

SEWER INFRASTRUCTURE PLANNING



Ben Sherman and Mark TenBroek of CDM evaluate flow conditions in southwest Detroit as part of the Greater Detroit Regional Sewer System Combined Sewer Overflow (CSO) modeling work.

Photo courtesy: Camp Dresser & McKee.

Local units of government are challenged to both maintain and improve their existing sewer systems while planning for future economic growth and development. Providing adequate wastewater collection, transport, and treatment is essential not only to protecting public health, safety, welfare, and the environment, but to ensuring a sustainable quality of life as well. In order to adequately handle municipal wastewater, both the physical infrastructure and the financial capability to meet the operation, maintenance, and ultimate rehabilitation/replacement needs must be addressed. This includes on-site sewage disposal systems which will continue to be used extensively by both households and business.

The financial resources needed to construct, maintain, and improve sewage systems are becoming more of a local responsibility than in the past. As state and federal grant programs for sewer construction were phased out, local governments often shifted this financial burden to the land developers, requiring they extend sewer service to new development. While this shifts the initial capital costs for the sewer collection system in growing areas, the operation, maintenance, and repair of the sewers usually becomes the responsibility of the municipality, as does providing additional treatment capacity, if needed.

In many cases, this resulted in an incremental approach to extending sewer lines, often on a subdivision-by-subdivision basis. This approach to sewer extensions has resulted in lost opportunities to attain more cost-effective and environmentally sound practices than could be achieved from a more holistic approach. Coordination of planning for both current and future sewer needs

is essential in minimizing conflicts between local, county, and regional plans and policies.

A key theme of the *Water Quality Management Plan for Southeast Michigan* is that improving and sustaining rivers, streams, and lakes requires attention to and action on a wide range of contributors to water pollution. One prerequisite to achieving clean water is sewer infrastructure (either sewers or on-site sewage disposal systems) that adequately serves the needs of existing and future populations of the region. The relationships between provision of sewer service, land use, and sustaining designated uses within waterbodies are complex. The tools and techniques described here, when used in conjunction with comprehensive plans, zoning ordinances, and land division regulations, provide a basis for making land use and sewer infrastructure more compatible and sustainable.

