THE U.S. CONFERENCE OF MAYORS – MAYORS WATER COUNCIL

Trends in Local Government Expenditures on Public Water and Wastewater Services and Infrastructure: Past, Present and Future

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THE U.S. CONFERENCE OF MAYORS
MAYORS WATER COUNCIL

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Mayors Briefing

Purpose of the Report

The purpose of this report is to examine trends in local government spending on public water and wastewater services and infrastructure to determine the level of resources devoted to these functions; and to project what the likely spending requirements will be over the next 20 years (2009 to 2028). The report also reviews how various federal government agencies provide financial assistance for public water and wastewater systems, and suggests some broad goals for renewing the intergovernmental commitment to sustainable water and wastewater services and infrastructure.

Like many other forms of public infrastructure in America, water and wastewater suffer from the lack of a coordinated and integrated National Strategy. Rather than providing leadership, Congress and the federal government have essentially abandoned providing meaningful financial assistance to local government, but have, instead, authorized and implemented a costly and increasing wave of mandates. The mandates lack prioritization based on comparative risk; and are not coordinated to match compliance phase-in with the ability of local government to finance improvements. Instead, the wave of mandates is forcing local government onto a spending treadmill where ever-growing annual investments may not be sufficient to guarantee safe, affordable and adequate supplies and services or comply with law in the 21st century. Current federal policy fails to target financial assistance to the very metro-urban areas that the national economy depends on for employment and wealth creation.

One of the biggest impediments to renewing our national public water and wastewater infrastructure is the lack of precision in our understanding of who is paying how much for what; and how much total investment needs will be in the near future. This has resulted in a vague and false confidence among Congress that they have already addressed the issue by granting $60 billion to cities over two decades ago to build water infrastructure when the cost in a single year (2008) is over $40 billion in capital investments and another $50 billion for operations and maintenance. A more thorough understanding of how much is spent on public water and wastewater is a necessary first step in establishing a framework for a National Strategy. A National Strategy requires an accurate accounting of what percent of societal resources are now devoted to public water and wastewater; as well as how much of societal resources will be required in the future. Like any 'public good' issue, scarce resources should be targeted according to carefully thought out priorities (are we spending money on the right things?) and a recognition of the real limits of local government financial capabilities.

Key Findings

Local Government Spending on Public Water and Wastewater Systems: 1956 to 2008

- Local government has spent:
  - $1.6 trillion in nominal dollars, on public water and wastewater services and infrastructure
  - Or, $3.1 trillion in year 2008 inflation adjusted dollars
  - $93 billion on water and wastewater systems in 2008
- Local government spending on public water and wastewater doubled five times over this period, and GDP doubled four times.
- Annual local investment in these systems, including capital and Operations and Maintenance (O&M), is equivalent to 6.8 tenths of one percent of Non-defense GDP as of 2008.
  - For over 50 years local government investment in water and wastewater services and infrastructure represented between 0.5 and 0.7 tenths of one percent of Non-defense GDP.
    - Wastewater infrastructure (not including O&M) investments average 0.155 tenths of one percent of Non-defense GDP; during the period 2000 to 2008 it has fallen to 0.11 tenths of one percent.
- Currently, 60 percent of every dollar invested pays for Operations and Maintenance (O&M), reversing a past trend of majority spending on the capital investment side of the ledger.
- Capital outlays for infrastructure replacement are increasing each year, but the replacement outlays are decreasing as a relative percent increase over previous years. Wastewater capital investment is at an alarmingly low replacement rate.

Projections of Future Local Government Spending: 2009 to 2028

- Historic spending patterns from 1956 to 2008 were reviewed to determine a range of growth rate assumptions to project a range of future local government spending. Starting the base year at $93 billion in 2008 spending as the departure point:

Future Spending Projection	20-Year Cost w/o Needs Gap ($ Trillion)	20-Year Cost w/Needs Gap ($ Trillion)*
High Growth 7.50%	4.3	4.8
Mid-Range Growth 5.22%	3.3	3.8
Low Growth 2.66%	2.5	3

* Addition of $25 billion/year for infrastructure over current spending.

- Projected investment over the next 20 years will range between one and a half to three times the investment made over the last 53 years
- The EPA's high end estimated "Needs Gap" of additional capital spending ($500 billion) amounts to between 10 and 20 percent of the projected range in total spending over the next 20 years. The Needs Gap estimate is a component cost category of the "big picture".

- Several anticipated, but not yet quantified, factors could significantly influence the projected estimates of total local government spending over the next 20 years. These factors include:
  - Population growth
  - Replacement of above ground treatment works that are approaching the end of their useful life
  - The requirement for more advanced levels of energy intensive water treatment technology to address:
    - An increased number of water contaminants such as those entering water bodies from consumer and pharmaceutical products;
    - Reuse of wastewater for potable purposes; and,
    - Recovery of brackish water from groundwater sources and the ocean for potable purposes.
  - Water related impacts from climate change in coastal high hazard areas, in floodways, and in areas prone to extended drought.

Federal Government Role in Financing Public Water And Wastewater Investment

The Federal government, (i.e., Congress and the relevant Federal Agencies) has performed one of the most sophisticated acts of avoiding responsibility for the policies it has imposed on the nation's cities in modern history when it comes to public water and wastewater. Local government was a willing partner with Congress in setting the lofty goals of the Clean Water and Safe Drinking Water Acts. Local government willingly and enthusiastically continues to implement the programs and make major investments to achieve these goals, but the Federal government has abdicated its role as 'partner' in this effort. Instead of sharing the responsibility to finance the necessary infrastructure Congress has taken the position that achieving the goals of the water laws is not a federal responsibility.

The key federal agency (EPA) is no longer the 'partner' to local government that it once was; the Agency has instead assumed the role of 'prosecutor'. As a regulatory and enforcement arm of the federal government, the EPA explains that it is merely exercising due diligence when it adopts overly costly rules and impossibly short time frames for local government to comply with. Local elected officials who struggle to provide the financing to meet the requirements are now cast in the popular press as the ones who are "poisoning" our waterways. This situation continues to erode public confidence in government at all levels.

Congress, on occasion, requests information from the Congressional Budget Office and the Government Accountability Office in response to local government requests for financial assistance. Reports from these organizations generally reinforce the message that public water and wastewater are not federal responsibilities, and that local government is, in many ways, deficient in its efforts to finance and operate water and wastewater systems. These declarations reinforce current Congressional attitudes that water and wastewater should not be shared intergovernmental responsibilities; nor do they address the pending crisis of crumbling water infrastructure in America.

This report makes a first attempt at providing some perspective on the role of federal financial assistance over the last few decades. The key findings indicate that the federal government is not only doing too little, but the little they do is targeted in a way that, again, fails to provide meaningful help to the metro-urban economies (cities) that drive the national economy.

- Federal financial assistance to local government for public water and wastewater has been flat since the mid to late 1980s; and has declined as a proportion of total investment.
- Federal agency programs to provide financial assistance to local government are limited due to: inadequate commitment of capital funding; disbursement of State Revolving Fund (SRF) capitalization grants to the states rather than directly to local government; and, the tendency to focus financial assistance on small and rural communities.
- Local Government is responsible for providing 98 percent of total investment in public water and wastewater systems.
- The State Revolving Fund loan programs, the preeminent federal water infrastructure financial assistance program for local governments, provides relatively little "face-value" compared to other federal assistance programs:
  - The near $2 billion a year Congressional appropriation to recapitalize grants to states provides roughly $80 million in "face-value" to local government: a contribution of six ten-thousandths of one percent of Non-defense GDP
  - The cumulative amount of interest rate subsidy for the SRF loan programs may be close to $300 million a year: two thousandths of one percent of Non-defense GDP.
- The Department of the Treasury provided an estimated $2.61 billion subsidy in the form of lost revenues from the interest rate charged on municipal bonds used for public water and wastewater projects in 2006: a contribution of two hundredths of one percent of Non-defense GDP.
- Both HUD and USDA provided $4.5 billion, each, over the 10-year period 1991 to 2000 in the form of grants, loans and loan subsidies to local government for public water and wastewater investment.

Federal Program/Policy Compared to Local Government Investment	Percent of Non-Defense GDP
Local Government (1956 – 2008) (one year)	0.65 (on average)
EPA – SRF (one year)	0.0006 (2006)*
EPA – SRF (cumulative-revolving)	0.002 (2006)
EPA – SRF (Earmarks – one year)**	0.003
Treasury (tax preference on Muni Bonds)	0.02 (2006)
HUD (one year est. between 1991-2000)	0.003
USDA (one year est. between 1991-2000)	0.003
DOC – EDA (one year est. between 1991-2000)	0.001

* See discussion in Appendix 1: Materials and Methods

** Based on FY1991-FY2000 Data reported in GAO, 2001.

A National Action Agenda to Renew and Strengthen the Intergovernmental Commitment to Water and Wastewater Infrastructure

- Suggested Congressional Actions
  - Allocate an additional $50 billion over 10 years in this way: $3 billion annually in grants to cities to comply with sewer overflow infrastructure; and $2 billion annually in additional SRF loan funding for rehabilitation of aging infrastructure, protection of water and wastewater infrastructure, and promote source water availability;
  - Fully fund federally-passed environmental mandates and court-ordered consent decrees applicable to water and wastewater systems (e.g., combined-sewer and wet weather overflow issues);
  - Increase program/policy flexibility to allow cities to undertake locally-designed strategies, emphasizing green infrastructure and other flexible and innovative solutions;
  - Remove Private Activity Bonds for water/wastewater infrastructure from State Volume Caps;
  - Identify and remove impediments in the Federal Tax Code to enhance local government access to private capital to fund public water and wastewater infrastructure.
- Suggested EPA Actions
  - Provide more direct and location/situation specific technical assistance to cities concerning: asset management, long-range capital planning, and sustainable system pricing strategies;
  - Develop EPA Regional plans for infrastructure improvements related to climate change, including adapting to events such as droughts, floods, and rising sea levels;
  - Provide technical assistance to cities to optimize the water-energy nexus to conserve both and reduce carbon footprint.

I. Purpose and Background

a. Purpose

The purpose of this report is to provide a characterization of trends in local government spending on public water and wastewater services and infrastructure in the United States, and to comment on the declining role of federal financial assistance to local government in this area. This characterization may be useful to government policy makers at the local, state and federal levels as they consider how best to identify (and allocate) an appropriate level of social resources required to provide safe, affordable and adequate water and wastewater services and infrastructure for sustainable cities in the 21st century. Currently, local government contributes over 97 percent of total annual expenditures on public water and wastewater services and infrastructure while state and federal contributions are minimal, have provided a relatively declining share over time, and have established financial assistance distribution mechanisms that favor states rather than the local governments who are legally responsible for compliance with the unfunded mandates of state and federal water laws. The Conference of Mayors is hopeful that the information in this report will encourage greater cooperation, less disjointed decision making, and higher levels of cost-sharing among all levels of government because the investment needed over the next 20 years (2009 to 2028) will dwarf the total investment made over the last 53 years.

b. Background

Almost everyone agrees that clean drinking water and public wastewater services (herein referred to as water infrastructure) are necessary priorities to sustain public health, support the economy and protect the environment. Significant portions of societal resources have been devoted to water infrastructure in American cities over the last 60 years to meet these priorities. An impressive inventory of physical assets, by any world-wide measure, has been developed over this period. The investment needs to develop new assets, rehabilitate the aging existing infrastructure, and operate the systems to comply with existing law and expected levels of service, public health protection and environmental stewardship appear to greatly exceed current and planned allocation of resources. The American economy with a Gross Domestic Product (GDP) in 2008 exceeding $14 trillion dollars certainly has the wealth to devote to achieving sustainable public water infrastructure, but such allocation of resources competes with other important infrastructure and social needs.

i. An Inventory of Physical Assets

EPA has on several occasions, (e.g., various reports, testimony before Congress, and in public presentations) commented on the largesse of America's water infrastructure. It estimates that there are approximately 155,000 public drinking water systems in the nation, (US EPA, November 2008). The vast majority of Americans (292 million) are served by 52,000 community water systems and another 21,400 non-community water systems. Community water systems include over 1.8 million miles of network pipes, (US EPA, December 2002). The nationwide system of wastewater infrastructure includes 16,000 publicly owned wastewater treatment plants, 100,000 major pumping stations, 600,000 miles of sanitary sewers, and 200,000 miles of storm sewers.

Information presented in this report clearly indicates dramatically escalated investments in public water and wastewater infrastructure over the last three decades. Local

government and other organizations have expressed concerns that this infrastructure is approaching, or already has exceeded, its projected useful life. Underground assets, the pipes, often comprise the largest asset portion of city water infrastructure. EPA estimates from system surveys that 80 percent of water system distribution mains are less than 40 years old, and four percent are more than 80 years old. "The older pipe tends to be in larger systems…The cost per mile of pipe replaced increases with system size; larger systems tend to be urban and in northern areas, where population density and frost tend to increase the cost of maintaining and replacing water mains", (US EPA, December 2002, Volume II, Tables 35-38). The situation for wastewater pipes has the added concern that a number of very large systems in densely populated cities are served by original pipes that may be at least 100 years old.

A survey of major American cities reports the cycle for water pipe repair and replacement to range from three to 300 years; and 44 percent of surveyed cities anticipate completing a cycle in more than 50 years, (Anderson, 2007). The same report indicates that cities anticipate wastewater pipe repair and replacement cycles to range from two to 1,200 years; and half of the cities expect their cycles to exceed 40 years.

An earlier survey of major American cities indicates that over 60 percent of the surveyed cities identified rehabilitating aging urban water infrastructure as their top water resources priority (Anderson 2005). That report also found that 92 percent of the survey cities made major capital investments in water infrastructure between 2000 and 2004, and planned to do so again between 2005 and 2009. Greater than 70 percent of the surveyed cities were making major capital investments in their underground assets, but only 50 percent were making major capital investments in their above ground assets.

ii. Estimated Need for Investment in Public Water Infrastructure

The American Society of Civil Engineers (ASCE) released its first Report Card for America's Infrastructure in 2005 (ASCE 2005), and an updated report more recently (ASCE 2009). The Report Card "…provides an assessment of the condition and need for investment of 15 infrastructure categories". ASCE suggests that drinking water and wastewater systems generally receive a D- grade. The Report Card cites water loss of seven billion gallons a day from leaking drinking water pipes, an annual shortfall of $11 billion to replace aging facilities, and billions of gallons of untreated wastewater discharged into surface waters each year, as some of the major problems caused by, among other things, lagging investment.

Several estimates of the 20-year need for investment in water and wastewater infrastructure have been made. Some of these estimates are based on 'bottoms-up' information generated from water and wastewater system surveys. Others are based on analyses of finance costs or resource costs. It is important to note that some of the estimates include total spending, but some only involve estimates of the 'Needs Gap", or, the investment over and above annual spending that is required to comply with existing law and expected service levels. Thus, there is sometimes a mixture of Operations & Maintenance (O&M) costs with infrastructure capital costs.

EPA has produced a series of reports estimating capital investment needs to comply with existing law over a 20-year period: 1995 @ $200.5 billion; 1999 @ $198.2 billion; 2003 @ $331.4 billion. The latest estimate based on extrapolations from a statistically designed 2007 survey of community water systems is reported in 2009 (US EPA, February 2009). The 2007 needs estimate is $334.8 billion, adjusted to 2007 dollars. The 2007 estimate "…represents infrastructure projects necessary from January 1, 2007, through December 31, 2026, for water systems to continue to provide

safe drinking water to the public." That estimated need includes investment in pipes, plants, storage tanks and other assets.

