# The Utility Approach to Stormwater Management

Homer Wilson
Jones & Henry Engineers
Fort Wayne, Ohio

*This article originally appeared in the June 1990 issue of Public Works? , published by Public Works Journal Corporation, 200 South Broad Street, Ridgewood, NJ 07450. ? 1990 Public Works Journal Corporation.* 

MANY communities perceive storm drainage problems as seasonal and temporary and believe that the problems go away when the rain stops. Consequently, comprehensive stormwater programs are not fully developed or are simply neglected. Maintenance is handled on a crisis basis, with repair money coming from general or street funds. Large capital stormwater projects may appear as a line item in the annual budget.

Communities with improperly managed stormwater drainage systems experience frequent basement, yard, and street flooding, which will continue without a proper stormwater management program. Municipal officials often cite lack of funds as a reason for not addressing these problems. The ability to select and implement a financing method may be limited, perhaps by political considerations. As a viable funding alternative, communities may wish to consider - the utility approach.

A stormwater utility, like other utilities, provides a service to the public, supported by charging fees to its customers. As a separate enterprise fund, the utility charges operate and maintain the existing system, and sometimes finance capital improvements. User charges provide a consistent, predictable, long-term revenue source.

### *Determining Rates*

Fair and equitable program charges should relate directly to the cost of providing the service. Once the utility is firmly established, rates can be adjusted as the system expands.

Stormwater utility charges reflect the amount of runoff a parcel contributes to the drainage system. This contribution is calculated by determining a land parcel's total impervious service area, or by using some ratio of impervious to pervious surface area. Residential areas are generally homogeneous enough that a uniform or flat rate can be calculated and charged, whereas commercial and industrial parcels need to be examined individually.

Communities of all sizes operate stormwater management utilities. Five Ohio communities with user charges are Cincinnati, Montpelier, Union, Wooster, and Zanesville. Population in these municipalities ranges from 385,457 in Cincinnati to 4,431 in Montpelier. Monthly residential charges range from $0.48 in Zanesville to $3.00 in Union and Montpelier. Table 1 sums the important facts.

**Table 1- Ohio Stormwater Utilities**

| Community | Population | Effective Date of Ordinance | Monthly Residential Rate ($) | Estimated Annual Revenues ($) |
|---|---|---|---|---|
| Cincinnati | 385,457 | 09/84 | 1.60 | 4,500,000 |
| Montpelier | 4,431 | 12/22/86 | 3.00 | 74,556 |
| Union | 5,219 | 09/87 | 3.00 | 63,000 |
| Wooster | 19,289 | 03/18/85 | 2.90 | 350,000 |
| Zanesville | 28,655 | 01/01/87 | 0.48 | 70,000 |

In Cincinnati, parcels were assigned an "Area Range Number" (ARN) based on surface area. Parcels between 1 and 2,000 sq ft were assigned ARN 1. Parcels between 2,001 and 4,000 sq ft were ARN 2, and so on.

The percentage of a parcel's impervious surface, or the runoff coefficient, is represented by an "Intensity of Development Factor" (IDF). Eight land use classifications were identified, with IDF's ranging from 0.05 for park lands to 0.85 for commercial development. According to Cincinnati's Stormwater Management Utility Ordinance, the numerical value for each land use is based on generally accepted engineering standards, local conditions, and a analysis of the city's 1983 photographic land use interpretation study. Table 2 lists these factors.

**Table 2- Intensity of Development Factors (IDF) in Cincinnati**

| Land Use | IDF |
|---|---|
| Commercial | 0.85 |
| Industrial | 0.75 |
| Multifamily | 0.60 |
| Transportation | 0.50 |
| Institutional | 0.40 |
| Residential | 0.25 |
| Agricultural | 0.08 |
| Park | 0.05 |

Source: Cincinnati Stormwater Management Utility Ordinance

A parcel's "Equivalent Runoff Unit" (ERU) is calculated by multiplying the ARN by the IDF. Typically, one-, two-, and three-family properties comprise 9,000 sq ft or less. Therefore, a flat rate of 1.25 ERU (ARN 5 x 0.25 IDF) has been applied to all properties in these residential categories. Multifamily and nonresidential properties use the actual formula for the ERU. The monthly charge per parcel is the ERU multiplied by $1.28.

The Wooster City Council decided that city properties are furnished stormwater drainage service proportionate to the amount of the property's impervious surface. The basic service unit was calculated to be 3,050 sq ft of impervious surface, and this figure was applied to all conventionally developed residential properties in the R-1 zoning districts. According to the Wooster Storm Drainage Utility Ordinance, 60 percent of one basic service unit is the equivalent service unit for one- and two-family residential properties in R-2, R-3, R-4, R-5 and nonresidential zoning districts. All other properties are furnished service equivalent to multiples of the basic service unit, as calculated for individual properties by the city engineer's office. The rate per equivalent service unit in Wooster is $2.90 month.