KEEPING IT CONNECTED

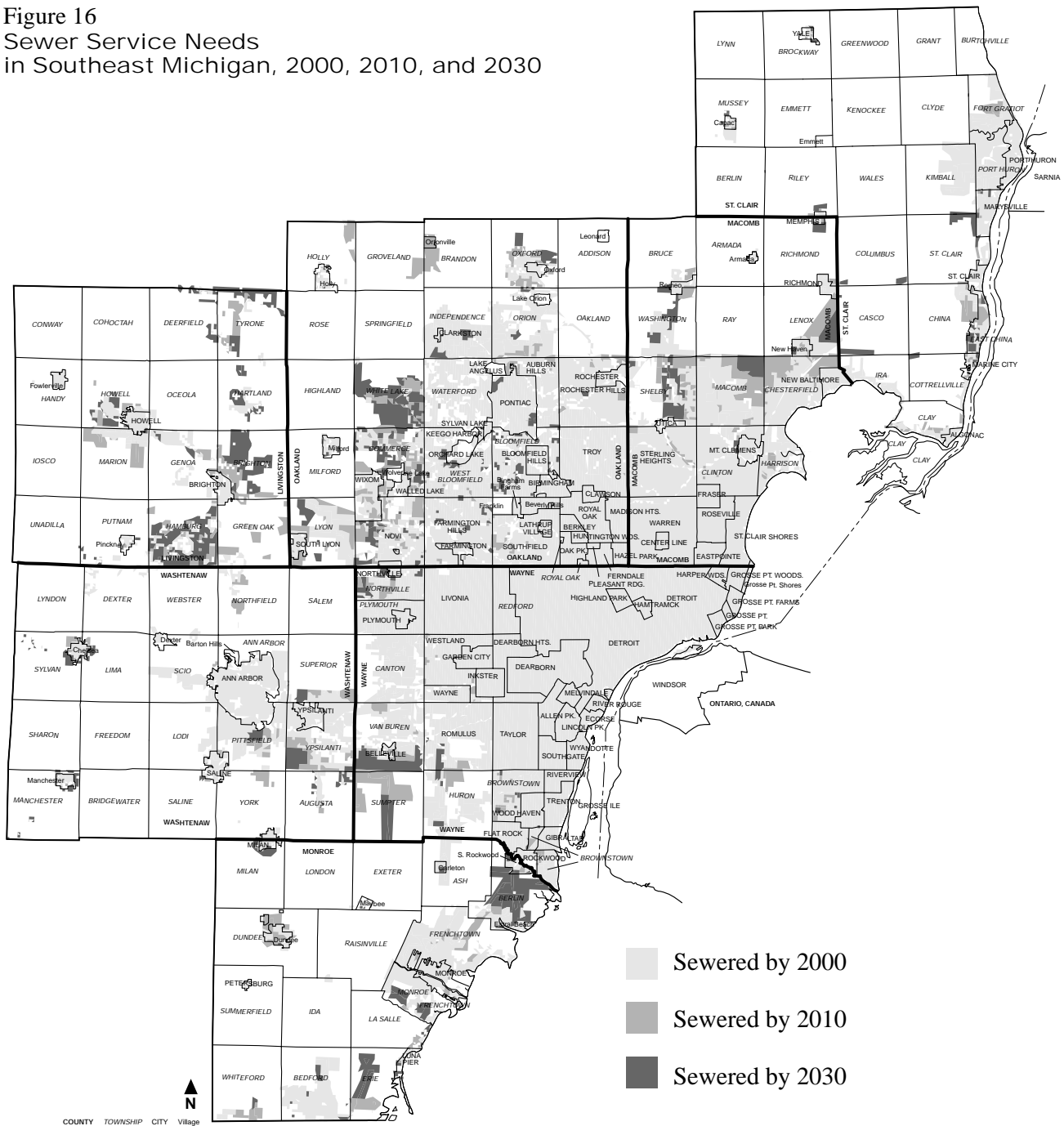
Ensuring adequate sewer infrastructure to meet future needs is as important in the master planning process as ensuring that future transportation needs are considered. However, sewage transport and treatment capacities frequently are not sufficiently addressed. Because providing adequate sewer infrastructure can substantially influence the quality of life within a community by enhancing the environmental character and opportunities for economic development, communities need to ensure adequate funding to operate, maintain, and replace its sewer infrastructure.

Planning and Regulatory Considerations

Municipalities in Michigan have the legal authority to construct, operate, and maintain sewer systems, either independently or collectively. Under Michigan law, municipalities are responsible for raw sewage discharges within their jurisdiction and can be required to take the corrective action necessary to protect public health and the environment.

Nonetheless, sewer infrastructure financing is often a critical constraint for local governments. Left unresolved, current unmet needs will lead to even greater problems in the future. Aging and deteriorating service in older, urban areas will inhibit revitalization efforts. As noted above, sewer infrastructure funding has, in recent years, become more of a local responsibility. State and federal funding has been declining, even as local needs have risen.

Figure 16
Sewer Service Needs
in Southeast Michigan, 2000, 2010, and 2030



Source: SEMCOG.

In order for municipal sewer collection and treatment facilities to be eligible under the federal and state grant and subsequent loan programs established by the Federal Water Pollution Control Act Amendments of 1972, (PL 92-500) municipalities are required to develop a waste treatment management plan. Most of these plans, commonly referred to as 201 facilities plans, were originally prepared in the 1970s and only a few have

been updated to reflect current demographic and development patterns. The plans:

- identify and evaluate existing sanitary sewers, interceptors, lift stations, and treatment facilities,
- estimate the sources and impact of infiltration and inflow on the sewer system, and
- identify system improvements to meet the needs for the current population and the estimated population in 20-30 years.