The Congressional Budget Office (CBO) provided high-cost and low-cost estimate scenarios concerning future needed investments in drinking water and wastewater infrastructure, (CBO, November 2002). CBO qualifies the nature of the estimates, stating "...the estimates are intended to represent the minimum amount that water systems must spend (given the scenario's specific assumptions) to maintain desired levels of service to customers, meet standards for water quality, and maintain and replace their assets cost effectively". The CBO estimates involve the years 2000 to 2019 in an effort to be comparable to other organization's estimates. They report "... annual costs for investment will average between $11.6 billion and $20.1 billion for drinking water systems and between $13.0 billion and $20.9 billion for wastewater systems", in 2001 dollars. CBO also projects that annual cost over the period for operations and maintenance (O&M), which are not eligible for aid under current federal programs, will average between $25.7 billion and $31.8 billion for drinking water systems and between $20.3 billion and $25.2 billion for wastewater systems.

CBO emphasized "...the large amount of uncertainty surrounding those future costs." The authors suggest that actual future costs may lie outside the range estimates reported due to "...limitations of the data and the uncertainty about how future technological, regulatory, and economic factors might affect water systems".

Water Infrastructure Network (WIN) published a report (April 2000) that relied on a 'bottoms-up' analysis of the infrastructure investment needs for public water and wastewater for the 20-year period 2000 to 2019. The analysis benefitted from the extensive practical and professional water and wastewater experience of the coalition of public and private organizations involved. The report estimated that additional capital investments (the funding 'gap') of $23 billion a year is necessary, over current spending, to comply with existing law and expected levels of service. This figure is extrapolated to $460 billion (in nominal dollars) over the 20 year period involved. WIN broke this down on an annualized basis: an additional $12 billion for water and $11 billion for wastewater.

The WIN report emphasized total spending by local and state government on both O&M and capital investment. The report estimates that $95 billion in total annual spending is needed to provide the adequate funding for O&M and capital investment: $50 billion for drinking water and $45 billion for wastewater. The report estimates that $1 trillion of investment is needed over the 20-year period for capital investment.

The various estimates of capital investment needs conducted by different organizations, sometimes covering different time periods, (e.g., 2000 to 2019, 2007 to 2026) comprise a range of potential costs, and some provide point estimates as well. Comparing these estimates is tantamount to mixing apples and oranges. EPA presents many of the estimates in a single chart where the dollar amounts are inflation adjusted to 2007 dollars, (EPA, February 2009, Exhibit 1.3, p. 4). The high-end estimate appears to be close to $500 billion; for convenience that number is used in this report to represent the Needs Gap.

II. Local Government Combined Spending on Public Water Supply and Wastewater Infrastructure and Services: Nominal and Inflation Adjusted (Constant) Dollars

a. Total Spending on Water Supply and Wastewater Systems

Local government combined spending on public water and wastewater from 1956 to 2008 was $1.61 trillion (nominal) dollars. This investment has made possible the current inventory of physical assets including some 52,000 public water supply and 1,600 wastewater systems. The trend over this 53-year period is one of nearly continuous annual investment increases (Table 1). Total combined expenditure in 1956 was $2.3 billion. In 2008 it grew to $93.6 billion. And yet, local government is on a spending treadmill where ever-growing annual investments may not be sufficient to guarantee safe, affordable and adequate supplies and services in the 21st century. One possible indication that investment is not keeping up with needs is inferred from the decreasing relative proportion of investment over four decades (1960s through the 1990s). The data suggest a pattern of continually paying more but losing ground on investment required to maintain the physical integrity of the built water and wastewater infrastructure.

It is reasonable to expect local government spending in the early years (the 1950s and 1960s) would yield significant results because the inventory of physical assets was relatively sparse. Growth of the inventory (water supply and wastewater systems) was spurred by the action-forcing mechanisms of federal policy in the Clean Water Act and the Safe Drinking Water Act. It is important to look beyond trends in annual spending and to focus on spending over a series of decades because it characterizes long-term spending that is not distorted by spending in any single year that may have experienced unique conditions. This approach also allows for the calculation of relative proportional changes in spending over time.

Hence, combined spending on water and wastewater systems in the 1950s was $10.1 billion; $39.1 billion in the 1960s; $100.8 billion in the 1970s; $268.5 billion in the 1980s; and $493.1 billion in the 1990s. Expenditures in each decade grew, at least in nominal dollars. The relative proportional change in spending over the four decades including the 1960s, 70s, 80s and 90s, however, exhibits a different trend (Table 1: column 3). The relative proportional increase in spending in the 1970s compared to the 1960s is 158 percent, (or - spending in the 1970s was 158 percent of spending in the 1960s). The increase in the 1980s compared to the 1970s is 166 percent. And, the increase in the 1990s compared to the 1980s is 84 percent. The declining proportional rate of increased spending over time is important because it suggests a shift in investment emphasis between providing services, building new systems and maintaining existing systems.

Total local government combined spending on public water and wastewater systems from 1956 through 2008 is $3.164 trillion measured in 2008 dollars (constant dollars) versus $1.68 trillion measured in nominal dollars (Table 2). The investment trend in inflation adjusted (constant) dollars mimics the trend in nominal dollar investments - increased spending each successive decade, but the constant dollar amounts are higher than spending measured in nominal dollars. The relative proportional investment change in constant dollar spending over the five decades (Table 2; column 3), is lower than the relative proportional change in nominal dollar spend-

ing (Table 1; column 3). For example, the relative proportional change in nominal dollar investment in the 1990s compared to the 1980s was 84 percent (Table 1). While the same time period change measured in constant dollars was 36.5 percent (Table 2). Generally, the relative increases over the decades are consistently lower for wastewater than for water supply.

Table 1 Local Government Trends in Combined Total Spending on Public Water Supply and Wastewater Treatment, 1956 - 2008 - Nominal Dollars

Time Period	Water and Wastewater Exp. ($ bill)	Change from Prev. Period (%)	O & M Exp. ($ bill)	Change from Prev. Period (%)	Capital Outlay Exp. ($ bill)	Change from Prev. Period (%)	No. of Years
1956-2008	1,610.50	–	916.4	–	694.1	–	53
1956-59	10.1	–	3.85	–	6.3	–	4
1960-69	39.1	–	15.8	–	23.3	–	10
1970-79	100.8	158	44.4	181	56.5	142	10
1980-89	268.5	166	140.3	216	128.3	127	10
1990-99	493.1	84	294.2	110	198.9	55	10
2000-08	698.8	–	417.9	–	280.9	–	9

Several component cost categories comprise total local government expenditures on public water and wastewater systems. Providing potable and sewage services and maintaining the systems are grouped under Operations & Maintenance (O&M). Capital investments include, but are not limited to, construction, major equipment, rehabilitation, etc. The proportion of investment in these categories has changed over time. Changes in the relative magnitude of spending for these categories describe past and present priorities concerning service provision and capital investment.

Table 2 Local Government Trends in Combined Total Spending on Public Water Supply and Wastewater Treatment, 1956 - 2008 - Constant Dollars (2008 = 100%)

Time Period	Water and Wastewater Exp. ($ bill)	Change from Prev. Period (%)	O & M Exp. ($ bill)	Change from Prev. Period (%)	Capital Outlay Exp. ($ bill)	Change from Prev. Period (%)	No. of Years
1956-2008	3,164.10	–	1,686.50	–	1,477.60	–	53
1956-59	97.8	–	43.3	–	54.5	–	4
1960-69	332.6	–	137.5	–	195	–	10
1970-79	438.2	31.7	198.5	44.4	239.6	22.9	10
1980-89	612.6	39.8	322.6	62.5	290	21	10
1990-99	836.2	36.5	483	49.7	353.2	21.8	10
2000-08	846.7	–	501.5	–	345.2	–	9

b. Combined Water and Wastewater Spending on Operations & Maintenance (O&M)

Combined spending on water supply and wastewater system O&M was $916.4 billion over the 53 year period 1956 to 2008 (Table 1). O&M spending has gradually grown over time as a proportion of total expenditures. For example, in 1956 O&M

spending was $861 million (or 37.5 percent of total spending for that year) compared to $1.43 billion devoted to capital spending (62.5 percent). This relationship was reversed in the mid-1980s when O&M accounted for a majority proportion of total spending. By 2008 O&M spending accounted for 59 percent of total spending at $55.6 billion compared to $38 billion (41 percent) devoted to capital expenditures.

O&M nominal spending rose from $15.8 billion in the 1960s to $44.4 billion in the 1970s, a 181 percent increase (Table 1; columns 4 and 5). During the 1980s O&M expenditures increased 216 percent over the 1970s. The relative increase in the 1990s compared to the 1980s was 110 percent; but expenditures in the 1990s were $294.2 billion compared to $140.3 billion in the 1980s.

Inflation adjusted spending on O&M from 1956 to 2008 was $1.69 trillion (Table 2), compared to $916.4 billion in nominal dollars over the same period (Table 1). The inflation adjusted relative change in O&M investment over the four decades accounted for relatively lower increases over time (Table 2). Investments in the 1970s were 44.4 percent greater than the 1960s. Investments in the 1980s were 62.5 percent greater than in greater than the 1980s.

c. Combined Water and Wastewater Capital Outlays

Capital investment (investment in infrastructure construction, major repair and/or replacement, but not maintenance) for the period 1956 to 2008 was $694.1 billion. Capital investment accounted for a majority of total expenditures on public water supply and wastewater systems through the mid 1980s, but exhibited a declining relative share of total spending over time. Capital investment in nominal dollars for water supply and wastewater systems in 1956 were $1.4 billion; and $38 billion in 2008.

Capital spending in nominal dollars rose from $23.3 billion in the 1960s to $56.5 billion in the 1970s; a 142 percent increase (Table 1). During the 1980s it increased 127 percent over the 1970s. Expenditures in the 1990s were $198.9 billion compared to $128.3 billion in the 1980s; the relative change in the 1990s over the 1980s was 55 percent.

Inflation adjusted capital spending over the period 1956 to 2008 was $1.48 trillion (Table 2), compared to $694.1 billion in nominal dollars. The inflation adjusted investments exhibit steadily lower relative increases over time. For example, $239.6 billion invested in the 1970s was a 23 percent increase over investment in the 1960s. During the 1980s investment increased 21 percent over the 1970s; and increased nearly 22 percent in the 1990s compared to the 1980s. One might expect the capital investments to increase substantially during the 80s and 90s in response to federal and state performance standard mandates. The 'investment impact' of the performance standard mandates, however, may have been felt more on the O&M side of the ledger.

The capital investment patterns are troublesome, however, because many of the public water supply and wastewater systems are approaching, or already have reached, their useful structural lifetimes. In many urban settings the cost to replace aging underground pipes is greater than when the pipes were first laid due to the density of subsequent urban development and higher prices for labor and materials. Replacement of pipes in suburban areas is also very costly. Also, water supply and wastewater treatment technologies and equipment have changed. Generally, their cost has increased over time due not only to inflation but also due to the advanced capabilities necessary to meet increased federal and state standards of performance.

The spending trends for total expenditure, O&M and capital investment are

presented in graphical format in Figures 1 and 2. One trend that stands out is that in constant dollar investments, even local government spending appears to have hit a plateau.

Figure 1: Local Government Spending on Public Water and Wastewater, 1956 – 2008, Nominal Dollars

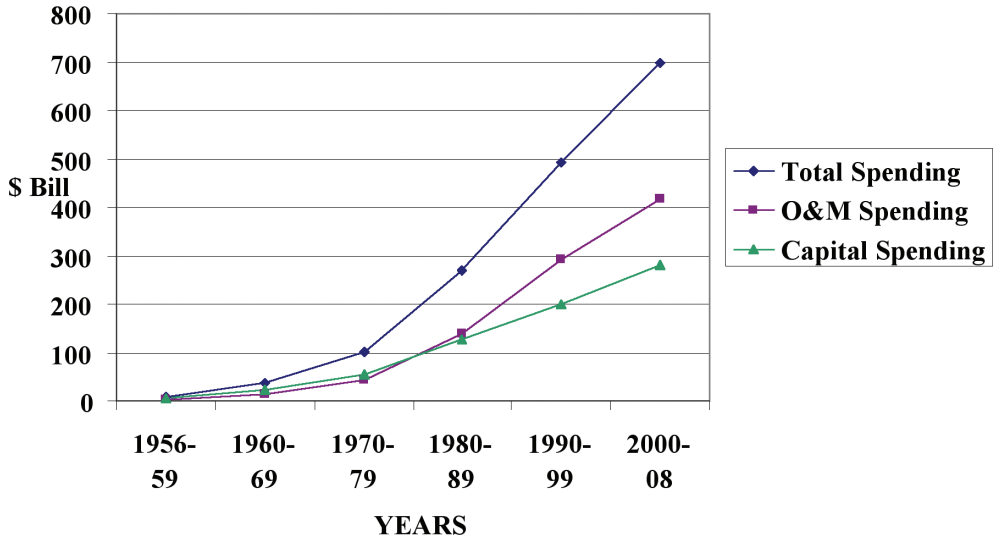
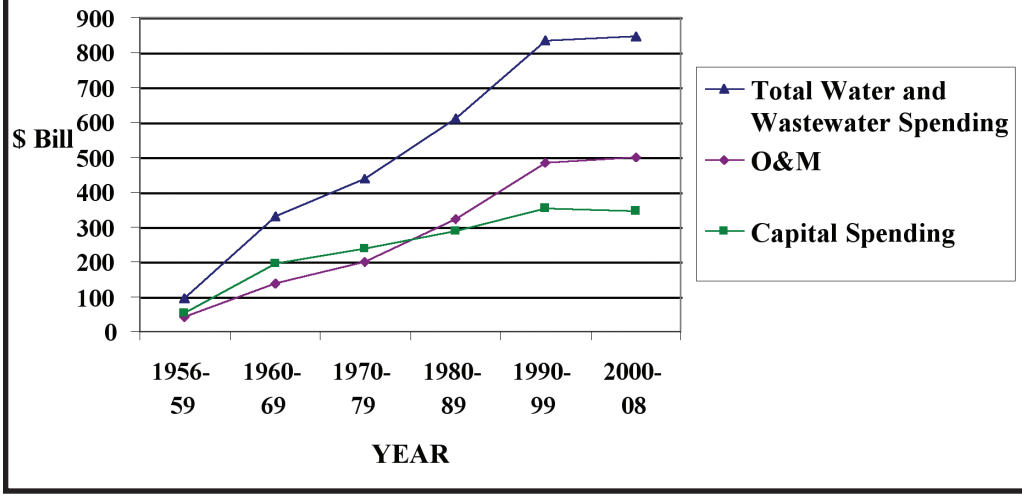


Figure 2: Local Government Spending on Public Water and Wastewater, 1956 –2008, Constant Dollars (2008=100%)



III. Local Government Water Supply System Expenditures

Data are available for three different cost components of total water supply (reported as water utility) expenditures: O&M, capital outlay and interest payments on bonds and loans. Comparable year data, however, are only available for the time periods 1956, 1957 and 1961 to 2004. Since total water utility expenditures were available for 1958 to 1960, missing data elements were estimated using a proportion allocation approach that is discussed in Appendix I, Materials and Methods. While interest payments are described below as a distinct cost component it should be noted that interest payments are combined with capital outlays for further analysis, and especially to be comparable to capital outlays for wastewater systems.

a. Total Spending on Water Supply Systems

Total local government water supply expenditure over the 53-year period 1956 to 2008 was $893.5 billion in nominal dollars (Table 3). Water supply accounts for 55.5 percent of the combined water and wastewater spending over that period. Water supply expenditures historically commanded a higher share of total spending. In 1956 water supply spending accounted for 64 percent of the total. In 2008 it accounted for 55 percent. Wastewater expenditures currently account for about 45 percent of overall spending. Annual expenditures for water supply and wastewater systems have fluctuated over time.

