes. In the early 1990s, the regulations were expanded to cover stormwater flows from large cities with populations over 100,000. The 1999 notice (referred to as Phase II) brought smaller urbanized areas under regulation for development projects of one acre or more. NPDES permits require renewal every five years, allowing time for program managers to adapt and customize their systems.

EPA delegates NPDES authority to most states, which then develop a statewide general permit that spells out municipal compliance requirements. For planning and zoning,

the most important elements are the post-construction rules and the stormwater management plan that specify best management practices (BMPs). EPA materials issued to date include BMPs for traditional water bodies as well as guidance on using land-use practices such as infill and increasing open space protection—integrated "by ordinance or other regulatory mechanism."

Why Post-Construction?

Post-construction stormwater measures help control runoff after the completion of a project by assigning some measure of responsibility for stormwater control to developments over the life of the project. In the past, the engineer's job was to remove water from the site and into the

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About the Author

Lisa Nisenson is a principal at Nisenson Consulting. She is also working with Tetratech to develop stormwater program guidance for the U.S. Environmental Protection Agency’s Office of Water. Nisenson has worked on smart growth at the national and local levels for nearly 15 years.

conveyance system as quickly as possible. The approach kept basements and foundations dry but proved catastrophic for local streams that suffered the impact of collective polluted flow from houses, offices, and parking lots.

The damage to streams is more than an environmental misfortune. The flow collected from acres of concrete scours riverbanks and creates mud deposits, making streams wider and shallower. The altered water flow poses challenges to floodplain managers, water supply companies, and industries that rely on clean, steady flows. The primary reason for the problem is the location and extent of land development, and the most common indicator is impervious cover—rooftops, parking lots, and roads, and even compacted dirt, gravel, and grassy surfaces.

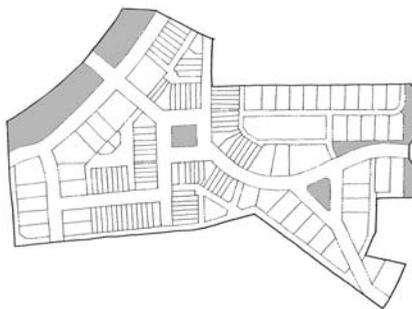
WHAT DRIVES IMPERVIOUS SURFACE?

Watershed managers and land developers cannot manage the impacts of excess impervious surface without first understanding the reasons for its proliferation. Planning and zoning officials regularly make decisions about impervious cover with respect to:

- **Parking.** Minimum parking standards and cautious lending practices can lead to unnecessarily large parking lots.
- **Site design.** Site design parameters have increased with setbacks and minimum lot size requirements (partially to accommodate more parking) and maximum height limitations that force development outward to meet demand. Even where codes allow multistory development, parking requirements based on square footage ultimately dictate less intensity.
- **Street design and mode choice.** Unconnected, hierarchical street designs often result in dispersed development and an increase in impervious surface, leading to poor transportation choices. Street design also influences mode choice. In places where trips for

daily needs cannot be made without a car, businesses will argue that they need generous parking allotments.

- **Separation of uses.** The Euclidean model of separating uses can make walking or combining trips impractical, if not impossible. When businesses and services are spread out, more impervious surfaces are created and people are beholden to vehicular travel.
- **Redevelopment.** Redevelopment is among the best (yet least recognized) watershed protection strategies. By contrast, vacating an urban site to relocate at the basin’s edge ultimately means the watershed is burdened with runoff from two sites.
- **Infill.** Infill development was listed in the 1999 notice as a viable strategy for reducing stormwater impacts. This was mostly true. However, planners must track absorbent spaces that are poised for development and balance flows accordingly.
- **New stormwater requirements.** Some of the emerging BMPs require that large portions of a site remain undeveloped (though not necessarily undisturbed). Be careful. The result