Many communities use funds from the Michigan Clean Water State Revolving Fund (SRF) to finance sewer infrastructure, but increasing needs and significantly decreasing SRF funds is a concern for local communities within the region. SEMCOG's report, *Investing in Southeast Michigan's Quality of Life: Sewer Infrastructure Needs*, estimates that there will be between \$14-26 billion in need by 2030 to maintain and improve Southeast Michigan's sewer infrastructure. Yet, recently the SRF has averaged less than \$240 million per year for the entire state. Given the gap between actual and needed sewer funding, comprehensive planning and the need for cost efficiency in the delivery of service is all the more critical to local governments.

SEMCOG policy

The *Water Quality Management Plan for Southeast Michigan* designates SEMCOG as the Continuing Planning Agency under the federal Clean Water Act. One of SEMCOG's functions is to review sewer projects proposed for funding under the Clean Water Act. Project proposals are submitted to SEMCOG to ensure consistency with the plan. Part of the review for consistency includes a comparison of the proposed service area and the area designated for sewerage on the map. SEMCOG policy supports state or federal funding only for those projects within areas designated for sewer service in the plan. SEMCOG's Regional Clearinghouse Review Committee can amend eligibility boundaries when there is sufficient documentation that sewers are needed to address a public health concern. This policy does not mean that sewers are prohibited in other areas, only that limited state and federal funding be targeted to those existing areas.

Tools for Sewer Infrastructure Planning

There are several tools communities can draw from to plan for their sewer infrastructure. This section focuses on the following techniques:

- Initiating sewer service planning.
- Developing a sanitary sewer ordinance.
- Financing sewer infrastructure.
- Engaging in intergovernmental cooperation.

Initiating sewer service planning

Master plans and capacity study

Sewer service planning should be integrated into the community master planning process. During the planning process, several items should be evaluated, followed by explicit decisions that are then reflected in local plans and ordinances, including:

- Determining future wastewater infrastructure needs and costs based on residential, industrial, and commercial growth, local zoning, and master plans.
- Identifying short-range sanitary sewer infrastructure needs, as well as the location and capacity of service needed to support full development of the master plan.
- Using forecasting information to analyze future growth and wastewater treatment capacity needs.
- Inventorying the age of existing infrastructure and developing a maintenance and replacement schedule. (Typically, a consultant is hired to perform such a study.)
- Addressing the impacts of infiltration and inflow, storm water and combined sewer overflows (CSOs), as well as dry-weather flow.
- Developing and adopting a wastewater system plan for financing: additional transport and treatment capacity, maintaining and replacing the existing system; and maintaining and replacing any new construction.
- Linking sanitary sewer planning to the protection of health, safety, and welfare of residents.

New sewer capacity should be planned for in a process that includes other community service and infrastructure needs. The community's master plan should seek to coordinate the provision of municipal services in a manner that reflects local and regional sustainable development goals and policies. Local governments need to work together with the state to consider how needs can most cost effectively be met.

Mapping wastewater collection and treatment infrastructure

To ensure that adequate collection and treatment infrastructure are available and appropriately scaled to handle current and future wastewater needs, municipalities should identify and map areas to be sewerage, areas where on-site treatment will be used as the sewer infrastructure, and areas that will remain unsewered. Sewer infrastructure maps can then be used to direct development to areas where wastewater needs can be effectively and efficiently met.

Several steps should be part of developing this wastewater infrastructure map, including:

- Identifying current sewerage area and capacity in a community.
- Identifying areas that are unsuitable for on-site sewage disposal systems and those that should not be sewerage (e.g., environmentally sensitive lands, floodplains, and areas designated for open space).
- Identifying areas that will require sewers, based on density levels established in the community's zoning and master plans.
- Mapping the community's soil suitability for on-site sewage disposal systems. (This information can be

obtained from your county office of the Natural Resources Conservation Service.)

- Mapping other features that are important in determining future sewer needs (e.g., major roads, future commercial areas).

After identifying the current sewer areas and capacity, soils, roads, and commercial needs, the next step is to map the community's future sewer needs. This would then be used as a basis for updating or preparing a capital improvement plan.