Water supply spending commanded between 59 and 63 percent of combined water and wastewater expenditures from 1956 until the early 1970s. That share decreased in the late 1970s and early 1980s to around 50 percent (and slightly lower) as a result of increased spending on wastewater made possible by the construction grants program implemented under the authority of the Clean Water Act. Since 1986 the water supply share of total expenditures has been 55 percent, plus or minus two percent.

Table 3 Local Government Trends in Spending on Public Water Supply, 1956 - 2008 Nominal Dollars

Time Period	Total Water Utility Exp. ($ bill)	Change from Prev. Period (%)	O & M Water Exp. ($ bill)	Change from Prev. Period (%)	Capital Outlay ($ bill)	Change from Prev. Period (%)	Interest Exp. ($ bill)	Change from Prev. Period (%)	No. Of Years
1956-2008	893.5	–	509.5	–	272.3	–	111.7	–	53
1956-59	6.4	–	2.8	–	3	–	0.6	–	4
1960-69	24.1	–	11	–	10.4	–	2.7	–	10
1970-79	51.7	114	27.3	148	18.1	74	6.3	133	10
1980-89	143.7	178	80.4	194	45.5	151	17.8	182	10
1990-99	274.3	91	160.6	100	77.5	70	36.1	103	10
2000-08	393.2	–	227.5	–	117.6	–	48.1	–	9

Total spending on public water supply systems in 1956 was $1.46 billion. By 2008 total spending increased to $51.5 billion. The pattern of increasing annual nominal

dollar expenditures over time and relative percentage decline in spending holds for water supply with some period-specific differences. Local government spent $24.1 billion in the 1960s and $51.7 billion in the 1970s, a 114 percent increase over the previous decade. In the 1980s spending increased to $143.7 billion, a 178 percent increase over the 1970s. During the 1990s local government spent $274.3 billion, an increase of 91 percent over the previous decade. The nine year period 2000 to 2008 marks an increase in spending over the 1990s with $393.2 billion.

Total water supply spending for 1956 to 2008 was $893.5 billion in nominal dollars, compared to $1.761 trillion in inflation adjusted dollars (Table 4). Inflation adjusted investments rose 14.2 percent in the 1970s compared to the 1960s. Investments rose again by 43 percent in the 1980s compared to the 1970s. The relative increase in inflation adjusted investment declined slightly in the 1990s to 42.2 percent compared to investment in the 1980s.

The component cost category proportions of total water system expenditures during this 53 year time period include: O&M – 57.8 percent; capital outlay - 30.1 percent; and interest payments – 12.1 percent. The range in spending in these cost components have fluctuated over time and are discussed below.

Table 4 Local Government Trends in Spending on Public Water Supply, 1956 – 2008 Constant Dollars (2008 = 100%)

Time Period	Total Water Utility Exp. ($ bill)	Change from Prev. Period (%)	O & M Water Exp. ($ bill)	Change from Prev. Period (%)	Capital Outlay and Interest Exp. ($ bill)	Change from Prev. Period (%)	No. Of Years
1956-2008	1,760.80	–	972.4	–	788.4	–	53
1956-59	62	–	31	–	31	–	4
1960-69	200.3	–	96.1	–	104.1	–	10
1970-79	228.7	14.2	123.2	28	105.5	1.3	10
1980-89	327.1	43	184.9	50.1	142.2	34.8	10
1990-99	465.1	42.2	263.9	42.7	201.1	41.4	10
2000-08	477.6	–	273.1	–	204.4	–	9

b. Water Supply System Operations & Maintenance (O&M) Expenditures

Local government expenditures on O&M for 1956 to 2008 were $509.5 billion; and since the mid-1980s O&M began to command a majority share of total water supply system expenditures. O&M spending rose from $615 million in 1956 to $29.7 billion in 2008.

O&M spending increased from $11 billion in the 1960s to $27.3 billion in the 1970s; a 148 percent increase (Table 3). During the 1980s O&M expenditures increased 194 percent over the 1970s. The relative rate of increase in the 1990s over the 1980s was 100 percent: and the nominal dollar expenditure in the 1990s was $160.6 billion compared to $80.4 billion in the 1980s.

Inflation adjusted spending on water supply system O&M was $972.4 billion for the period 1956 to 2008, (Table 4). O&M inflation adjusted spending increased by 28 percent in the 1970s compared to the 1960; and increased by 50 percent in the 1980s compared to the 1970s. Spending on O&M increased by 42.7 percent in the 1990s compared to the 1980s.

c. Water Supply System Capital Outlays

Capital investment for the period 1956 to 2008 was $272.3 billion in nominal dollars (Table 3). Capital spending accounted for about half of total water supply spending in the early 1960s, and has increased in nominal dollar value over time, but has declined as a relative share of water supply spending. In 1956 capital spending was $0.7 billion; in 2008 it was $15.5 billion (about half of what O&M spending was in that year).

Capital outlays rose from $10.4 billion in the 1960s to $18.1 billion in the 1970s, a 74 percent increase. During the 1980s capital outlays increased 151 percent over the 1970s. The relative rate of increase in the 1990s over the 1980s was 70 percent; the expenditure in the 1990s was $77.5 billion compared to $45.5 billion in the 1980s. Capital spending continued to increase in nominal dollars during the period 2000 to 2008.

Combined capital outlays and water interest payments for 1956 to 2008 were $383.9 billion in nominal dollars (Table 5), compared to $788.4 billion in 2008 inflation adjusted dollars (Table 4). Inflation adjusted combined capital and interest payments increased from $104.1 billion in the 1960s to $105.5 billion in the 1970s, a 1.3 percent increase. Capital and interest payments rebounded with a 34.8 percent increase in the 1980s compared to the 1970s and a 41.4 percent increase in the 1990s compared to the 1980s. Constant dollar spending during the period 2000 to 2008 indicates a much lower increase in capital investment.

Table 5 Local Government Trends in Spending on Public Water Supply Capital Outlays and Interest, 1956 - 2008 - Nominal Dollars

Time Period	Capital Outlay and Interest Exp. ($ bill)	Change from Prev. Period (%)
1956-2008	383.9	–
1956-59	3.7	–
1960-69	13.1	–
1970-79	24.4	86
1980-89	63.3	159
1990-99	113.7	80
2000-08	165.7	–

d. Water Supply Interest Payments

Interest payments on water supply borrowing, primarily in the form of municipal bonds (including general obligation and/or revenue bonds) and loans, was $111.7 billion for the period 1956 to 2008 (Table 3). It rose from $132 million in 1956 to $6.2 billion in 2008. It accounts for about 12 to 13 percent of current overall water supply system spending.

Local government spent $2.7 billion on water interest payments in the 1960s. Spending rose by 133 percent in the 1970s to $6.3 billion. Predictable increases occurred in the 1980s as the inventory of physical assets grew, and the use of municipal bonds and loans to finance projects increased. Interest payments in the 1980s were $17.8 billion, a 182 percent increase over the 1970s. Interest payments in nominal dollars increased to $36.1 billion in the 1990s, a 103 percent increase over the 1980s.

It is worth mentioning that interest payments have risen to more than 12 percent of total water supply system spending. When compared to capital outlays, however,

interest payments take on added prominence. During the 1960s interest payments were 20.6 percent of combined capital outlays and interest payments. Interest payments rose to 31.7 percent of combined expenditures in the 1990s. They are currently about 29 percent of combined capital and interest expenditures, based on information for 2000 to 2008.

Figures 3 and 4 provide graphical representations of the nominal and constant dollar relationship between expenditures. Figure 4, in particular, exhibits the capital spending plateau in inflation adjusted dollars in the 1990s and beyond.

Figure 3: Local Government Spending on Public Water Supply, 1956 – 2008, Nominal Dollars

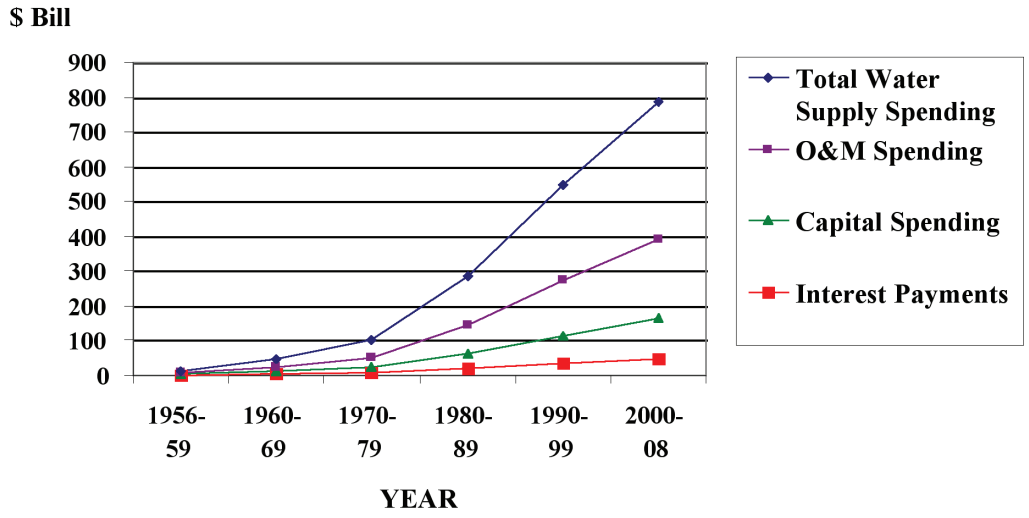
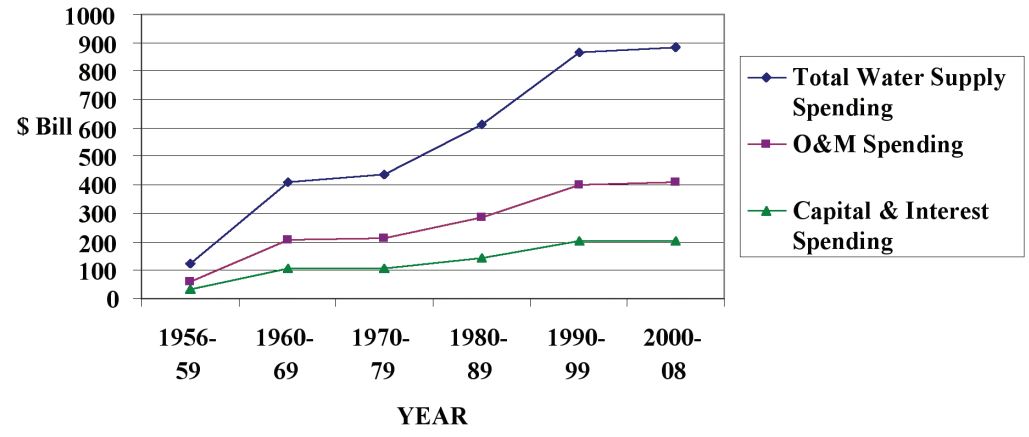


Figure 4: Local Government Spending on Public Water Supply, 1956 – 2008, Constant Dollars, (2008 = 100%)



IV. Local Government Public Wastewater System Expenditures

Information on local government expenditures for public wastewater systems (also referred to as sewers or sewerage by the U.S. Census Bureau reporting conventions), is currently available for 1956 to 2006. Estimates are generated for some years for analytical purposes, and the method of estimation is reported in Appendix – 1 Materials and Methods. Total wastewater system expenditures are comprised of two cost component categories: O&M and capital outlay. Total expenditures and the cost component categories are described below.

a. Total Spending on Wastewater Systems

Total spending by local government on wastewater systems for the 53 year period 1956 to 2008 was $717 billion in nominal dollars (Table 6, Figure 5). Spending in 1956 was $835 million, and rose to $42.1 billion in 2008. The increase is partially attributable to an infusion of federal construction grants program authorized by the Clean Water Act and associated grants to local government that were distributed in the 1970s and 1980s. Federal financial assistance, in a number of forms that are discussed later in this report, have declined precipitously and now play a minor role in aggregate spending on public wastewater systems. Currently, wastewater expenditures account for 44.5 percent of combined water supply and wastewater spending.

Wastewater expenditures totaled $15 billion in the 1960s, and rose to $49.1 billion in the 1970s, a 227 percent increase. In the 1980s spending increased to $124.9 billion, a 154 percent increase over the 1970s. During the 1990s local government spent $218.8 billion, an increase of 75 percent over the previous decade. Total spending for the period 2000 to 2008 was $305.6 billion.

Inflation adjusted spending on public wastewater systems for the period 1956 to 2008 was $1.403 trillion (Table 7, Figure 6) compared to $717 billion in nominal dollars for that same period. Over the four decades examined, inflation adjusted investments continuously increase but the relative increase from decade to decade lessens. For example, investments in the 1970s were 58 percent greater than in the 1960s; the 1980s increased 36 percent compared to investments in the 1970s; and, the 1990s investment increased slightly less than 30 percent over the 1980s investment.

b. Wastewater System Operations & Maintenance (O&M) Expenditures

Local government wastewater system nominal dollar O&M expenditures was $406.8 billion for the period 1956 to 2008 (Table 6). It rose from $246 million in 1956 to $25.8 billion in 2008. O&M accounts for 45.1 percent of total spending on wastewater systems over this period, but has ranged between 50 and 67 percent of total wastewater spending since 1984.

Table 6 Local Government Trends in Spending on Public Wastewater Treatment 1956 - 2008 - Nominal Dollars

Time Period	Total Waste-water Exp. ($ bill)	Change from Prev. Period (%)	O & M Exp. ($ bill)	Change from Prev. Period (%)	Capital Outlay Exp. ($ bill)	Change from Prev. Period (%)	No. Of Years
1956-2008	717	–	406.8	–	310.2	–	53
1956-59	3.7	–	1.1	–	2.6	–	4
1960-69	15	–	4.8	–	10.2	–	10
1970-79	49.1	227	17.1	256	32	214	10
1980-89	124.9	154	59.9	250	65	103	10
1990-99	218.8	75	133.6	123	85.2	31	10
2000-08	305.6	–	190.4	–	115.1	–	9

Dramatic growth occurred in O&M spending over the four decades examined. In the 1960s local government spent $4.8 billion on this cost component. It rose to $17.1 billion in the 1970s, a 256 percent increase. Spending in the 1980s was $59.9 billion, a 250 percent increase over the 1970s. O&M investment increased to $133.6 billion in the 1990s, an increase of 123 percent over the investment made in the 1980s.