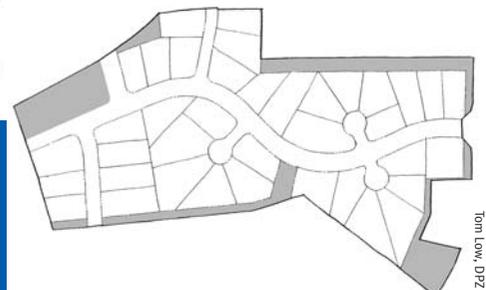
➡ Vermillion, a development project in North Carolina, is characterized by less street imperviousness per unit of development given its compact footprint and development intensity.

can favor developers who assemble a parcel large enough to accommodate 200,000 square feet of floorplate, 800 parking spaces, drive aisles, and service bays, plus the calculated land set-aside. Such requirements tend to exacerbate sprawl and impervious cover because big enough parcels can only be found in the outlying areas and require the expansion of roads and other infrastructure.

THE ROLE OF PLANNING AND ZONING

Planning and zoning departments can have a big impact on the development and maintenance of stormwater management plans. The question is where to start.

First, establish which federal and state stormwater rules apply, in particular, for post-construction. Among the first questions to ask are (1) *What water quality problems exist today?* and (2) *What are the anticipated problems in the watershed?* The type and nature of water stressors invariably influence planning needs. Also, obtain copies of the comprehensive plan and watershed plan. A strong comprehensive plan is the initial and most important BMP to put into place. Applying BMPs in an ad hoc manner will not protect against stream degradation and flooding in the long term. Ignoring a land-use pattern that creates excess imperviousness will only delay the inevitable costs of stream restoration and flood clean-up that site-specific BMPs cannot control.



Tom Low, DPZ

**DEVELOPING A COMMON VOCABULARY:
BEST PRACTICES IN LAND DEVELOPMENT REGULATIONS AND STORMWATER CONTROL**

Municipal governments (cities and counties) covered under Phase II were required to present preliminary stormwater plans (the notice of intent) to the state by March 10, 2003. That submittal triggered a five-year time frame for starting the stormwater program, including ordinance changes. But legal challenges and state decisions have since resulted in delay, leaving municipalities in one of the following scenarios:

Square one: Your stormwater colleagues are just now embarking on code review. Bring to the table the comprehensive plan, the zoning code, and a readiness to talk about pending changes. Outreach to a variety of stakeholders is essential—watershed groups, home builders, public works departments, and interested local businesses. Also invite economic development representatives, developers who specialize in redevelopment, growth management groups, and regional transportation coordinators. The role of planning and zoning is likely to involve modifying land development regulations to include stormwater controls.

At the table: The development of the code is underway and the zoning office has been consulted. You may find several areas where the proposed stormwater regulations are in conflict with desired land development regulations, so your role may involve defending aspects of the plan or code. By the same token, having a stormwater engineer review the comprehensive plan might reveal options not evident when post-construction controls were not yet under consideration. Be prepared to make two lists: one of immediate changes for stormwater management and a running list of longer term improvements for the next NPDES permit cycle or plan review.

Not invited (perhaps not welcome): What if you just heard of changes that are underway and it appears you may not have a say? There is still time. First, recognize that this may just be an oversight. The obscure terms used in the *Federal Register* notice may not have fully revealed that planning and zoning are at the core of regulatory changes. Ask if you can see proposed changes. If the relationship has reached the “hostile” stage think about where the proposed changes might run counter to popular initiatives and look for common solutions. Municipal managers are loathe to tackle a fight pitting a hard-fought comprehensive plan against a federal environmental mandate.

THE DISTRICT

Once planners understand how to use the elements in both plans, they should look to the district. For watersheds this may be a sub-watershed or drainage basin, while in land use it may be a neighborhood, brownfield, planned unit development, or subdivision. This critical level of analysis is often overlooked in water planning for three reasons:

1. The early discussions of watershed-friendly development techniques took place without questioning the impact of highly separated land uses.