Ann Arbor, Michigan established a service fee system based on "billable hydraulic acreage". First, theoretical hydrological response factors, which approximate stormwater discharge, were developed to represent the approximate runoff contribution for the Ann Arbor area. These factors were assigned to each land parcel, taking into account the runoff rate, rainfall intensity, and the runoff rate modified by retention. The hydrological response factors are: 0.20 for pervious land surface; 0,95 for impervious land surface with no retention; and 0.30 for impervious land surface with retention.

A parcel's billable hydraulic acreage is computed by multiplying the appropriate hydrologic factor by the acres in that category (pervious, impervious, impervious with retention), and adding the results. Multiplying the hydraulic acreage by the predetermined utility service charge rate of $38.88/hydraulic acre per quarter determines a parcel's service charge. Single-family and two-family residences were assigned a hydraulic acreage of 0.0933. All other parcels were measured individually to determine pervious and impervious land surface. Table 3 demonstrates a service charge calculation.

**Table 3- Ann Arbor, Michigan Stormwater Service Charge Calculation**

| Area in Acres x | Hydrologic Response Factors | = Hydraulic Acreage |
|---|---|---|
| 0.264 | 0.20 | 0.0528 Pervious |
| 0.837 | 0.95 | 0.7952 Impervious |
| 0.000 | 0.30 | 0.0000 Impervious w/ Retention |
| | | 0.8480 Total |
| 0.848 Total Hydraulic Acres x $38.88 = $32.97 Service Charge per Quarter | | |

There is no definitive formula for establishing a successful water utility. Each community must tailor a program to its particular situation and political climate. However, the following general steps should be considered in utility development.

**Document need for a stormwater utility program.** Record historic flooding problems and their locations, severity, and dates. Locate problem sites on a map and classify them according to type. Newspaper articles are helpful to highlight the need.

**Educate administrative staff.** A stormwater management utility with user charges is a relatively new concept. Make sure that key city personnel understand its advantages and drawbacks.

**Establish a steering committee.** A storm drainage steering committee cooperates with the administrative, public works, and/or engineering departments on the public participation process. This crucial committee should include representatives of local realtors, developers, large property owners, the general public, the chamber of commerce, civic groups, churches, and schools. It is important to include factions that may oppose the utility and user charges to accurately assess the probability of community acceptance of the utility proposal.

**Develop a public participation program.** Although the general public is aware that excessive rains and flooding cause problems, there may be resistance to a new user fee, or "tax". Citizens must be convinced that the problems are best solved on a city-wide basis. A successful program educates the electorate on storm drainage and the methods use to correct or prevent problems.

The steering committee should suggest how best to handle public participation. Public meetings with a formal presentation and question-and-answer period may prove effective.

**Develop a comprehensive implementation plan.** This plan should address all program activities and phases, determine a task sequence, assign responsibilities, establish billing procedures, estimate costs, and schedule events.

**Calculate current stormwater program costs.** These costs may include storm sewer and catch basin maintenance, repair and reconstruction, ditch maintenance, storm drainage costs paid by sanitary sewer fees, any existing drainage debt service, and joint drainage projects.

**Estimate other stormwater revenue needs.** Estimate the costs for a preventive maintenance program, proposed capital projects, storm drainage master planning, and additional personnel and equipment.

**Prioritize needs and projects.** You will not be able to solve all your problems immediately. You may never be able to solve all your problems. Rank projects according to need.

**Establish a Preliminary budget.** A preliminary budget may include costs to: alleviate current short-term stormwater problems, including operation and maintenance; finance completion of a detailed stormwater management plan; inform the public that a storm sewer user fee is necessary and desirable; and determine needed personnel, equipment, and materials.

**Create a rate structure.** Develop a user fee system based on the runoff from improved land, with an average single family residential lot representing a single drainage unit. Base the determination of single family lot imperviousness on a city-wide statistical sampling. The typical single-family residence will be the standard unit in the rate structure. Evaluate the need to use a larger (greater than one) ratio for suburban or larger residential lots.

Measure all commercial and industrial property to develop ratios of impervious area compared to equivalent residential units. Schools, government buildings, institutions, and other non-residential, noncommercial, and nonindustrial property need to be measured. Formulate recommendations on billing these properties. This task is time-consuming but necessary. Aerial photographs could be useful.

Review unique sites such as properties along a stream draining directly to a stream. Recommend user fee limits. Propose a system of developer fees and connection fees to recover costs of providing services and buy-in to new developments and subdivisions.

**Refine budget and user charges.** If, after determining the user charges based on the preliminary budget, monthly charges are too high, reduce the budget and lower the user charges. However, if the community is willing to pay a higher monthly fee, raise the budget and fees to include additional priority projects.

**Prepare a stormwater utility and user charge ordinance.** Draft an ordinance that explains the need for the stormwater utility and establishes the user charges by land use classification.

**Develop a billing system.** Investigate the existing utility billing system and determine the optimum stormwater billing procedure. The current sewer and water billing system might suffice.

Communities cannot afford to ignore stormwater problems indefinitely. The stormwater utility with user charges may prove to be the optimum method for some areas to finance the development and implementation of a comprehensive and effective stormwater management system. As a new approach, it bears investigating.