Inflation adjusted spending on O&M from 1956 to 2008 was $714 billion (Table 7), compared to $406 billion in nominal dollars. The inflation adjusted dollar values of each successive decade of investment increased, but the relative change exhibits declining percentage increases. For example, investments in the 1970s were 81.9 percent greater than in the 1960s; an 82.9 percent increase in the 1980s compared to the 1970s; and, a 59.1 percent increase in the 1990s compared to the 1980s. Spending in the period 2000 to 2008 indicate a small increase over spending in the 1990s.

c. Wastewater System Capital Outlays

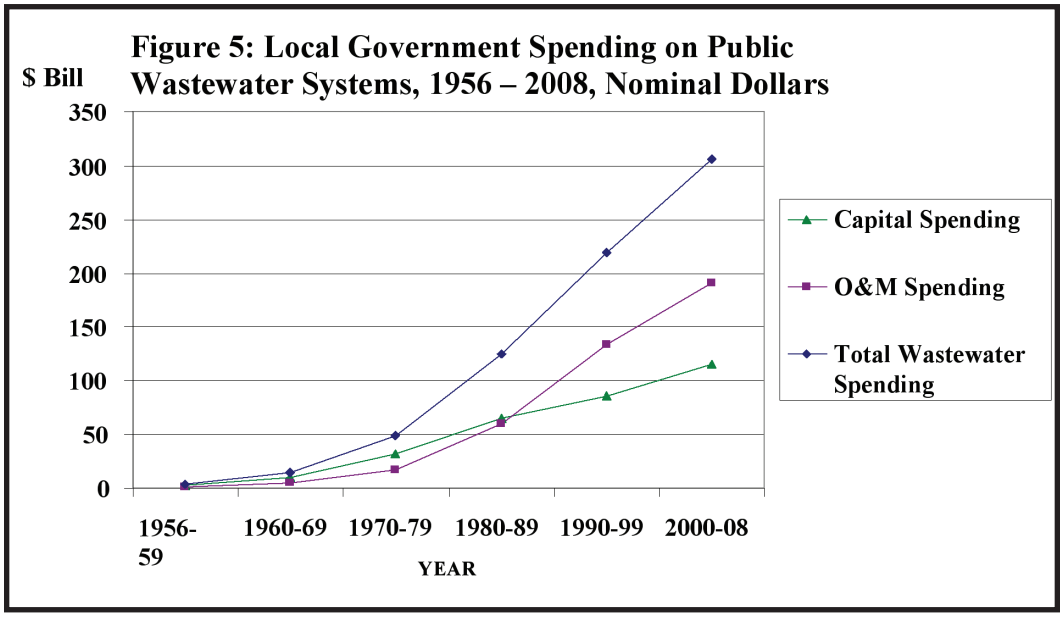
Capital spending for public wastewater systems for the period 1956 to 2008 was $310.2 billion in nominal dollars. Capital investment rose from $589 million in 1956 to $16.3 billion in 2008. The capital component of total wastewater spending ranged in the high 60 and 70 percent range until 1977. By 1994, and through to 2008, the capital component dropped to about 30 percent of total wastewater spending.

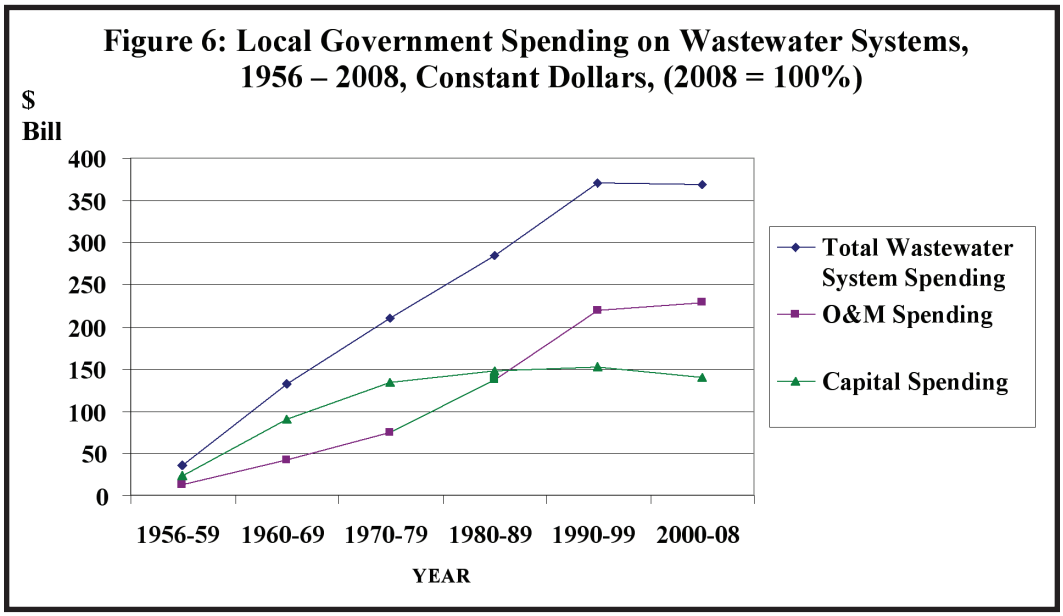
Capital investments rose from $10.2 billion in the 1960s to $32 billion in the 1970s, a 214 percent increase. It rose to $65 billion in the 1980s, a 103 percent increase compared to investment in the 1970s. Nominal investments increased to $85.2 billion in the 1990s; and accounted for a 31 percent increase over the 1980s. Nominal spending for the period 2000 to 2008 was $115.1 billion.

Inflation adjusted capital spending on public wastewater systems for the period 1956 to 2008 was $698.2 billion, compared to $310.2 billion in nominal dollars for the same period. A significant trend in local government spending is the dramatic decline in relative change in inflation adjusted wastewater capital investment over the four decades reviewed. Inflation adjusted capital investment in public wastewater systems increased from $90.9 billion in the 1960s to $134.1 billion in the 1970s; a 47.5 percent increase. But investments in the 1980s were only 10.2 percent greater than the 1970s; and only a 2.8 percent increase in the 1990s compared to the 1980s. Inflation adjusted spending for the period 2000 to 2008 indicate level spending, or potentially only a slight increase over the 1990s.

Table 7 Local Government Trends in Spending on Public Wastewater Treatment 1956 - 2008 - Constant Dollars (2008 = 100%)

Time Period	Total Waste-water Exp. ($ bill)	Change from Prev. Period (%)	O & M Exp. ($ bill)	Change from Prev. Period (%)	Capital Outlay Exp. ($ bill)	Change from Prev. Period (%)	No. Of Years
1956-2008	1,403.30	–	714.1	–	689.2	–	53
1956-59	35.8	–	12.3	–	23.5	–	4
1960-69	132.2	–	41.4	–	90.9	–	10
1970-79	209.4	58.4	75.3	81.9	134.1	47.5	10
1980-89	285.5	36.3	137.7	82.9	147.8	10.2	10
1990-99	371.1	30	219.1	59.1	152	2.8	10
2000-08	369.1	–	228.3	–	140.8	–	9





V. Local Government Expenditures on Public Water and Wastewater as a Portion of Gross Domestic Product

Local government is the dominant source financing public water and wastewater services and infrastructure in America and, therefore, it determines what portion of social resources are devoted to these purposes. Comparing such expenditures to Gross Domestic Product (GDP) provides another measure, in addition to nominal or constant dollars, of the level of resources devoted to this purpose over time.

For the purpose of this comparison local government expenditures in nominal dollars, which reflect resource costs in current years, are compared to total GDP and non-defense GDP. The latter comparison is performed because one can argue that the defense spending portion of GDP benefits the American public indirectly; whereas, the value of non-defense goods and services comprising the GDP directly benefit the public. A less persuasive, but not to be ignored, argument can be made that domestic spending (in this case public water and wastewater) competes for priority with all spending; so comparison to total GDP provides another useful metric. Thus, comparisons to total as well as non-defense GDP are presented here.

a. Local Government Water and Wastewater Combined Spending as a Portion of Total GDP

Combined water and wastewater spending by local government from 1956 to 2008 was on average slightly above six tenths of one percent (0.62%) of total GDP (Table 8). The percent of GDP ranged between a low of 0.49 percent in 1968 to a high of 0.71 percent in 1992. Although the range is considerable, the variation has not been great. The standard deviation of the arithmetic average is six one hundredths of one percent over the 53 year period (compare the average at 0.62 to the standard deviation 0.059). Thus, the standard deviation, a measure of variability, indicates in this case that the average is fairly stable and is normally distributed.

The change in investment over time yields a mixed picture (Table 8). For example, the lowest portion of GDP devoted to public water and wastewater occurred in 1968, not in 1956. If one expects a linear increase in spending over time (the case with nominal dollar spending), then 1956 might have marked the low point. And, the high range occurred in 1992, not in 2008, even though in nominal dollars the highest investment value occurred in 2008.

The high and low range of investment compared to GDP may be subject to short-term economic fluctuations. By grouping investments in decades and partial decades (Table 8) the impacts of short-term economic conditions are somewhat blunted. Spending over the four-year period 1956 to 1959 was an average of 0.54 percent of GDP. It reached the highest decade average in the 1990s at 0.67 percent of GDP. It dropped to 0.65 percent of GDP in the following nine-year period 2000 to 2008.

b. Water Utility System Spending as a Portion of Total GDP

Spending on water utility systems averaged three and half tenths of one percent (0.35%) of GDP over the period 1956 to 2008 (Table 8). This level of investment remained rather stable with a standard deviation of about three one hundredths of one percent (0.028%). Spending ranged from a low of 0.29 percent of total GDP in multiple time periods (1973) to a high of 0.39 percent of GDP in 2003.

Spending on water utility systems was 0.34 percent of GDP in the period 1956 to

1959 and the 1960s; and declined to 0.31 percent of GDP in the 1970s. Investments increased to 0.35 percent of GDP in the 1980s and increased again in the 1990s and the period 2000 to 2008 (0.37%). Yet the increased spending from 2000 to 2008 is only minimally related to federal financial assistance via the Safe Drinking Water Act SRF loan program because local government spending was $256.6 billion compared to less than $7 billion in capitalization grants from Congress to the states for the SRF loan program during this period.

c. Wastewater Spending as a Portion of Total GDP

Local government spending on wastewater systems was less than three tenths of one percent (0.27%) of GDP, on average, over the period 1956 to 2008. Again, like water utility investments, the wastewater investments were fairly stable with a standard deviation of four-hundredths of one percent for the period (0.046 %). Spending as a percent of GDP ranged from a low of 0.19 percent in 1968 to a high of 0.34 percent in 1981.

Spending on wastewater systems as a percentage of GDP increased over time, from 0.2 percent on average from 1956 to 1959, 0.21 percent in the 1960s, 0.28 percent in the 1970s, and 0.31 percent in the 1980s. A modest decline occurred in the 1990s (0.3%) that continued for the period 2000 to 2008 (0.28%).

d. Local Government Water and Wastewater Spending as a Portion of Non-Defense GDP

Non-defense GDP is on average seven percent lower than Total GDP over the 53-year period 1956-2008. Thus, the effect of comparing local government spending on public water and wastewater as a portion of non-defense GDP is an across-the-board increase over what is ascertained compared to total GDP by roughly four-one hundredths of one percent (0.62% of Total GDP and, 0.66% of Non-defense GDP). However, the difference is not constant, but varies from seven one-hundredths to three one-hundredths of one percent at different times (Table 8).

Water utility spending as a portion of non-defense GDP is two-hundredths of one percent greater than that for Total GDP; and is the same for wastewater systems (Table 8). There is slightly more variation in water utility spending as a portion of Non-defense GDP than there is in wastewater spending.

Table 8: Local Government Total Combined Expenditures on Public Water and Wastewater Systems as a Portion of Total Gross Domestic Product (GDP) and Non-defense Gross Domestic Product, 1956 - 2008

Category	Combined Water and Wastewater		Water Utility Systems		Wastewater Systems	
Parameter	Total GDP (%)	Non-Defense GDP (%)	Total GDP (%)	Non-Defense GDP (%)	Total GDP (%)	Non-Defense GDP (%)
Range Low	0.49 (1968)	0.54 (1968)	0.29 (1973)	0.31 (1973)	0.19 (1968)	0.21 (1968)
Range High	0.70 (1992)	0.75 (1987)	0.39 (2003)	0.43 (1961)	0.34 (1981)	0.37 (1981)
Average Percent of Total and Non-Defense GDP						
1956-2008 Avg. Std Dev	0.62 0.059	0.66 0.054	0.35 0.028	0.37 0.028	0.27 0.046	0.29 0.045
1956-1959	0.54	0.61	0.34	0.39	0.2	0.22
1960-1969	0.55	0.61	0.34	0.38	0.21	0.23
1970-1979	0.59	0.63	0.31	0.33	0.28	0.3
1980-1989	0.66	0.71	0.35	0.37	0.31	0.33
1990-1999	0.67	0.71	0.37	0.39	0.3	0.32
2000-2008	0.65	0.68	0.37	0.39	0.28	0.27

e. Local Government Water and Wastewater O&M Spending as a Portion of Total GDP and Non-defense GDP

The growing role of O&M spending is evident when viewed as a portion of Total and Non-defense GDP. For example, it was two-tenths of one percent (0.2%) of GDP on average between 1956 and 1959, and doubled in the 1990s to four-tenths of one percent (0.4%). A similar growth pattern can be seen as a portion of Non-defense GDP (Table 9). The larger portion of O&M spending occurred in water systems as opposed to wastewater systems. In the earlier time periods water system O&M spending as a portion of Total and Non-defense GDP was twice that of wastewater O&M; but in the later time periods wastewater O&M spending as a portion of GDP substantially increased. By the 1990s water system O&M (0.22%) was about four hundredths of one percent of GDP higher than wastewater system O&M (0.18%).

Table 9 Local Government O&M Expenditures on Public Water and Wastewater Systems as a Portion of Gross Domestic Product (GDP) and Non-defense Gross Domestic Product, 1956 - 2008

Category	Combined Water and Wastewater O&M		Water Utility Systems O&M		Wastewater Systems O&M	
Parameter	Total GDP (%)	Non-Defense GDP (%)	Total GDP (%)	Non-Defense GDP (%)	Total GDP (%)	Non-Defense GDP (%)
Range Low	0.19 (1956)	0.22 (1956)	0.14 (1956)	0.16 (1956)	0.05 (1956)	0.06 (1956)
Range High	0.42 (1995)	0.44 (1995)	0.23 (1995)	0.24 (1995)	0.19 (1995)	0.20 (1995)
Average Percent of Total and Non-Defense GDP						
1956-2008 Avg. Std Dev	0.313 0.077	0.334 0.076	0.192 0.029	0.206 0.027	0.127 0.049	0.136 0.049
1956-1959	0.2	0.23	0.15	0.66	0.06	0.06
1960-1969	0.22	0.24	0.15	0.17	0.07	0.07
1970-1979	0.26	0.28	0.16	0.17	0.1	0.1
1980-1989	0.34	0.37	0.19	0.21	0.14	0.16
1990-1999	0.4	0.42	0.22	0.23	0.18	0.19
2000-2008	0.39	0.41	0.21	0.22	0.18	0.19

f. Local Government Water and Wastewater Capital Spending as a Portion of Total and Non-defense GDP

Combined water and wastewater capital spending has declined from one-third of one percent of GDP to about one-quarter of one percent of GDP (Table 10). Water utility spending declined from an average of two-tenths of one percent of GDP from 1956 to 1959, to 1.5 tenths of one percent (0.15%) in the 70s, 80s, 90s and the period 2000 to 2008. Wastewater, on the other hand, experienced an increase in the 1970s and 80s, and an eventual decline in the 1990s and the period 2000 to 2008. The increases in the 1970s and 1980s are heavily influenced by the federal Construction Grants program. For example, local government capital spending on wastewater from 1970 to 1979 was $32 billion, and federal wastewater construction grants reported during that same period equaled $31.9 billion. Federal Construction grants made from 1980 to 1989 equaled $21.9 billion, or about one-third of the $64.9 billion invested in wastewater capital by local government during that same period.