Developing a sanitary sewer ordinance

The allowed uses of a public sewer system are generally controlled through a local sewer use ordinance. Communities should consider including a requirement that structures be connected to a sewer system as it becomes available in the area. Components of the ordinance could include a requirement that all structures (residential/commercial/industrial) within a specified distance of an existing sewer line to be connected to the public sewer system, establish connection and usage fees, installment contracts, and a provision for on-site sewage disposal system use when public sanitary sewer is not available. Requiring sewer hookups allows the community, based on zoning, to determine the sewer capacity needed to service an area, ensures that sewer lines are appropriately sized to serve the area, and that at least a portion of the cost associated with the sewer installation is distributed among the users through hookup fees.

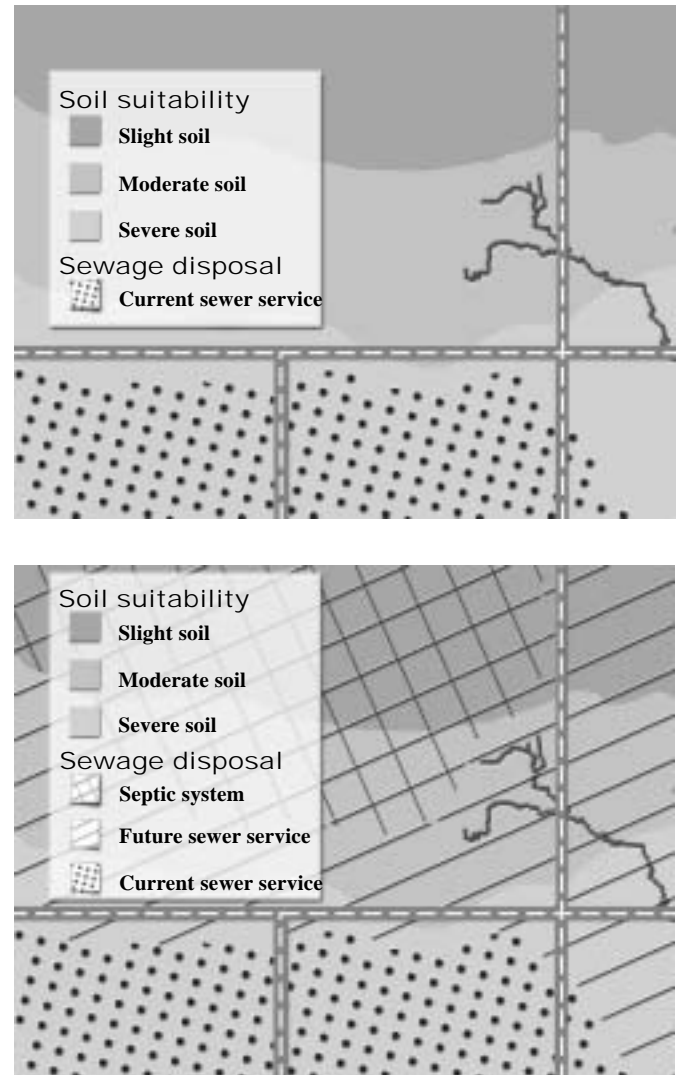
Financing sewer infrastructure

Capital Improvement Plan

Planning capital improvements within a community allows for a comprehensive approach to storm water management and sanitary sewer planning. It is also an important tool in land use and zoning decisions. Having a plan for future utilities will give planning commissions the tools they need to appropriately respond to new development proposals.

Every community should have a mechanism or system that allows for careful consideration of how existing facilities will be monitored, maintained, and replaced, and how and where future systems will be built and paid for. A capital improvement plan (CIP) lists all new major public facilities and associated infrastructure to be built, remodeled, or purchased in a community within the foreseeable future. Capital improvements consist of the major physical facility projects over and above annual operating expenses. A CIP helps establish a schedule or program for sewer projects according to community priorities. A CIP should be updated annually to reflect changing priorities and financial resources in the community.