2. District planning for compact form and development intensity runs counter to traditional stormwater engineering approaches and performance standards, which are established at the site or project level rather than the district or sub-basin level. Calculating performance for a pond on an individual site is easier than assessing the benefits of redevelopment for a watershed.

3. Like many aspects of infrastructure, the responsibility for stormwater control is increasingly delegated to the developer. As such, site design tends to be inwardly

focused to meet the needs of the site rather than to take advantage of an efficient, natural system for the entire basin.

To help improve assessments for districts or sub-basins, planners should work with stormwater and watershed departments. For watersheds, engineers can look at a redevelopment project to measure the amount of impervious surface avoided, or identify drainage basins for redevelopment in an older downtown. Engage economic development departments to see where the municipality’s

⊕ (Left) The rolled curb of the sidewalk in this Hercules, California, street allows emergency vehicles to navigate the narrower streets that support this walkable neighborhood; (Right) A water body with no purpose other than to move water off the site of a prototypical suburban subdivision. The sign reads “No trespassing, fishing, or ice skating.”



Local Government Commission

Michael Davidson

stormwater investments can attract developer interest.

Finally, many stormwater managers are working with planning and zoning departments to identify areas for off-site mitigation. Where site constraints rule out on-site stormwater handling, fees-in-lieu is an alternative. The crux of such a program is to have already identified (at the district and watershed levels) the best areas to invest fees for water quality and flood prevention.

In the end, good stormwater and comprehensive plan will converge on the following goals:

- Minimizing imperviousness at the watershed level by targeting and redirecting development onto smaller footprints,
- identifying and preserving critical ecological areas and contiguous open space,
- maximizing the use of existing infrastructure and developed sites, and
- retrofitting existing properties through home owner and property management campaigns.

LINKING STORMWATER AND LAND USE THROUGH PLANNING AND ZONING

Because stormwater runoff is a growing environmental threat, new rules are aimed at protecting and improving water quality. However, stormwater engineers must also understand that in urban and rapidly developing areas, ordinance drafting does not occur in a vacuum. Many areas have established zoning, planning, and land conservation activities, so the new rules are as much about integrating stormwater strategies into land development regulations as they are about instituting new practices.

Developing a joint water and land development program involves both a management strategy and the components of that strategy. Sample approaches are as follows:

Bare-Bones Ordinance with Design Guidelines

This is good for communities that organize by districts and neighborhoods for governance, infrastructure planning, and growth policies. District plan details are often highly interwoven and require the same integration as stormwater BMPs. With input from the stormwater engineer, communities can recast the pattern book for traditional neighborhood design (TND) as a

GOALS WITHIN COMPREHENSIVE AND WATERSHED PLANS SHOULD BE COMPLEMENTARY		
Comprehensive Plan	Watershed Plan	Be prepared to:
Create and preserve parks and open space.	Create and protect open space with a focus on land with a higher ecological value for infiltration or flood control.	reexamine land preservation policies for water goals. You may need to add parcels for aquifer recharge and stream bank stabilization.
Compact development form	Reduce impervious surfaces.	argue the two are the same. Compact development is, by definition, highly impervious at the district scale but can save land development in greenfields.
Density	Clustering	use the environmental support for clustering to your advantage when density is challenged. Also look for opportunities to use landscaping in urban site plans for stormwater control. The developer already has it budgeted.
Connected, multi-modal streets with narrow widths	Better street design with narrow streets	include emergency responders in the discussion. They often want wider streets for access. In watershed literature, street design is often limited to the site or subdivision scale. Develop the case that connected streets support compact form. In addition, scrutinize the current and future transportation role of sidewalks. While some LID literature supports better cul de sacs, increasingly the advice is to discourage them.
Smart growth	Low-impact design (LID)	answer questions about differences between the two. Some literature says that smart growth is about the pattern while LID is about the site. In reality, both are evolving to include options for the watershed (or region), district, and site. LID is often described as mimicking or reproducing natural hydrology, which in built-out cities may be difficult to fully achieve. Finally, realize that LID techniques are rightly on a path to becoming routine elements in site and architectural designs.

stormwater design manual. Other design districts might include brownfields, planned unit developments, and downtown redevelopment districts. In the end, you may have several design guidelines for many distinct districts.