Table 10 Local Government Capital Expenditures on Public Water and Wastewater Systems as a Portion of Gross Domestic Product (GDP) and Non-defense Gross Domestic Product, 1956 - 2008

Category	Combined Water and Wastewater Capital		Water Utility Systems Capital		Wastewater Systems Capital	
Parameter	Total GDP (%)	Non-Defense GDP (%)	Total GDP (%)	Non-Defense GDP (%)	Total GDP (%)	Non-Defense GDP (%)
Range Low	0.24 (2001)	0.25 (2001)	0.13 (1984)	0.14 (1978)	0.09 (2001)	0.09 (2001)
Range High	0.38 (1975)	0.41 (1975)	0.22 (1961)	0.25 (1961)	0.22 (1977)	0.24 (1977)
Average Percent of Total and Non-Defense GDP						
1956-2008 Avg. Std Dev	0.307 0.040	0.331 0.048	0.163 0.020	0.175 0.026	0.144 0.035	0.155 0.038
1956-1959	0.33	0.38	0.2	0.22	0.14	0.15
1960-1969	0.33	0.36	0.19	0.2	0.14	0.16
1970-1979	0.33	0.36	0.15	0.16	0.19	0.2
1980-1989	0.31	0.34	0.15	0.16	0.16	0.18
1990-1999	0.27	0.29	0.15	0.16	0.12	0.12
2000-2008	0.26	0.27	0.15	0.16	0.11	0.11

VI. Projecting Future Local Government Spending on Public Water and Wastewater Systems

The Census Historical data base was examined to determine, from past experience, what spending growth scenarios could provide a range of future spending projections. Spending by local government has doubled five times over the 53-year period examined (Table 11). GDP doubled four times over the same period. It should come as no surprise, then, that over the next 20 years (2009 to 2028) spending will double one or more times. Fortunately, growth in GDP has provided the 'wealth' needed to increase spending. Should GDP decline, however, then local government will likely consider shifting spending priorities.

Table 11 Occurrence of Local Government Spending Increases on Public Water and Wastewater Compared to Increases in GDP

Year	Combined Spending on Water and Wastewater ($ bill)	No. Of Years to Double	Gross Domestic Product ($ bill)	No. Of Years to Double
1956	2.3		437	
1968			875	12
1969	4.6	13		
1975	9.8	6		
1976			1,820	8
1982	21.4	7		
1984			3,650	8
1992	43.6	10		
1996			7,866	12
2007	89.4	15		
2008	93.6		14,265	

a. Growth Rates Used for Projections

The average annual increase in local government spending over the period 1956 to 2008 is 7.55 percent. This number serves as a growth assumption for the high-range projection. Several factors suggest that 7.55 percent may push the envelope. For example, it may be unlikely that population growth over the next 20 years will match that for the 53-year period examined. Another factor is the capital investment stimulus provided by the Construction Grants program when federal assistance had a major impact on spending. Also, establishment of water quality standards and broadening the scope of the water standards and regulation have had a material impact on "compliance" spending by local government.

On the other hand, it might be unwise to discount additional costs associated with several anticipated but not yet quantified factors. For example, population growth over the next 20 years is likely to occur, along with a continued trend toward urbanization and an increase in the percent of the population served by public water and wastewater systems. Another factor is the anticipated replacement of aboveground treatment works that are approaching the end of their useful life. The EPA Needs Gap does address this factor, but it may be more focused on the underground asset replacement costs. Public health concerns may drive investment to more advanced levels of energy intensive water treatment technology to address an increased number of water contaminants such as those entering water bodies from consumer and pharmaceutical products. Also, heightened awareness of critical water shortages may drive investment toward reuse of wastewater for potable purposes; and, the recovery of brackish water from groundwater sources and the ocean for potable purposes - both are expensive and energy intensive technologies. Additionally, water related impacts from climate change in coastal high hazard areas, in floodways, and in areas prone to extended drought may emerge as major cost drivers.

A low range growth assumption was derived from the 53-year average increase in spending. The low range percentage is 2.66; it is one standard deviation below the 53-year average (the high range growth assumption). Some of the influence of the construction grants program and the phenomenal growth in population and investment related to suburbanization is blunted by using one standard deviation below the long-term average spending increase. In the event of an extended economic recession,

however, the low range growth assumption could be indicative of the difficulty local government would face in financing capital investments. Also, in the modern history of spending we are dealing with, 1956 to 2008, GDP has almost always grown each year. We have not yet faced a situation where a significant decline in GDP has occurred, and thus do not know how local government spending priorities would be impacted. Counterbalancing this potentiality is the fact that local government is required by law to meet federal and state standards in the provision of water and wastewater services (e.g., water quality standards, drinking water standards, etc.). Given these factors it makes sense to assume that a 2.66 percent increase in spending over the next 20 years serves as a realistic low range measure of the range of possibilities.

A mid-range growth assumption was derived by calculating the average spending increase over 10 more recent years, 1999 to 2008. This growth rate is 5.22 percent. An advantage of using this growth rate is that it reflects current conditions in a mature inventory of physical assets. It also reflects the major investment role played by local government (98 percent of all spending), and the shrinking role of the federal and state governments in spending for this purpose. Yet, the mid-range growth assumption could overestimate local government spending if GDP declines significantly; and underestimate spending if the anticipated but not yet quantified suite of factors (population growth, climate change, water reuse and reclamation) exerts greater impact on investment decisions.

Finally, it should be noted that, while possible, a decline in spending is not considered here. Historical spending patterns revealed that an actual decline in spending has occurred in the past as an exceptional event. The decline in spending was both short-lived and quickly reversed. Also, in examining historical spending patterns it is evident that we are experiencing not a decline in spending, but a decline in the relative increase in spending over the last several decades. As mentioned in an earlier section to this report, the anemic increase in capital spending for wastewater systems, a 2.8 percent increase in constant dollars in the 1990s compared to the 1980s, is a critical indicator of spending trend reversal. Indeed, capital investment in wastewater systems from 2000 to 2008 (not a full decade) are not keeping pace with the same investment for the 1990s, but the spending information for 2009 is not yet available for comparison.

b. A Range of Projected Future Spending Increases

Projected spending by local government on public water and wastewater over the 20-year period 2009 to 2028 could range from $2.5 to $4.3 trillion (Table 12). The mid-range estimate is $3.3 trillion. These projections rely on the growth rates described above, and do not include the $500 billion over 20 years ($25 billion/year) associated with the Needs Gap). The overall projections increase across the board if an additional $25 billion per year in capital investment (the Needs Gap estimate used in this report) is added to the estimated spending. Thus, the projected spending range increases: $4.8 trillion (high); $3.8 trillion (mid-range); and $3 trillion (low). The Needs Gap component, under this scenario, becomes a 10 to 20 percent component of overall spending.

Given the history of how local government spending repeatedly doubles over time, at $93 billion spent in 2008, the low estimate (with Needs Gap component) reflects one doubling in 20 years, with a nominal dollar value of $189 billion to be spent in 2028. The mid-range estimate results in a nominal dollar expenditure of $284 billion in 2028, and this is less than doubling spending twice in 20 years. The high range estimate of $421 billion expenditure in 2028, and this represents a doubling of spend-

ing twice over the 2008 expenditure, or, 4.5 times what was spent in 2008.

There is an expectation that if local government adds the $25 billion in capital investment to the ever-growing annual expenditures that the national inventory of water and wastewater systems will be in compliance with existing law. Change in law, however, is also expected to occur over the next 20 years. A ramped-up treadmill of new federal unfunded mandates would have a major impact on actual local government spending.

Table 12 20-Year Projected Local Government Spending on Public Water and Wastewater Systems, 2009 - 2028

20-year Spending Projection Scenario	High Estimate 7.50% ($ Trillion)	Mid-Range Estimate 5.22% ($ Trillion)	Low Estimate 2.66% ($ Trillion)	Historic Spending by Local Government 1956-2008 ($ Trillion)
Total Local Government Spending	4.353	3.334	2.495	1.61
Additional $25 Billion/Year Needs Gap Capital Spending	4.853	3.834	2.995	na
Needs Gap as % of Total	10.3 - 11.5	13.0 - 15.0	16.7 - 20.0	na
Nominal Dollar Spending in 2028 (With Needs Gap)	0.421	0.284	0.189	na
Constant Dollars (2008 = 100%)	na	na	na	3.164

VII. Federal Financial Assistance to Local Government for Public Water and Wastewater Systems

Public water and wastewater services and infrastructure in America are traditionally provided by local government. It is often classified as a 'government enterprise' whereby local government charges system users through rate structures, hook-up and connection fees to generate a revenue stream that is intended to amortize debt incurred to finance capital investments, and to support the ever-growing cost of O&M. The primary form of financing water and wastewater projects by cities of 30,000 or greater population is through municipal government obligation or revenue bonds combined with user rates (pay-as-you-go), (Anderson 2005).

Federal government involvement in providing assistance to local government for public water and wastewater infrastructure was generally nominal until Congress boosted direct grants to communities when it passed the 1972 Clean Water Act (CWA). A growing body of scientific literature in the 1960s and early 1970s concerning the widespread degradation of water quality in America prompted Congress

to set far-reaching goals to improve water quality, protect human health, to restore the health of ecosystems and to generally promote responsible environmental stewardship, (referred to in the Act as swimmable and fishable waters). Congress placed considerable emphasis on the fact that major rivers and lakes traversed interstate jurisdictions, and therefore the federal government invoked Constitutional powers, including but not limited to, the Interstate Commerce Clause to protect water quality. Congress also established financial incentive programs to help communities develop the infrastructure needed to achieve the goals of the CWA. The federal Construction Grants program was one such program, and although it ended in 1990 it is still considered one of the most popular programs of federal financial assistance to cities. The Construction Grants program, however, is/was not the only financial incentive program for local government aimed at improving water quality.

a. Several Federal Financial Assistance Programs

Federal financial assistance programs to aid regional, state and local governments have been in place for some time. Congress has authorized and provided financial assistance through various appropriation actions for a number of water infrastructure and water resource activities including capital investment and operations and maintenance (O&M) in the form of grants, loans, loan guarantees, and other types of subsidies. The most widely recognized federal assistance programs today are the congressionally authorized capitalization grants to states to fund the CWA and SDWA SRF loan programs. The federal commitment to protect public health and promote environmental stewardship in this area, however, extends beyond the SRF programs, and has been both substantial and longstanding, falling under the jurisdiction of several federal agencies.

The Congressional Budget Office (CBO 2007, Table B-2, Listing of Federal Infrastructure and Related Programs) reports the categorical financial assistance programs implemented by the key federal agencies. These programs include assistance for capital investments (and sometimes for O&M); the assistance includes grants, loans and other subsidies (in some cases it supports salaries and expenses). The programs are implemented by the Departments of Agriculture, Commerce, Housing and Urban Development, Interior and State. They are also implemented by the U.S. Environmental Protection Agency (EPA) and the Army Corps of Engineers (USACE).

CBO (2007) provides a fairly comprehensive characterization of trends in public spending on water infrastructure (one report in a series of CBO reports on the subject). A similar database was used in the CBO report as is used in this report - the Census Historical data base, 1956 to 2004. The CBO report is intended to inform Congress and others on federal contributions for "Those types of infrastructure, which draw heavily on federal resources, share the economic characteristics of being relatively capital intensive and producing services under public management that facilitate private economic activity." (CBO 2007, p. 1).

CBO asserts, "Since the mid-1950s, expenditures for transportation and water infrastructure by the federal government and state and local governments have annually accounted for over 2 percent of the nation's gross domestic product…In 2004, such spending for infrastructure was more than $312 billion (measured in 2006 dollars)." CBO cites that 60 percent ($34 billion) of the federal contributions to infrastructure in 2006 was designated for highway and road projects. Water resources contributions were $3.5 billion and water supply and wastewater treatment contributions were $2.2 billion. It should be noted that the federal government contribution for water supply and wastewater related to the SRF programs was in the form of capital grants to

states. The states subsequently disburse the federal grant money in the form of loans to local government, but this is discussed separately below. Federal agencies, other than the EPA, have (and continue to) provide grants, loans and other subsidies to local government for public water and wastewater investment.

The findings reported by CBO to Congress generally lump federal contributions to local water supply and wastewater treatment infrastructure in with transportation infrastructure, including highways, roads, aviation, water resources and water transport. It should be noted that of the $312 billion figure cited, water supply and wastewater accounts for the lowest level of federal contributions for the infrastructure category - a small portion of the reported two percent of GDP that CBO states the federal government currently provides in assistance to local government. As presented earlier in this report, local government spending for this purpose is between six and seven tenths of one percent of non-defense GDP; and local government spending accounts for 98 percent or more of all spending in this area.

It should also be noted that the form in which federal financial assistance is provided makes a difference at the local level. For example, the "face-value" of financial assistance for public water and wastewater infrastructure varies considerably based on whether the form of assistance is a grant, loan, loan subsidy or a tax expenditure (foregone revenue to the Department of The Treasury). It should also be recognized that the "face-value" of federal financial assistance varies when you consider a single project or a national policy covering many projects.

GAO (2001) reported that over the ten-year period FY1991 to FY2000 nine agencies of the federal government "…made available $44 billion, in a variety of forms, for drinking water and wastewater capital improvements." Four agencies accounted for 98 percent of this amount (Table 13). Several agencies not included in Table 13 contributed another $1.1 billion for capital improvements.

GAO correctly asserts that "EPA represents the largest source of financial assistance at the federal level through its Drinking Water and Clean Water State Revolving Funds, contributing about 56 percent of the total," (GAO 2001, p. 11). However, it is important to distinguish that EPA's contributions, while a majority of the total federal funds made available for public water and wastewater projects, are actually grants to states (not local government). When states make the financial assistance available to local government through the SRF program there is flexibility in the form of distribution. For example, states may provide the funding in the form of a grant or partial grant. Or, it can be in the form of a loan that has a lower than commercial interest rate. Thus, the actual "face-value" of federal financial assistance to local government for water and wastewater capital improvements financed via SRF loans is the difference on the contracted interest rate compared to a less favorable rate; probably between two to four percent.

