EXECUTIVE SUMMARY

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WATER ENVIRONMENT RESEARCH FOUNDATION

STORMWATER

Decentralized Stormwater Controls for Urban Retrofit and Combined Sewer Overflow Reduction: Phase II

This report is the second phase of a research effort to assess decentralized stormwater controls for urban retrofit and combined sewer overflow (CSO) management. Phase I, published by WERF in 2006 (03SW3), found that decentralized controls in urban areas were technically feasible, and that several cities were successfully using them to reduce runoff and pollutants. Phase II looked further into the institutional, financial, and programmatic issues involved in broadening adoption of decentralized controls.

Decentralized Controls Have a Role in the Urban Environment

Compared to conventional grey infrastructure, decentralized controls provide a greener, more sustainable urban design. Because decentralized controls rely heavily on vegetation or practices that simulate elements of the natural hydrologic cycle, the environmental benefits extend beyond stormwater and water quality. Decentralized stormwater controls play a productive role in the growing "green city" movement, offering an integrated approach at comprehensive environmental management. Some of the challenges that may benefit from decentralized stormwater management include urban heat islands, air quality, energy, climate, and aesthetic and community benefits.

A decentralized approach can improve stormwater control results, especially when retrofits are made in areas of highly connected impervious surfaces, where infrastructure is aging, and/or where impervious or open areas are limited.

They are well suited to help meet environmental and regulatory requirements that face municipalities, including total maximum daily loads (TMDLs), CSO long-term control plans and consent decrees, and other court orders and legal actions.

The report provides illustrative examples of typical decentralized controls in various scenarios including dense urban areas, transportation corridors, parks, urban residential areas, etc. Figure 1 shows decentralized controls for suburban residential areas.

Integrate Planning and Design Efforts

A new decentralized strategy presents a number of challenges. Technical and planning staffs and elected officials need to coordinate efforts to implement an effective program. The researchers examined some tools that are critical to the success of a distributed integrated system. Those tools include comprehensive master planning that incorporates stream and wetland setbacks and conservation design as well as setting up an effective management structure. A planning approach is shown in Figure 2.

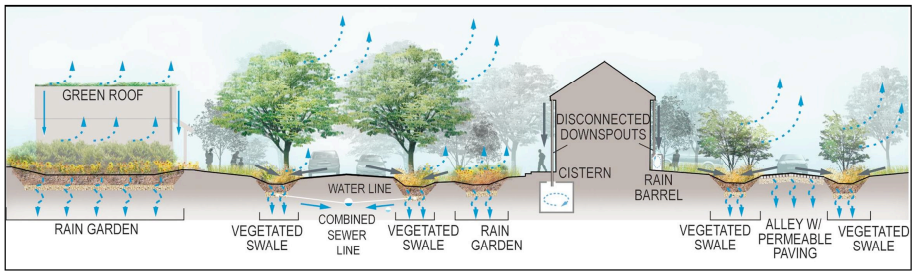

Figure 1. Typical decentralized controls for suburban residential areas

BENEFITS

- Identifies decentralized controls to achieve environmental objectives.
- Presents alternatives for integrating or retrofitting decentralized controls in the urban environment.
- Provides design templates according to land use.
- Presents guidance on incorporating decentralized controls into stormwater models.

RELATED PRODUCTS

Decentralized Stormwater Controls for Urban Retrofit and Combined Sewer Overflow Reduction: Phase I (03SW3)

Using Rainwater to Grow Livable Communities: www.werf.org/livablecommunities (04SW1)

Critical Assessment of Stormwater Treatment and Control Selection Issues (02SW1)

Infiltration vs. Surface Water Discharge: Guidance for Stormwater Managers: Phases 1 and 2 (03SW4, 04SW3)

International Stormwater BMP Database (www.bmpdatabase.org, 03SW1CO)

RELATED ONGOING RESEARCH

Linking BMP Systems Performance to Receiving Water Protection to Improve BMP Selection and Design (SWC1R06)

Decentralized Stormwater Techniques: Training and Dissemination (DEC4R06)

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Pilot projects	Monitoring & analysis	Planning & implementation strategies	Funding acquisition & prioritization	Strategic & coordinated installation	Program & performance assessment	Broad municipal application

Figure 2. Planning and implementation process

U.S. EPA advocates a watershed-based planning model since conflicting policies are best reconciled at the watershed level. Decentralized controls should be integrated into those models.

Each City Needs to Plan According to Their Needs

Each stormwater or combined sewer system has unique operational and system characteristics that preclude prescriptive guidance. However, a few planning and implementation approaches are the most likely for decentralized control installation and selection.

- pilot installations by an agency or organization at any level
- watershed-based approaches, typically overseen by a regional or higher level authority
- building and site redevelopment projects that implement distributed controls as part of their building process
- large-scale urban revitalization projects, often a collaboration between agencies and private developers

Each municipality needs to identify their particular stormwater drivers. This will help them determine which controls are appropriate for the land use and critical stormwater parameters (e.g., volume reduction primarily in combined sewer systems, or volume reduction and water quality in areas with sensitive receiving waters). They also need to identify best management plans as they determine funding sources and monitoring protocols.

Decentralized Controls Have Financial Benefits

Decentralized control measures can potentially influence the financial costs of mitigating CSOs and stormwater runoff. The costs associated with stormwater management programs are directly related to the impact of development practices on nature's ability to maintain a water balance.

Implementing decentralized control programs may be the most cost effective and efficient way to achieve water quality goals and requirements. However, the multiple benefits provided by decentralized controls, and the ability to capture the asset values of ecosystem services, require more comprehensive methods of economic valuation than those traditionally used to assess stormwater and CSO programs. The report discusses several methods for evaluating the economic considerations:

- damage cost avoided, replacement cost, and substitute cost methods
- life-cycle cost analysis
- benefit-cost analysis
- productivity method
- hedonic pricing method

Several Models Can Help with Stormwater Planning

Whatever processes are used to integrate decentralized controls into capital projects, development projects, and/or planning, a stormwater model capable of simulating decentralized controls will be an essential part of any stormwater management program. Modeling defines the runoff problem, generates and evaluates alternatives, enables decisions, and provides efficient management options.

The report provides guidelines for the software modeling of seven unique decentralized best management practices.

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The research on which this report is based was funded in part by the U.S. Environmental Protection Agency (U.S. EPA) through Cooperative Agreement No. CR-83155901-1 with the Water Environment Research Foundation (WERF). Unless an U.S. EPA logo appears on the cover, this report is a publication of WERF, not U.S. EPA. Funds awarded under the agreement cited above were not used for editorial services, reproduction, printing, or distribution.

01/09