For example, Emeryville, California, faced a tough environment for stormwater control because of a high number of contaminated sites, a built-out development

portfolio, high water table, and clay soils. First, the city tackled its parking ordinance to reduce the number of spaces and find opportunities for public and off-site parking. Second, the city worked to incorporate greenspace into development sites and to add swales to treat and slow stormwater runoff. Finally, the city encouraged green building techniques such as cisterns and

➡ Redevelopment in ultra urban areas can meet landscaping and stormwater objectives at once through careful design.



Lisa Nissen

Make Land-Efficient Growth Policies Stormwater BMPs

EPA suggests several smart growth practices for a stormwater management program, including infill and guiding growth to areas with existing development.

The City of San Jose, California, takes advantage of state permit flexibility to classify designated affordable housing projects as stormwater BMPs. In recognition that pressure for affordable and workforce housing was pushing development outward, the city created a management structure to consider which housing developments could qualify. (For the code language see www.sanjoseca.gov/planning/stormwater/pol_stormwater.pdf.)

green roofs as architectural details. (See www.ci.emeryville.ca.us/planning/pdf/stormwater_guidelines.pdf.)

Separate Ordinances for New Development, Redevelopment, and Infill

Redevelopment is almost universally more difficult than greenfield development. Without careful application, stormwater requirements may tip the balance for developers who cannot make projects fiscally viable. EPA's post-construction language in the 1999 notice has "new development" and "redevelopment" together, but a good stormwater plan can benefit from developing separate ordinances.

The State of Wisconsin has a nationally recognized program of water protection for lakes and rivers. In determining stormwater standards, the state recognizes that different development types require different rules. Consequently, the state has settled on a system to tier water quality performance measures for best management practices based on whether the site is new development, redevelopment, or infill. (See www.dnr.state.wi.us/org/water/wm/nps/stormwater/post-constr/.)

Overlays for Areas Requiring Special Protection or Incentives

Overlay zones are a popular zoning tool and can also be applied to protect stream buffer areas or target areas with a BMP. Overlays are also an option when the completion of a comprehensive watershed plan is years away, but immediate steps are needed within land development regulations to pro-

tect natural resources. To see this approach in action visit the website of the New York Rural Water Association, which uses an overlay zone to protect rural waters as part of a larger rural planning effort. (See www.nyruralwater.org/downloads/bulletins/booklet.pdf.)

A separate stormwater code is good for communities without zoning or for those unable to revisiting an existing code.

Opportunities within Land Development Regulations

Elements within land development regulations are ripe for reform, including those that would help reduce impervious surfaces. As stated earlier, parking is the frontier for such efforts, along with provisions for lot sizes, height limitations, landscaping, and setbacks that can push development outward.

EPA's *Parking Spaces, Community Places* has numerous examples of flexible parking. If your community uses an aerial photography service for tax assessments or environmental planning, consider using those images to estimate parking demand and oversupply. (See www.epa.gov/smartgrowth.)



City of Portland

➡ Water that falls on the roof of this parking structure is first diverted to rain gardens. The design adds street level interest while reducing runoff.

ADDITIONAL ONLINE RESOURCES

Stormwater authority

www.stormwaterauthority.org

This site offers links to each state's NPDES page. Go to the small tab named "Regulatory Data" to see a column of states.