Moreover, during this ten-year period, the highest face value federal assistance appears greater from USDA or HUD, and probably Congressional earmarks rather than from the EPA SRF programs, because a substantial portion of the assistance from these agencies is in the form of grants, in addition to loans.

i. **USDA:** The U.S. Department of Agriculture's Rural Development – Water and Waste Facilities and Community Program funds "…planning, coordination, and implementation of rural community and economic development programs," including water projects related to agricultural activities (www.ers.usda.gov/FarmBill/2008/Titles). USDA provides financial assistance in the form of grants to very small rural communities to comply with water pollution and drinking water regulations. Congress authorized the creation of the Special Evaluation Assistance

for Rural Communities and Households (SEARCH) program to provide grants to communities under 3,000 population to prepare studies required to meet environmental (including water related) standards. The USDA administers another program that provides grants to individual rural homeowners to develop water-well systems; the amount of the grants for each well range from $8,000 to $11,000. USDA also administers the Circuit Rider Program that provides technical assistance for daily operations of rural water systems.

ii. **HUD:** The Department of Housing and Urban Development has allowed Community Development Block Grant (CDBG) funds to be used for public water and wastewater development for some time. HUD also participates in a USDA-administered program that targets funding assistance to special regions to develop water and wastewater capacity, the Assistance to Colonias effort (HUD 2003). It focused on communities outside of a Metropolitan Statistical Area with a population exceeding one million, but within 150 miles of the US-Mexican border. The four border states include: Arizona, California, New Mexico and Texas. HUD approved a state set-aside of 10 percent of CDBG funds sent to these states to be used for Colonias experiencing a lack of potable water supply or inadequate sewage systems. HUD has modified this financial assistance program over time, but has consistently provided direction to the state administrators to dedicate a portion of the CDBG funds to Colonias.

iii. **DOC-EDA:** The Department of Commerce – Economic Development Administration has federal financial assistance available for economically distressed areas. Usually as part of larger efforts to spur local economies EDA can make direct grants to local government organizations for public water and wastewater infrastructure development.

EDA conditions financial assistance eligibility based on a defined area. Two major eligibility criteria must be satisfied: 1) an area experiencing two years of unemployment above the national average; and 2) experiencing 80 percent or less of the national average in per capita income. EDA can also designate a special need based on broader concerns. Organizations receiving assistance must provide a 50 percent matching share, and an additional 30 percent where needed. The financial assistance may be in the form of grants and/or revolving loans. From FY1991 to FY2000 the EDA provided $1.1 billion in direct grants to local organizations for investment in public water and wastewater projects.

iv. **EPA:** The EPA provided federal financial assistance directly to communities in the past. The Construction Grants program and the State Revolving Fund loan programs are discussed in a section below. While there is significant value attached to the State Revolving Fund loan programs that make available low interest loans and loan guarantees, they are mostly not in the form of grants to communities. The EPA is directed by Congress to distribute specific earmark funds to local government projects. GAO reports that $4.5 billion in earmarks were designated by Congress for this purpose over the period FY1991 through FY2000.

The face value of grants from DOC-EDA, HUD and USDA to communities may be greater than the face value of local government benefits through the EPA loan programs. However, a substantial amount of the USDA grants are not directed to urban centers but to rural communities. Thus, the benefit to metro-urban areas is environmentally valuable but is indirect, and do not really help those urbanized cities afford the necessary water and wastewater investments.

Table 13 Federal Financial Assistance for Drinking Water and Wastewater Capital Improvements, FY1991 – FY2000

Federal Agency	Grants to States ($)	Grants to Communities ($)	Designated Appropriations* ($)	Loans ($)	Loan Gurantees ($)
EPA	20 bill		4.5 bill		
USDA		4.5 bill	376 mill	550 mill	7.1 bill
HUD		4.5 bill	39.4 mill		
DOC-EDA		1.1 bill			

Source: Adapted from GAO November 2001 p. 2
* Generally in the form of Congressional earmarks specifically directed to recipients (such as communities) via the appropriations legislation.

b. Financial Assistance from the Department of the Treasury

An extremely important but seldom recognized form of federal financial assistance to local government for public water and wastewater capital investment comes from the U.S. Department of the Treasury (Treasury). This financial assistance is in the form of Treasury revenues forgone (also called tax expenditures) through the tax preferences that the federal government offers on municipal bonds issued by states and localities to finance their infrastructure spending. In lieu of such tax preferences municipal entities would likely be compelled to turn to commercial bonds to finance infrastructure projects, and the immediate impact would be a higher interest rate payment that would increase the cost of any project. The municipal bond interest rate discount (local tax-exempt bonds) applies nationally to qualified local governments, and thus has an important cumulative impact.

CBO (2007) refers to Office of Management and Budget (OMB) estimates of Treasury revenues forgone related to all state and local tax-exempt bonds was $23 billion in 2006. This is a cumulative total loss for bonds issued over a number of years, but represents the Treasury tax expenditure estimate for year 2006. CBO estimates that bonds used for transportation or water projects "…accounted for a stable share of about 27 percent of the total value of government obligations issued between 1991 and 2004, a reasonable inference of the loss of federal revenues in 2006 attributable to government obligations' financing public infrastructure is approximately $6.3 billion (27 percent of $23 billion,)" (CBO 2007, p. 16).

Based on a discussion with CBO report author (N. Musick, July 28, 2009), one way to estimate the value of the $6.3 billion in forgone revenues to the Treasury related to tax-exempt bonds used for public infrastructure is to estimate the share dedicated to public water and wastewater. Thus, approximately one-third of the allocation of federal financial assistance is allocated to water projects. Hence, a rough estimate of the revenue loss to Treasury in 2006 for public water and wastewater municipal bonds would be $2.1 billion. An additional $510 million loss to the Treasury in 2006 results from the use of private activity bonds used for water and wastewater facilities. Treasury losses attributable to all tax-exempt bonds used for water and wastewater capital projects in 2006 is estimated to be roughly $2.61 billion.

The amount of 'tax expenditure' from preferential municipal bond policy in 2006 is the single largest source of federal financial assistance to local government in "face-value". Local government spending in 2006 was close to seven tenths of one percent

of non-defense GDP. Treasury 'tax expenditures' for that year are equal to about two-hundredths of one percent of GDP (0.02%).

Looked at another way, the 2006 $2.61 billion 'tax expenditure' is the single largest "face-value" financial assistance to local government for water and wastewater capital spending. It far exceeds the "face-value" benefit to local government related to SRF loans. Tax-exempt municipal bonds are widely used by cities both today and historically; thus, the cumulative impact of 'tax expenditures' for this purpose are significant and may very well rival, when looked at over time, the amount of federal financial aid provided via the federal Construction Grants program of the 1970s and 80s.

c. Infrastructure Financial Assistance Via the CWA Construction Grants Program

Federal financial assistance for public wastewater infrastructure dates back to the 1950s. The Federal Water Pollution Control Act Amendments of 1956 provided grants to communities to construct treatment facilities, but limited grants to 30 percent of eligible construction costs. The Federal Water Pollution Control Act Amendments of 1972 substantially increased the level of financial assistance, and allowed for 75 percent of eligible construction costs. The percentage allowable assistance was reduced in 1981 and phased out in 1987. It was, however, a very popular program with cities for obvious reasons.

The construction grant program authorized by the CWA was a conscious attempt by Congress to help local government afford the high price tag of achieving the goals of the Act. Federal construction grants made directly to cities precede the CWA, but the dollar value of the grants program was significantly increased after its adoption. Construction grants totaled $56.1 billion from 1957 to 1990. The average level of grant appropriations over the 34-year period was $1.65 billion. The grant program hit the $1 billion mark in 1971, and ranged as high as $9 billion in 1976. It began to taper downwards until 1990, and was replaced by the CWA State Revolving Fund loan program authorized by Congress in the 1987 Amendments to the CWA.

Local government total spending on wastewater systems over the same time period was $209.5 billion. Spending on capital for that period was $117.3 billion. The construction grants program was enormously popular because it was "free" money; and because it significantly supported spending on this function. For example, a decade before the CWA authorized construction grant program federal grants accounted for roughly four to six percent of total spending on public wastewater systems. The federal portion of total spending jumped from 12 to 61 percent of total spending during the period 1967 to 1972. In 1976 the $9 billion allocated to communities from the construction grant program was 1.5 times more than local government capital spending on wastewater. Local government capital outlay for public wastewater in 1976 was $3.9 billion compared to $9 billion for capital investment provided by the construction grant program. (Allocation, or award, of construction grants normally precedes actual investment of those grants by local government.)

As pointed out in Section V of this report, local government capital investment in wastewater infrastructure in the 1970s and 1980s was heavily influenced by the federal Construction Grants program. Federal government grants matched local government capital spending on wastewater from 1970 to 1979 and accounted for about one-third of local government spending between 1980 and 1989.

Federal grants to municipalities decreased from 25 percent of total wastewater spending in 1980 to 20 percent in 1985. By 1989-1990 it declined to about five percent of local spending levels. Congress largely opted out of the grant model in

favor of a revolving loan program in 1987, except for extending the authority of some federal agencies to continue providing limited grant funding.

d. The Clean Water Act State Revolving Fund (CWSRF) Loan Program

Congress replaced the construction grants program in 1987 by amending the CWA to implement a revolving loan fund program to be administered by 50 states and Puerto Rico (the State Revolving Fund loan program, or CWSRF). The CWSRF "... programs operate essentially as environmental infrastructure banks...provide low-interest loans to a wide variety of eligible water quality projects, and loan repayments are recycled back into individual CWSRF programs. Principal repayments plus interest earnings become available to fund new water quality projects, allowing the funds to "revolve" over time," (US EPA, 2007, p.5).

Congress appropriated $25.4 billion in capital grants to the states from 1989 through 2007. While the CWA was amended in 1987, the states needed time to establish legislative authority and an administrative capacity and protocol to disburse their capital grants into loans for local government. The states set guidelines for how the SRF would be implemented, and they solicited loan applications from local governments in order to generate a 'project priority list' to target financial assistance. For every federal dollar involved the states contribute a matching share of 20 cents, thus, the states have added $5.3 billion to the revolving loan program over the period of its existence. Some states have issued CWSRF leveraged government bonds to increase the amount of money available for projects by an additional $20.6 billion. EPA (June 2008) estimates that the all-in value of the program is about $65 billion over the period 1988 to 2007; $63 billion was allocated for water quality projects via 20,711 loans (96 percent of which were for wastewater treatment projects).

The cumulative financial assistance provided by the CWSRF is significant. EPA estimates that in 2007 $5.3 billion in financial assistance was made available. Over time the cumulative amount of the revolving loan structure may prove to be one of the most important sources of wastewater infrastructure investment financing. Generally, EPA estimates that 20-year loans under this program originating in 2007 will "...save more than 18 percent over the life of a typical 20-year loan compared to conventional financing," (US EPA, 2008, p. 5).

As previously noted, the CWSRF (and the DWSRF) capitalization grants to states are made available to local government normally in the form of loans, and very little in the way of grants. Thus, CBO can claim that the Congressional appropriation to recapitalize the SRF programs is a federal grant, but at the local government level the amount of federal financial assistance is largely one of a few percent reduction in interest rates on tax exempt government bonds compared to the interest rate of commercial bonds (however, it should be recognized that the CWSRF program allows states to charge interest rates ranging from zero percent to the market rate for bonds). The grants to the states, however, should not be double-counted as grants to local government for purposes of characterizing local government spending on public water and wastewater systems.

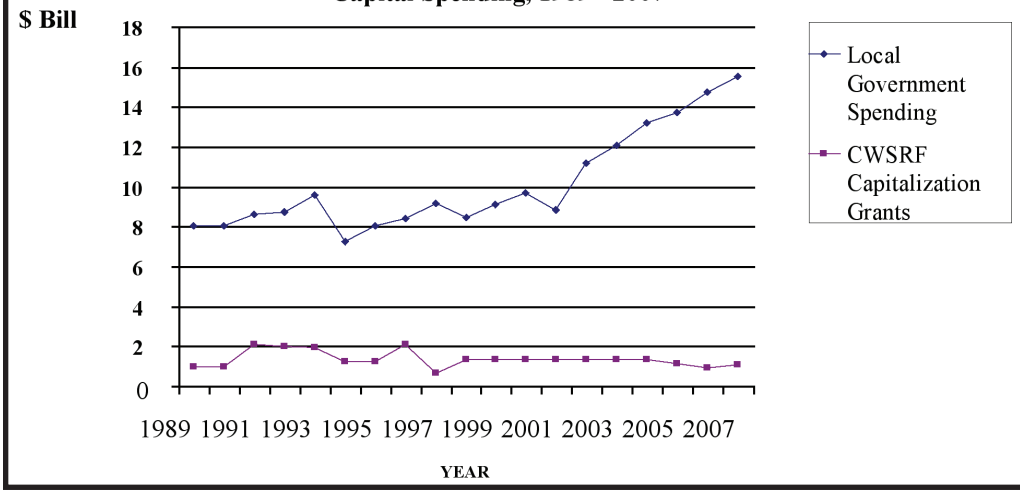
An unusual approach was adopted in the American Recovery and Reinvestment Act of 2009 (ARRA). The ARRA authorized fifty percent of the one-time state grant amount of $6 billion for the CWSRF and DWSRF to be disbursed in the form of principal debt forgiveness and low- or no-interest loans. And, the portion of the ARRA grants that are designated to be used for principal forgiveness also can be accounted as federal grants to the states and grants from the states to the local govern-

ments receiving the forgiveness of principal repayment.

The cumulative value of the revolving fund loan program built up over time with capital repayments plus interest payments currently play a larger role in wastewater infrastructure financing than does the annual Congressional appropriation of capitalization grants to the states. Yet, it should be recognized, again, that when local government takes advantage of this financing mechanism it is still in the form of a loan, and the federal assistance portion still is limited to the reduced interest rates made available compared to market rates.

Congressional appropriations to recapitalize the CWSRF program are compared to local government wastewater system capital outlays for an 18-year period, 1989 to 2006 (Figure 7). To be more certain, local government capital outlays are direct project investments; the CWSRF appropriation is the total capital amount that is divided up for formula-based distribution to the states. The recapitalization total may account, on average, for close to 14 percent of local government capital outlay. However, as suggested by Figure 7, the gap between local spending and Congressional appropriations continues to widen over time.

Figure 7:
CWSRF Capitalization Grants and Local Government Wastewater Capital Spending, 1989 - 2007



e. The Safe Drinking Water Act State Revolving Fund (DWSRF) Loan Program

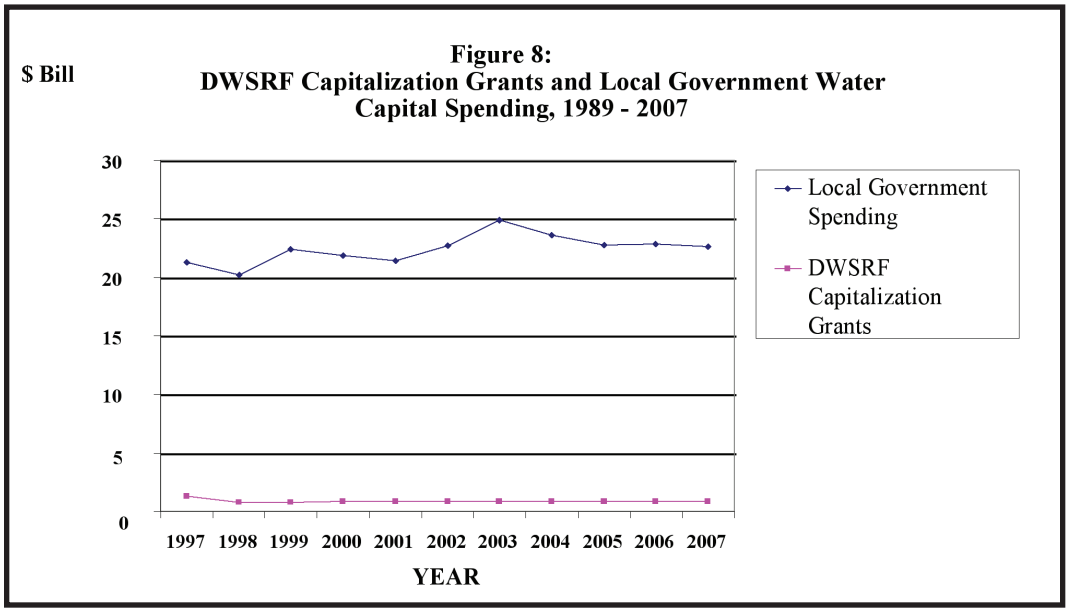
Congress authorized establishment of a revolving loan fund program when it amended the Safe Drinking Water Act (DWSRF). It was fashioned after the CWSRF, and relies on Congressional appropriations for capital grants to the states. Similar to the CWSRF, the DWSRF is disbursed from states to local government in the form of loans, with a nominal amount directed to grants for special purposes. The DWSRF loan program was launched in 1997.