Figure 17
Identifying Wastewater Infrastructure
in Your Community



Top: Planning for sewer service should be an essential component in the community's master/comprehensive plan. The first step in designating areas to be sewered is to identify current sewers in the community. Next, map out the community's soil suitability for on-site sewage disposal systems. (This information can be obtained from your county office of the Natural Resources Conservation Service). Include other features on your map that are important in determining future sewer needs (e.g., major roads, future commercial areas).

Bottom: After analyzing the current sewer area, soils, roads, and commercial needs, map the future sewer needs for your community. After designing the future sewer service for your community, it's important to include this information in the community's capital improvement plan.

Consider the following components to include in a capital improvement plan:

- Include policies related to natural resource protection.
- Include standards as the basis for design of storm water and sanitary systems.
- Identify the location of both the current and future sanitary and storm sewer infrastructure and areas served or to be served in the future.
- Include capital improvement for installing, maintaining, and replacing storm and sanitary sewer utilities.
- Identify the financial resources needed and available to meet the sewer needs, including options for raising additional revenue and providing services at a lower cost.
- Call for the use, maintenance, and replacement of storm water best management practices.
- Include capacity contractual agreements with providers (for water) and receivers (for sewerage).
- Have special provisions for industrial users and require pretreatment of wastewater.

Municipalities have a variety of mechanisms available to generate revenues and lower costs. For example, there may be an opportunity for two or more communities to join together to meet their sewage transport and/or treatment needs with regional facilities or implementing an accelerated manhole maintenance program to reduce infiltration, thereby increasing transport and treatment capacity. Each municipality will have to determine the appropriate combination of mechanisms to best meet their unique circumstances.

Water and sewer rates

Sewer rates generally are the primary source of revenue for sewer operation and maintenance. Therefore, rates need to be established at a level that provides adequate funding for sewage collection, transport, and treatment, as well as any debt retirement and capital improvements assigned to sewer rates.

- Review sewer rates to determine the adequacy of revenue to properly operate and maintain sewer infrastructure systems and periodically reassess funding needed to provide a high level of operation and maintenance.
- Treatment facilities that serve more than one municipality should consider rate structures that offer incentives for developing and implementing sustainable growth and pollution prevention measures.
- Use the water and sewer billing system as an opportunity to disseminate water quality educational information, tips on water conservation, and promote environmental stewardship.

Engaging in intergovernmental cooperation

A significant number of municipalities in Southeast Michigan cooperate on meeting their sewer service needs. For example, the Detroit Water and Sewerage Department provides wastewater treatment for more than 75 municipalities. In fact, many of the more than 50 municipal wastewater treatment plants in Southeast Michigan serve more than one community. Additionally, several counties own and operate sewer interceptors that transport wastewater from several municipalities to different treatment facilities. Cooperation with neighboring communities on sewer service can reduce costs by achieving economies of scale in providing service and avoiding the expense of duplicative planning and sewer service availability.

At a minimum, neighboring municipalities should be sharing and reviewing each other's sewer plans and maps in an effort to identify opportunities for cooperative arrangements and avoiding "hop-scotch" patterns of development that result in inefficient land use and infrastructure services.

Watershed management planning is another way to establish intergovernmental agreements related to sewer service. The storm water permitting program provides a prime opportunity for considering such intergovernmental cooperation through developing common (sub)watershed management plans. While this program is targeted primarily at controlling pollution from storm water, comprehensive watershed management plans often include a sewer service component. Active participation in local watershed management planning can also lead to designing and implementing sewer projects that focus on protecting water resources.

CASE EXAMPLE

Ypsilanti Community Utilities Authority (YCUA) Sanitary Sewer Master Plan

Contact: Larry Thomas, (734) 484-4600

The Ypsilanti Community Utilities Authority (YCUA) was formed in 1974 by combining the water and sewer departments of both the city and township of Ypsilanti. In addition to directly serving the city and township, YCUA contracts to provide bulk water and wastewater services to the townships of Pittsfield, Augusta, Sumpter and Superior. In 1993, YCUA began treating almost nine million gallons per day (mgd) of wastewater from portions of Canton, Northville, and Plymouth townships under a contract with the Western Townships Utility Authority (WTUA).

