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## **Assessments of Needs for Water and Wastewater Infrastructure in Appalachia**

The dialogue concerning water and wastewater services is usually dominated by discussion of needs for physical capital infrastructure. This is not surprising, given that a new or expanded water or wastewater treatment plant, a new sewerage collection system, or an expanded water distribution system often is the most expensive public project carried out in or by a community. In addition to having large price tags, these projects bring pride, improved health, and economic development. When funds for the projects are not available, public leaders often make finding funds their number one priority. Water and wastewater needs related to decentralized systems, regulatory oversight, training, stormwater handling, source-water protection, watershed restoration, and system operation and maintenance rarely get the same attention either locally or nationally. As a result of the interest in capital, there are many more surveys of capital needs and sources of information on them, than there are of other types of needs.

Over the last ten years, a number of national, state, and advocacy organizations have completed water and wastewater infrastructure studies that cover parts of Appalachia (for a summary, see Tables 3-1 and 3-2). These studies have varied in scope, purpose, and method of implementation. Understanding the variations is crucial in determining how to extract and estimate Appalachian needs from the studies.

**Table 3-1. Differences among National Infrastructure Needs Surveys and Reports**

Author	Title	Geo-graphic Coverage	Scope (Systems Surveyed or Methodology)	Smallest Geo-graphical Subunit	Report Year	Report Frequency	Time Horizon	Private Utility Needs Included?	Include Currently Unserved Areas?
EPA	<i>Drinking Water Infrastructure Needs Survey: 2nd Report to Congress</i>	Nation	100% of large CWSs, American Indian and Alaska Native Village water systems, and extrapolation from of medium CWSs, 599 small CWSs, 100 non-CWSs	State	2001	Every 4 years	20 years	Yes	Yes if experiencing drinking water public health problems
EPA	<i>Clean Watersheds Needs Survey 2000</i>	Nation	Surveyed facility list includes most centralized discharging facilities and many collection systems	Utility	2003	Every 4 years	Identified needs as of 1/1/2000; varies in horizon	No	Yes
AWWA	<i>Dawn of the Replacement Era: Reinvesting in Drinking Water Infrastructure</i>	Nation	Extrapolation from 20 utilities	Nation	2001	Special	30 years	Yes	No

Author	Title	Geo-graphic Coverage	Scope (Systems Surveyed or Methodology)	Smallest Geo-graphical Subunit	Report Year	Report Frequency	Time Horizon	Private Utility Needs Included?	Include Currently Unserved Areas?
CBO	<i>Future Investment in Drinking Water and Wastewater Infrastructure</i>	Nation	Top-down macro estimate	Nation	2002	Special	20 years (2000-2019)	Yes	Only extensions due to public health threats
EPA	<i>The Clean Water and Drinking Water Infrastructure Gap Analysis</i>	Nation	DWNS & CWNS plus modeled estimates	Nation	2002	Special	20 years (2000-2019)	Yes	Per DWNS and CWNS
Water Infrastructure Network	<i>Clean and Safe Water for the 21st Century: A Renewed National Commitment to Water and Wastewater Infrastructure</i>	Nation	Top-down macro estimate	Nation	2000	Special	20 years	Yes	Indirectly (capital cost of building new infrastructure is included)

**Table 3-2. Differences among State Infrastructure Needs Surveys and Reports**

<b>Author</b>	<b>Title</b>	<b>Geo-graphic Coverage</b>	<b>Scope (Systems Surveyed or Methodology)</b>	<b>Smallest Geo-graphical Subunit</b>	<b>Report Year</b>	<b>Report Fre-quency</b>	<b>Time Horizon</b>	<b>Private Utility Needs Included?</b>	<b>Currently Unserved Areas Included</b>
West Virginia Infrastructure and Jobs Development Council	<i>PWS and PWWS Inventory &amp; Needs Assessment Report 2002</i>	West Virginia	All 557 CWSs and all 292 community sewage systems	Utility	2002	Every 3 years	Identified needs	Yes	Yes
North Carolina Rural Center	<i>Clean Water: Our Livelihood, Our Life</i>	North Carolina	405 water and 254 sewer systems in 75 predominantly rural counties	Utility	1998	Special	Identified needs	Yes	Yes
Ohio Public Works Commission	<i>Capital Improvement Reports</i>	Ohio	All water or sewer systems that apply for funds from OPWC (some <i>Capital Improvement Reports</i> are outdated)	Utility	Last-updated Capital Improvement Reports between 1999 and July 22, 2004	Contin-uous	5 years	Yes	No