Congress appropriated $9.5 billion in capital grants to the states from 1997 to 2007 for the DWSRF. Comparable data are available for Congressional appropriations and local government capital expenditures for water systems for the years 1997 through 2004. The DWSRF capital grants to states over that period ranged from three to six percent of local government capital outlays. The 11-year average is about four percent, and appears to be stable at around four percent.

While Congress has provided close to $10 billion in financial assistance, the actual

SRF loan program has provided more money as a result of repayments and interest and state leveraging of funds - all of which have increased the actual amount of money used by qualified local governments. Ben Grumbles, EPA Office of Water Assistant Administrator stated, "Over the past 10 years, the DWSRF program has provided $12.6 billion in assistance to 5,555 projects that have improved public health protection for millions of Americans. Since 1997, 39% of DWSRF assistance has been provided to systems serving fewer than 10,000 people, and 72% of all assistance agreements have been with these small systems," (EPA March 2008). Like the CWSRF, the DWSRF has made impressive strides in helping small and disadvantaged communities. While some portion of the DWSRF funds were used to forgive loan repayment, the larger share is disbursed by states as loans to local government.

Figure 8 compares the DWSRF capitalization grants from Congress to the states with local government capital investment in public water systems. The pattern clearly indicates a wide gap between local spending and capitalization grants to states. The gap has been both considerable and stable over time.



It should be noted that state assistance to local government for capital investment in water infrastructure has had a positive impact, if not a major one. GAO (November 2001) reports, "…a total of about $25 billion in state funds available for water infrastructure programs over the past 10 years." Additionally, GAO reported from results of their survey that states contributed "…about $10.1 billion to match EPA's capitalization grants for the Drinking Water State Revolving Fund and the Clean Water State Revolving Fund. This amount consisted of about $3.3 billion from state appropriations or other state sources, and about $6.8 billion that the states leveraged—that is, raised through the sale of state-issued bonds backed by the funds." States provide additional financial assistance to local government through state-sponsored grants and loans.

VIII. Reactions to Calls for an Increased Federal Subsidy

Clean and adequate drinking water and public wastewater services and infrastructure are necessary and beneficial investments of social resources. American cities have made significant investments over the last five decades to develop an extensive inventory of physical assets. A portion of the inventory is at or approaching the end of its useful life. Rehabilitation and renewal of this infrastructure, in addition to developing new physical assets, will require both additional and recurring investment, as well as new system investments. Local government has provided, and will continue to provide, the majority of the capital required to finance infrastructure and pay for system O&M. The future investment need, however, is quite substantial, and advocates of greater levels of federal assistance argue that the time has come for Congress to take action to help local government.

The U.S. Conference of Mayors has urged Congress to take several actions to help cities finance public water and wastewater infrastructure investment. Congress should make construction grants available to communities that are experiencing economic hardship or significant environmental remediation problems. Second, Congress should increase the amount of recapitalization of the SRF programs, and ensure a portion of the SRF loan funds be made available to urban centers. Third, Congress should modify current tax policy to encourage municipal access to private equity to finance public water and wastewater infrastructure investment, and modify the current tax code to remove state volume caps applicable to private activity bonds for public water and wastewater capital investment. The Conference of Mayors has developed additional, and more detailed suggestions to Congress on this subject (see Section IX and Appendix 2).

The Water Infrastructure Network (WIN 2001) report recommends a series of public and private actions that will be needed to meet the challenges for funding water and wastewater infrastructure over the coming decades. WIN suggests a fiscal partnership, with an increased federal role where needs are great, public health or the environment is at risk, or local resources are inadequate. This enhanced federal role should provide for distribution of funds in fiscally responsible and flexible ways, including grants, loans, loan subsidies, and credit assistance.

Two organizations that Congress relies on for information, the Congressional Budget Office (CBO) and the U.S. Government Accountability Office (GAO, formerly, the General Accounting Office) have examined public water and wastewater infrastructure investment needs and the level and structure of current federal subsidies to local government for that purpose. Both organizations have provided valuable information, and have offered insights that question the value of increased federal subsidies.

a. Current Level of Federal Subsidies is Significant – (Is It?)

The Congressional Budget Office (CBO, 2002; 2007) and the Governmental Accountability Office (GAO, 2001; 2002) have communicated to Congress several reactions concerning requests for increasing federal subsidies to help with capital investments in public water and wastewater infrastructure. CBO correctly asserts that "Ultimately, society as a whole pays 100 percent of the costs of water services, whether through ratepayers' bills or through federal, state, or local taxes," (CBO 2002, p. ix). Federal subsidy is merely a redistributive tool that allows government to intervene in the market to shift "…the burden of water costs from some households to others"

(CBO 2002, p. ix). In that same report CBO suggests that future costs can be funded from many sources and such subsidies "…are not necessarily a federal responsibility."

CBO offers insights intended to inform Congress on the current level of federal subsidies and the reasons why some organizations are seeking to increase them. CBO asserts that the current level of federal subsidy is already substantial. As presented in the previous section of this report, CBO identifies various federal financial assistance programs in the form of grants, loans and loan guarantees across several Administration budget ledgers (e.g., HUD, Agriculture, Interior, EPA, etc.). CBO states that federal subsidies for transportation and water infrastructure over the last few decades amount to two to three percent of non-defense GDP.

GAO is in agreement with CBO that the federal subsidy level is significant, "… EPA provides a significant amount of financial assistance for these facilities. Other federal agencies, as well as states, also provide assistance," (GAO, 2002, p.2). However, GAO qualifies this finding by including, "This assistance is primarily in the form of grants to the states to capitalize revolving loan funds," (GAO, 2001, p.1). And, GAO recognizes that local government relies on multiple funding sources,"…including federal and state loans and grants, bonds, and other debt and equity instruments - they rely primarily on user charges," (GAO, 2001, p.2).

Neither organization, however, while they may disagree on the estimated dollar amount of water infrastructure needs over the next several decades, disputes the fact that current aggregate spending is insufficient to, as EPA states it, comply with current federal law. Both organizations fall short of advising Congress to increase federal subsidies. They cite reasons involving the sending of artificial market pricing signals, creating financial disincentives for local investment, and several reasons describing how local government does not apply, or take advantage of, system efficiencies.

b. Unintended Consequences of Federal Subsidies

CBO stated concern over the implications of federal support for infrastructure investments, and especially certain unintended consequences. In the 2002 report CBO asserts that federal subsidies "…run the risk of undermining the incentives that managers and consumers have to make cost effective decisions, thereby retarding beneficial change in the water industry and raising total costs to the nation as a whole," (CBO 2002, Summary). Some examples they identify include reference to an analysis that found "…total investment in water infrastructure increased only 33 cents for each dollar of federal support; the other 67 cents effectively reduced state and local taxes or was spent on other uses" (CBO 2002). Additionally, citing a 1985 CBO report they state that a review of the wastewater construction grants program "…estimated that setting the federal cost share at 75 percent initially rather than 55 percent (the reduced level that went into effect that year) raised plant construction costs about 40 percent on average," (CBO 2002).

c. Failure of Local Government to Require Full Cost of Service

GAO's 2002 report to Congress was initiated at the request of a Senate Committee that was considering a number of legislative options to increase federal subsidies. GAO conducted a statistically representative survey of drinking water and wastewater systems to determine how the funds obtained by the system operators compare to the cost of providing service, and how "…utilities manage existing capital assets and plan for needed improvements," (GAO 2002). A third area of inquiry involved private company motivations for acquiring or operating public water and wastewater utilities.

GAO reported their findings to the Senate Committee, the basic thrust of which is that utility managers do not generally impose rates that cover the full cost of service. GAO applied a modified utility method approach to determine the full cost of service, including: O&M, taxes (or their equivalent), depreciation, and debt service (GAO 2002, p.22). GAO reported that utility revenues are comprised primarily of user charges, hook-up and connection fees.

Using the modified utility cost of service benchmark and information on utility revenues, GAO reported that 25 percent of drinking water and 40 percent of wastewater utilities had total revenues that were less than full cost of service. This short-fall in revenues may contribute to the nearly 30 percent of utilities that have deferred maintenance. The implication is that 70 to 80 percent of utilities raise enough revenues to cover O&M costs, but do not raise enough revenue to finance major capital improvements or implement sufficient rehabilitation and replacement programs. Simply stated, the inability of water and wastewater utilities to achieve sustainable systems is related to the failure of system managers to impose self-sustaining user rates.

d. Insufficient Asset Management and Capital Planning

GAO references an industry handbook that asserts asset management means "… managing infrastructure-related assets, such as pipelines and equipment, to minimize the total cost of owning and operating them while maintaining adequate service to customers,". In very gross terms this involves both management and planning activities that should, when properly coordinated and executed, result in understanding what the true full cost of service is. This, then, can help local government determine an appropriate combination of user rates, hook-up and connection fees and capital planning to achieve sustainable water or wastewater systems. Neither CBO nor GAO considered the implications of new performance standards and/or other unfunded federal mandates as important cost-drivers that local government is required to pay for.

GAO reports findings from their survey that more than 25 percent of utilities lacked capital asset management plans, and more than half of utilities with asset management plans were only partial plans. Further, the GAO reports that almost all utilities reviewed their capital improvements annually whether or not they had an asset management plan; and nearly half said their projected funding over the next five to ten years would not be sufficient.

GAO cites the advice put forth by various water utility associations espousing that "…utilities should manage their capital assets to maximize the useful life of the assets, control operating costs, and generally enhance the efficiency of their operations," (GAO 2002, p.2). These same organizations argue "…the rates that utilities charge their customers should be sufficient to finance all of the utilities' operating and maintenance expenses as well as capital costs" (GAO 2002, p.15).

e. Reducing Inefficiencies and Costs

The Congressional Budget Office appears to suggest that rather than increase federal subsidies for public water and wastewater infrastructure, utility managers can pursue policies, programs and pricing structures that achieve self-sustaining systems: "At the local level, community leaders are faced with increasing demands for funding all types of infrastructure and services and must find new ways to control costs or build public support for necessary expenditures," (CBO 2002, p.4). CBO describes a number of potential best management practices that water and wastewater utilities

should consider to increase efficiency and achieve cost-savings or cost-avoidance.

1) **Demand Management:** Drinking water utilities: conservation pricing structures; rebates for purchase of water use reduction equipment; voluntary conservation programs coupled with public education. Wastewater utilities: marginal-cost pricing to reduce cross-subsidies between different classes of users.
2) **Labor Productivity:** Increase productivity by reducing staffing for off-peak hours while increasing automation for normal operations; and, cross-training staff so there is no distinction between operations staff and maintenance staff.
3) **Consolidation of Systems:** Reduce administration, operations and labor costs by physically connecting smaller systems.
4) **Asset Management Planning:** CBO cites a report by Apogee Research/Hagler Bailly and EMA Services (CBO 2002, p. 53) that indicates increased efficiencies and cost-savings/avoidance via "…extending the life of equipment, eliminating redundant equipment, reducing O&M costs by as much as 40 percent, and improving the reliability of the system by roughly 70 percent."
5) **Innovative Construction Contracting:** Potentially significant cost savings to upgrade or construct a new treatment plant through design/build (DB) or design/build/operate (DBO) contracting with the private sector. DB and DBO alternatives can save 10 – 15 percent, or 35 to 40 percent, respectively, of overall project costs.

IX. Discussion

Clean and adequate drinking water and public wastewater services and infrastructure are necessary and beneficial investments of social resources. American cities have made significant investments over the last five decades to develop an extensive inventory of physical assets. A portion of the inventory is at or approaching the end of its useful life. Rehabilitation and renewal of this infrastructure, in addition to developing new physical assets will require increased investment. Local government provides the majority of the capital required to finance water infrastructure investments via loans, grants, bonds and user fees. Investment needed over the next 20 years, however, is likely to be between $3 and $5 trillion, for capital improvement and O&M costs. Given the magnitude of the public investment the time has come for Congress to consider reshaping action to more directly help local government achieve these national clean water goals.

What is clear is that there is no coordinated national water and wastewater strategy involving local government, Congress, and state and federal government. Congress has all but abandoned cities in the responsibility for providing safe and adequate water and wastewater services and infrastructure. As for the federal agencies, EPA plays a major role as the regulatory enforcer, with very little capacity for technical assistance to the cities; and other agencies play a minor role in providing federal financial assistance. The states provide some helpful financial assistance, but a good portion of their focus in implementing the SRF loan programs has been to disburse aid to relatively small and rural communities.

The U.S. Conference of Mayors has called for a national action agenda to renew and strengthen the intergovernmental commitment to water and wastewater infrastructure (Appendix 2). The agenda does not diminish the role or responsibility of local government for water and wastewater services and infrastructure. Clearly, improvements in asset management and long-range capital planning and sustainable pricing are needed, and those efforts and capabilities are currently evolving now

at the community level. And this is an area where direct EPA technical assistance to individual cities can be helpful. EPA can also serve to facilitate technology transfer as a way to help local government tame O&M costs.

Congress can increase federal financial assistance for capital investment, but also modify the tax code to remove impediments that prevent, limit or inhibit local government access to private capital that can be used to enhance investment. Congress should also be very concerned about the impacts the unfunded federal mandates treadmill has on local government ability to meet compliance obligations. Congress should also consider directing increased federal financial assistance for capital investment to the urban-metro economies, without decreasing the assistance that states rely on to help small and rural communities.

Some of these suggestions are listed in Appendix 2.

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Appendix 1
Materials and Methods

Materials (Data)

Local Government Public Water and Wastewater Expenditure Data

Data used in this report representing local government expenditure on public water and wastewater are from the U.S. Census Bureau's Survey of State and Local Government Finances. Data for FY-1992 through FY-2006 are found at www.census.gov/govs/www/estimate.html. Prior year (and some overlapping) data are available in Data Base on Historical Finances of State and Local Governments: "Govt_Finances" Fiscal Years 1957 - 2004. This database is an internal file of the Census Bureau, and it contains data items published in the report series "Government Finances". The data are derived from a combination of actual census information for certain years as well as statistical estimates for non-census years. All data are in the form of current dollar amounts, and are not inflation adjusted.

The data reported are roughly on a Fiscal Year basis, but the reader is cautioned that there is unavoidable difficulty in strict calendar terms. For example, data for FY2000-2001 is applied for the purposes of this report as FY2001. This protocol is adopted purely for convenience of analysis. According to Christopher Pece, Assistant Division Chief for Recurring Programs, Government Division, U.S. Census Bureau (telephone conversations on March 24-25, 2009) local governments reported information to the Bureau on a calendar year basis. Generally, local governments vary in their fiscal year designations. Mr. Pece estimates from experiential knowledge that some 40 percent of local governments end their fiscal years on June 30, another 40

percent designate December 31 as their end date, and another 20 percent use "any given" dates to start and end their fiscal years. Since the reported information is not provided on a uniform yearly basis it required the author to choose an analytical protocol that is not perfectly accurate, but is a reasonable approximation. It is noted that problems inherent in the lack of uniformity are overcome by the longevity of the period of data under consideration. This likely would not be an acceptable protocol to adopt for a much shorter period, or point-year, analysis of information.