Center for Watershed Protection

www.cwp.org

Low Impact Development Center

www.lowimpactdevelopment.org

EPA's smart growth page

www.epa.gov/smartgrowth

EPA's stormwater program home page

http://cfpub.epa.gov/npdes/home.cfm?program_id

Menu of best management practices

www.cfpub.epa.gov/npdes/stormwater/menuofbmps/menu.cf

Smart growth techniques as stormwater BMPs

www.epa.gov/dced/pdf/sg_stormwater_BMP.pdf

A Separate Stormwater Code

A separate stormwater code is good for communities without zoning or for those unable to revisiting an existing code. For example, the stormwater ordinance for Lafayette, Indiana, says the requirements of the ordinance are "in addition to" the minimum requirements of other land-use and water codes. The Lafayette code references the state's BMP manual. The key to a new stormwater ordinance is flexibility to respect local site constraints and environmental needs. (See lafayette.in.gov/Content/global/File/engineering/ord2005-08.doc.)

EMERGING ISSUES

The stormwater rules that are the impetus for this article are still making their way through the public process in hundreds of cities and counties. Unfortunately, the complex policy environment under which many of the decisions are made is not well understood. Planning and zoning officials should be knowledgeable of emerging issues.

Human and Financial Resources

Many cities are large enough to facilitate regulation but still too small to have fully

funded, state-of-the-art stormwater departments. For these cities, there is the danger that BMP selection will trend toward those measures that are easiest to implement and the most familiar. As such, blanket requirements that apply to all development projects, no matter the context, will rise to the top because of ease of implementation. Conservation subdivision design is emerging as a popular BMP because most communities can easily modify the subdivision ordinance. Unfortunately, this does little to address the much larger implications of dispersed development.

A Veneer of Green

Developers are hopping on the green bandwagon in droves. The move towards green design dovetails nicely with increasing consumer interest to locate next to, or with views of, "green." However, green features are *not* synonymous with sustainable development. The Coalition for Smarter Growth (www.smartergrowth.net) and other groups have emerged to critique designs and advocate for compact development. One of the latest trends is inclusion of walking trails in site design. However, if they are not designed to replace car trips with walk trips, generous parking allotments will continue. Successfully managing impervious cover and stormwater is not just related to how water flows, but also how people flow.

Gray Bias

The green design movement is strong. As noted throughout this article, on-site management for water runoff has taken the engineering world by storm. While the attention is long overdue, the improvement of the gray infrastructure that supports an efficient city form is as important as ever. True, the old gray paradigm of diverting water as quickly as possible to local streams is no longer valid. Now is the time to take advantage of existing investments and augment the gray with green.

IN SUM

Whether intended or not, new stormwater rules provide an opportunity to forge links among disciplines that often move along parallel tracks. Potable water, transportation, housing, and jobs are impacted by stormwater runoff. To that end, good water quality practices equal irrefutably good planning.

ZONING REPORTS LAND USE IN A NUTSHELL

John R. Nolon and Patricia E. Salkin. Thomson/West, 610 Opperman Drive, P.O. Box 64526, St. Paul, MN 55126-0526. 446 pp. 2006. Available from APA's PlanningBooks.com. \$27.50; \$25 for APA members.

Those who need a handbook-sized, but remarkably thorough, summary of American land-use law and how it applies to current practice would do well to invest in this new edition (with new authors) of a primary resource. Every chapter gets to the point efficiently and clearly in well-crafted prose. Topics include common law origins of land regulations, comprehensive plans, zoning, subdivision controls, and modern movements such as smart growth. More than a reference work, it can actually provide an interesting refresher on many points that many of us sometimes forget. This book can also serve well as a readable training tool for planning commissioners or inexpensive textbook for university planning students or those studying for the AICP exam.

Cover photo by Justine Horrocks. A house under several feet of graphically-rendered flood waters

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AMERICAN PLANNING ASSOCIATION

122 S. Michigan Ave.
Suite 1600
Chicago, IL 60603

1776 Massachusetts Ave., N.W.
Washington D.C. 20036



HOW CAN YOU DECREASE
THE RISK OF FLOOD?

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