Constructed in 1982, the YCUA wastewater treatment plant is capable of providing tertiary treatment to 29 mgd of wastewater. The plant was designed to allow expansion to meet future wastewater treatment needs.

Growth within the YCUA wastewater service area and the expansion of service area to include WTUA prompted YCUA to commission the development of a comprehensive Sanitary Sewer Master Plan. Completed in 1999, the Master Plan assesses the performance of the existing sanitary sewer system and the impact of population growth upon the system's performance. The Master Plan provides recommendations for improvements to accommodate future population growth and how to prioritize projects. As a result of this study, future wastewater treatment needs are projected to be an additional 17 mgd, increasing the plant capacity to 46 mgd. Plant expansion is expected to be completed in 2006.

Based on this plan, each municipality within the YCUA system is assessed the costs (including capital costs) of providing the services it receives. However, through cooperative arrangements and the sharing of administrative and other costs has resulted in a lower per unit cost of service. By working together, the communities served by YCUA will ensure that their current and future wastewater treatment needs are met in a cost effective and environmentally sound manner.

Sanitary Sewer Allocation Policy

Community: Ira Township

Contact: John Jones, (586) 725-0263

In 1996, the Ira Township Board implemented a moratorium on sewer extensions until it could complete a sanitary sewer study to determine available capacity within its own system, the regional interceptor, pump station, and treatment plant. Based on the study, the township had the capacity to transport and treat a maximum of 682 additional Residential Equivalent Units (REUs). Based on existing plats and site plans, 212 REUs had already been committed. This left 470 REUs uncommitted and available for future development.

To assure an equitable distribution of the remaining sewer capacity, the township adopted a sanitary sewer allocation policy in 1997. One of the primary objectives of the policy is to make sure land use plans are compatible with the remaining sewer transport and treatment capacity. Following are some of the key components of this policy:

- 75 percent of the non-committed capacity was allocated to residential users and 25 percent allocated to commercial, institutional, and industrial users.

- The township was divided into three sewer districts, based on remaining vacant land.
- No single residential development can receive more than 20 percent of the allocation for that district.
- The policy will be reevaluated every two years and amended if necessary.

Based on the township's master plan, sewer and water master plan, existing sewer capacities, proximity to existing infrastructure, and surrounding zoning and land uses, Ira Township denied a request to rezone a large tract of land that would have increased its residential capacity from 117 to approximately 300 lots. Subsequently, the developer challenged the rezoning decision and filed suit against Ira Township in Circuit Court. The court decided the case in favor of the township, finding "Ira Township, in light of its sewage capacity problems in 1996, was not unreasonable in not granting (the developer's) request for rezoning; the fact that the Township took a coordinated view of getting its own update to its master plan, with it amending the zoning of the whole township before it ruled on (the developer's) request was not unreasonable . . ."

Ira Township recognized that real limits to its ability to provide sewer service for future development exist and that sewer capacity will be a limiting factor in the density of future developments. By developing and adopting of its comprehensive sanitary sewer allocation policy, the township is able to make decisions in a fair and equitable manner on how its remaining sanitary sewer capacity will be distributed to meet future needs. Without this policy in place, the rezoning would otherwise have created sewer and treatment plant capacity problems. This might have resulted in negative water quality impacts, poor service, and additional costs to the township to remediate these problems.

Additional Resources

Bowyer, Robert A. *Capital Improvements Programs: Linking Budgeting and Planning*. American Planning Association. 1993.

Intergovernmental Growth Management Consortium. *Infrastructure Management Options to Deal with the Impacts of Growth*. 1991.

Planning and Zoning Center, Inc. *Community Planning Handbook: Tools and Techniques for Guiding Community Change*. Michigan Society of Planning Officials. 1992.

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Williams, Kristine M. "Strategies for Managing Capital Improvements." *Planning and Zoning News*, February 1992.