The data considered from the Census represent US Total figures for seven local government expenditure categories. Four of the expenditure categories involved public water supply, including but not limited to drinking, or potable, water (otherwise named water supply utility by Census). They are: total water utility expenditures; water utility operations and maintenance; water utility capital outlay, and, water interest payments. Three of the information categories involve public wastewater (otherwise named sewerage by Census). They are: total sewerage, sewerage operations and maintenance, and sewerage capital outlay.

It should be recognized that interest payments on water utility borrowing for capital investments is provided in the database, but is not provided for wastewater. Similarly, capital outlays for both water utility and wastewater include all capital spending and represents more than the portion devoted to financing over time. This distinction is important because efforts to predict financing future capital investments in connection to federal subsidies by way of loans and loan guarantees should be based on finance costs rather than current year resource costs.

The Historical Census information on local government expenditure span the period 1956 to 2004, and additional expenditure data for 2005 and 2006 are available from the Survey of State and Local Government Finances. The data, however, are not complete for each expenditure category for each year. Table A-1 provides a summary of what data are available, and were used in this analysis.

Price Indexes Used for Converting Nominal Dollars into Real Spending

A single price index used to estimate inflation impacts on local government investments in public water and wastewater over time would be insensitive to differences between the two major cost components involved - O&M and capital outlays. Based on telephone interviews with staff at the U.S. Department of Commerce's Bureau of Economic Analysis (Bruce Baker, Bureau of Economic Analysis, May 20 and July 10, 2009), it is advisable to refer to separate Price Indexes for inflation adjustment of nominal dollars for O&M and for capital outlay.

Table 3.10.4 Price Indexes for Government Consumption Expenditures and General Government Gross Output was used to estimate inflation (deflate) impacts related to O&M expenditures. In particular, indexes available on Line 47 State and Local Consumption Expenditures were used. The time series index is based on year 2005; thus index year 2005 equals 100%, (or year 2005 dollars). For purposes of this research the August 17, 2009 revision of Table 3.10.4 was used.

Government consumption expenditures are services produced by government that are valued at their cost of production, but excludes government sales to other sectors and government own-account investment (construction and software).

Tables 5.8.4 A&B: Price Indexes for Gross Government Fixed Investment by Type was used to estimate inflation (deflate) impacts related to capital outlays. More specifically, the Table 5.8.4 A time series indexes under State and Local Government Line 37 was used for new sewer (wastewater) systems; Line 38 was used for new water

(utilities or supply) systems. This table provides indexes for years 1956 to 1996. Table 5.8.4 B time series indexes under State and Local Government Line 41 was used for new sewer (wastewater) systems; and Line 42 was used for new water (utilities or supply) systems. This table provides indexes for years 1997 to 2008. Both Tables set the base year at 2005 = 100 percent. For purposes of this research the August 20, 2009 revision of Tables 5.8.4 A and 5.8.4 B were used. All adjustments were chained to the year 2008.

Gross Domestic Product

Information on Gross Domestic Product (GDP) was obtained from the U.S. Department of Commerce, Bureau of Economic Analysis, National Income and Product Accounts Table, Table 1.1.5. Gross Domestic Product. Total GDP annual rates were obtained from Line 1 of Table 1.1.5. National defense annual GDP was obtained from Line 22 of Table 1.1.5.

Table A-1 Bureau of the Census - Data Availability on Local Government Expenditures on Water Utilities and Sewerage

Water Utilities and Sewerage							
Category & Year	Total Sewer Exp	Sewer Operating Cost	Sewer Capital Outlay	Total Water Exp	Water Operating Cost	Water Capital Outlay	Water Interest Exp
2006-2005	X	X	X	X	X	X	X
2004-1961					X	X	X
2004-1956	X	X	X	X			
1957-1954			X				
1957-1952							
1957					X	X	X
1956					X	X	X
1952				X			
1950				X			
1948				X			
1946				X			
1944				X			
1940				X			
1938				X			
1936				X			
1934				X			
1932				X			
1927				X			
1922				X			
1913				X			
1902				X			

Methods

Simple Annual Resource Cost Analysis

Analysis of current dollar local government expenditures on public water and wastewater was performed with simple arithmetic summations and averages. As such, the characterization of trends in local government spending is based on resource costs. This distinction is important because the purpose of part of this analysis is to characterize past trends in expenditures. As discussed in the body of the report, the Congressional Budget Office (CBO), the EPA and WIN calculate estimates of future investment needs (Needs Gap), but CBO emphasizes that the appropriate economic protocol for calculating such estimates should be based on finance costs - the allocation of capital costs in the year they are made. Including interest costs in future years that are associated with capital investments should not be part of the estimate. Characterizing actual expenditures, therefore, carries a lesser accounting burden than estimating future investment and finance costs.

Aggregation of data to reflect relative changes from one decade to the next relied on the availability of data for the respective decades. Relative change from, for example,

the 1980s compared to the 1970s was calculated as follows: nominal total expenditures for water and wastewater for the 1980s minus nominal total expenditures for water and wastewater for the 1970s, divided by nominal total expenditures for water and wastewater for the 1970s. This relative change formula was used for each expenditure category for both nominal and inflation adjusted expenditures. This approach is utilized to construct the Tables exhibiting relative changes from the 1960s through the 1990s.

Converting Nominal Dollars into Constant Dollars (Inflation Adjustment)

Converting nominal dollar expenditures to constant dollars to represent real spending (inflation adjustment - actually, deflating) was done by multiplying each spending category in terms of nominal dollars for a given year by the time series index for that given year. The resulting vector of converted dollars was then summed in several ways to provide the findings presented in the various report tables.

The same procedure was followed for the combined total expenditure categories of water and wastewater. However, the cost categories of O&M and capital were multiplied separately by the appropriate time series index – O&M nominal dollars were multiplied by the time series index from Table 3.10.4; the capital nominal dollars were multiplied by the time series index from Tables 5.8.4 A&B. The resulting vectors were then added to derive a converted figure for total expenditures. This was done separately for water utility and for wastewater.

As mentioned in the report, when converting nominal dollar spending to real spending for the water utility category, water interest payments were added to water utility capital outlays. This is not a perfect situation. It may result in an overestimate of capital outlay. On the other hand, it does reflect actual resource costs expended in the time period of interest. Furthermore, the Census data on wastewater (sewerage) do not report interest payments separately.

Local Government Expenditures on Public Water and Wastewater as a Portion of GDP

Comparing local government expenditures on public water and wastewater to GDP was done by dividing public expenditures by GDP. Comparing the same to non-defense GDP was done by subtracting national defense GDP from total GDP, and then dividing local government expenditure on public water and wastewater by non-defense GDP.

EPA-SRF as a Percent of Non-Defense GDP

There are several ways to estimate the "face-value" of an SRF loan to a city. One way to do so, and to be comparable to, for instance, the "face-value" of municipal bonds used for water and sewer infrastructure investment, is to focus on the preferential interest rate made available. Thus, the difference between the interest rate on an SRF loan and a commercial loan (perhaps even commercial bond) is from 1 to 4 percent. The actual preferential rate depends on the financial assessment of the city in the form of its 'rating'. EPA points out that the value of an SRF loan could be as high as 18 percent of the overall cost of a project- in the form of cost-savings due to the preferred interest rate. In the current report, however, we selected a two percent interest rate preference using an SRF loan compared to a commercial loan (or bond) so that the roughly $2 billion in Congressional recapitalization of the SRF loan pro-

gram appropriations would be somewhat similar to the tax preference of a municipal bond, in a given year. This approach is far from perfect, and the EPA is encouraged to provide a more thorough accounting analysis.

Estimating Missing Data Elements

Water Utility Total Expenditure

The Historical Census data reports local government total expenditure on water utilities for the period 1956 to 2004, and in annual reports for 2005 and 2006. Estimates were calculated for total water utility expenditure for 2007 and 2008, as follows. From 1956 to 2006, total expenditures were $792 billion. The average change over 1957 to 2006 is $919 million. Thus, the average change over the 52 year period 1957 to 2006 is roughly $17 million. This figure does not appear to be a good representation of increased spending during the later years. So, both the last 10-year and 5-year periods were calculated to determine the best indicator of spending for years 2007 and 2008. The 10-year (1997 to 2006) average change was an increase of $1.8 billion; the average 5-year (2002 to 2006) change was an increase of $2.2 billion. The convention adopted was to add the $2.2 billion to total water utility spending for 2006, resulting in an estimated 2007 total expenditure of $49,615,795,000 ($49.6 billion). A 5-year rolling average was calculated based on total spending for 2003 to 2007 (the latter year is the estimate previously described), resulting in $1.9 billion. The $1.9 billion average was added to the estimated 2007 total expenditure to result in an estimated $51.5 billion for 2008.

Estimating Water Utility Component Cost (O&M; Capital Outlay and Interest Payments)

The Historical Census data does not report expenditures for the water utility component costs for 1958, 1959 or 1960. Two methods were considered for estimating these data elements. Calculating estimates based on interpolation procedures with reference to actual reported total expenditure data for 1956, 1957 and 1961 proved to overestimate the component cost categories. This was determined by comparing the interpolation estimates to total expenditures. In each case year, the interpolated estimate, when combined with other interpolation estimated cost components exceeded actual total expenditures.

The second, and selected method, was a proportional allocation procedure constrained by reported actual total expenditures. Actual reported data for the water utility cost component categories for 1957 and 1961 were used to determine the proportion of total expenditures for each cost category. For example, as reported in the Census data water interest payments represented 9.3 percent and 10.1 percent for 1957 and 1961, respectively. Thus, 10 percent was chosen to estimate this component cost for 1958, 1959 and 1960. The water utility O&M proportion was 43.4 and 42.8 for 1957 and 1961, respectively; and 43 percent was chosen to estimate this component cost for 1958, 1959 and 1960. Finally, the water utility capital outlay proportion was 47.2 and 47.0 for 1957 and 1961, respectively; and 47 percent was chosen to estimate this component cost for 1958, 1959 and 1960.

The more current Census data did not have information on the same water utility cost component categories available at the time of this review for the years 2005 to 2008. Thus, a proportional allocation procedure was employed to estimate these figures; the estimates were compared to total expenditures, which are provided by the

Census data. Using the years 2002, 2003 and 2004 as likely representatives of 2005 to 2008 expenditures, the following proportions were assigned to each cost component: water interest proportion, 12.1 percent; water O&M proportion, 57.8 percent; and, water capital outlay proportion, 30.1 percent was chosen, respectively, to estimate the component costs for 2005-2008

Estimating Wastewater (Sewerage) Total Expenditure

The more current Census data was used to calculate estimated total expenditures on wastewater for 2007 and 2008. The convention applied was identical to the one used for water utility - a rolling 5-year average based on the latest five years of actual reported data. Thus, the average change from 2002 to 2006 (starting at 2002 – 2001; 2003 – 2002; etc.) was $2.176 billion. Adding that figure to the reported 2006 expenditure resulted in an estimate of 2007 spending ($40.1 billion). Next, recalculating the 5-year average change in spending from 2003 to 2007 resulted in an estimated increase in total wastewater spending of $1.984 billion; and this was added to the estimated 2007 estimate to represent 2008 spending ($42.1 billion).

Estimating Wastewater (Sewerage) O&M Expenditures and Capital Outlay

Similar to calculating estimates for water utility component costs, a proportional allocation method was employed to estimate wastewater O&M expenditures and Capital Outlays for 2007 and 2008. Based on actual reported data on O&M expenditures for the previous three years, 2004 to 2006, it was determined that this cost component accounted for 61.3 percent of total wastewater spending. Similarly, the Capital Outlay proportion was 38.7 percent. These proportions were applied to estimates for these cost categories for the years 2007 and 2008.

Appendix 2

WATER AND WASTEWATER

WHEREAS, more than 50 mayors and infrastructure leaders from across the nation met at The U.S. Conference of Mayors' Action Forum on Infrastructure in New York City August 13-14, 2008, to develop an action agenda for a renewed commitment to America's infrastructure; and

WHEREAS, following that meeting a working group of mayors drafted a national action agenda on infrastructure; and

WHEREAS, that national action agenda includes a series of findings and recommendations for a new stronger relationship between the nation's mayors and the federal government to ensure that we update the country's antiquated infrastructure in ways that will keep us economically competitive, and do so in ways that are climate and energy centered; and

WHEREAS, the mayors and other leaders found that:

- Local Government invests greatly in the nation's water and sewer infrastructure to keep citizens safe and the United States economically competitive. The Federal Government needs to renew its partnership with local government to protect this critical infrastructure;
- Local Government is responsible for the vast majority of investment in water and sewer infrastructure, spending over $1.25 trillion from 1956 through 2005 ($85 billion in 2005 alone);
- Meanwhile, the federal contribution over this period was about 7% ($91 Billion) with $56 billion provided to cities from 1972 through 1990 in the form of wastewater construction grants;
- These construction grants, which helped cities comply with the regulations of the Clean Water Act, were phased out by 1990 and replaced by the State Revolving Fund Loan Program which has steadily been cut over the years;
- Despite the tremendous investment by local government, the U.S. Environmental Protection Agency estimates that there still is a $500 billion "needs gap" to meet our water and wastewater infrastructure needs and to comply with current environmental mandates;
- A recent report by the Cadmus Group for The U.S. Conference of Mayors, determined that Water and Wastewater Infrastructure investment stimulates the nation's economy and creates jobs;
- For every one dollar of water and sewer infrastructure investment, it is estimated that Gross Domestic Product increases by $6.35 in the long-term. For each additional dollar spent on operating and maintaining water and sewer industry, the increase of revenue or economic output for all industries is increased by $2.62 in that year;
- In addition, for every one job added in water and sewer creates 3.68 jobs in the national economy to support that job; and

NOW, THEREFORE, BE IT RESOLVED that The United States Conference of Mayors adopts as its policy the investments called for by the mayors in the National

Action Agenda on Infrastructure to renew and strengthen the federal commitment to the nation's water and wastewater needs:

- Remove Private Activity Bonds for water/wastewater infrastructure from State Volume Caps;
- Fully fund federally-passed environmental mandates and court-ordered consent decrees applicable to water and wastewater systems (e.g., combined-sewer and wet weather overflow issues);
- Place priority on funding rehabilitation of aging infrastructure (leaking pipes are a concern for most cities who can lose anywhere from 5-40% of their water), improvements that protect water and sewer infrastructure from catastrophic events, and ensure source water availability (35% of cities in a Conference of Mayors survey do not know where their water supply will come from by 2025);
- Allocate an additional $50 billion over 10 years in this way: $3 billion annually in grants to cities to comply with sewer overflow infrastructure; and $2 billion annually in additional SRF loan funding for rehabilitation of aging infrastructure, protection of water and sewer infrastructure, and promote source water availability;
- Address future infrastructure needs through a mix of funding sources;
- Increase program/policy flexibility to allow cities to undertake locally-designed strategies, emphasizing green infrastructure and other flexible and innovative solutions;
- Plan for and fund infrastructure improvements related to climate change, including adapting to events such as droughts, floods, and rising sea levels.