Author	Title	Geo-graphic Coverage	Scope (Systems Surveyed or Methodology)	Smallest Geo-graphical Subunit	Report Year	Report Fre-quency	Time Horizon	Private Utility Needs Included?	Currently Unserved Areas Included
Kentucky Governor's Water Resource Development Commission	<i>Water Resource Development: A Strategic Plan (1999)</i>	Kentucky	All extensions of service planned by 2020 (not current infrastructure needs)	Utility	1999	Special	20 years (2000–2020)	No	Yes
Kentucky Governor's Water Resource Development Commission	<i>Water Resource Development: A Strategic Plan for Wastewater Treatment (2000)</i>	Kentucky	All extensions of service planned by 2020 (not current infrastructure needs)	Utility	2000	Special	20 years (2000–2020)	No	Yes
Tennessee Advisory Commission on Intergovernmental Relations	<i>Building Tennessee's Tomorrow: Anticipating the State's Infrastructure Needs</i>	Tennessee	All projects during 2002–2007 costing at least \$50,000	County	2004	Annually	5 years (2002–2007)	No	No

### Scope and Implementing Organizations

Some surveys estimate national needs, whereas others estimate state or substate needs. EPA coordinates the national CWNS and the national DWNS every four years. The results of the CWNS conducted in 2000 were published in 2003.<sup>39</sup> Included are all wastewater capital needs that were present at the time of the survey, regardless of time period. The CWNS reports a total national need of \$181.2 billion (in 2000 dollars), including \$161.9 billion for wastewater collection and treatment facilities. The results of the DWNS conducted in 1999 were published in 2001. Included are national capital needs for 1999-2019.<sup>40</sup> The DWNS reports a total national need of \$150.9 billion (in 1999 dollars), including \$136.3 billion for the nation's community water systems and \$3.1 billion for not-for-profit noncommunity water systems.

EPA also has published an analysis that uses needs studies as well as supplementary data and modeling to estimate drinking water and wastewater needs and the infrastructure gap for the entire country. The *Gap Analysis* suggests that the nation's twenty-year needs for investment in wastewater facilities are \$331 billion-\$450 billion (in 2001 dollars). The figure for investment in drinking water facilities is presented as \$218 billion (in 2001 dollars).<sup>41</sup>

The Water Infrastructure Network (WIN) and the American Water Works Association (AWWA) carried out national-level studies as well.<sup>42</sup> Finally, the

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<sup>39</sup> Environmental Protection Agency, *Clean Watersheds Needs Survey 2000* (Washington, D.C.: EPA, 2003).

<sup>40</sup> Environmental Protection Agency, *Drinking Water Infrastructure Needs Survey: Second Report to Congress* (Washington, D.C.: EPA, 2001). The 2003 DWNS has been completed. However, the data will not be available for analysis until late 2005.

<sup>41</sup> Environmental Protection Agency, *The Clean Water and Drinking Water Infrastructure Gap Analysis* (Washington, D.C.: EPA, 2002).

<sup>42</sup> Water Infrastructure Network, *Clean and Safe Water for the 21st Century: A Renewed National Commitment to Water and Wastewater Infrastructure* (Washington, D.C.: the Network, 2000), available at [www.amsa-cleanwater.org/advocacy/winreport/winreport2000.pdf](http://www.amsa-cleanwater.org/advocacy/winreport/winreport2000.pdf); American Water Works Association, *Dawn of the Replacement Era: Reinvesting in Drinking Water Infrastructure* (Denver: the Association, 2001).

Congressional Budget Office (CBO) carried out an analysis of needs and past studies to generate additional numbers.<sup>43</sup>

All these studies provide national estimates. Some of them, such as the EPA needs surveys, have sufficient data and were carried out in a manner that permits presenting needs information at the state level. Others, such as the WIN and AWWA studies, are top-down modeling efforts that cannot readily be used to determine subnational needs.

The EPA needs surveys are carried out primarily by state needs coordinators, and each state is responsible for collecting data. The CWNS is done on a system- or facility-wide basis, so state-collected data can be used directly to estimate state needs. The DWNS involves some sampling at the state and national levels, so generating state estimates requires modeling done at the national level.

Several states in Appalachia carry out state-level infrastructure needs assessments separate from the EPA studies.<sup>44</sup> Some, such as Kentucky and West Virginia, collect data statewide at the project or system level so that they can generate needs estimates at substate levels. Others—for example, North Carolina—rely on sampling and then modeling to arrive at a state estimate. The resulting information cannot be easily disaggregated at the substate level.

Finally, some assessments, such as that reported in the *Virginia Coalfields Regional Water Study*, have focused on the need in a particular area of Appalachia.<sup>45</sup> The organizations responsible for state and regional needs surveys include economic

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<sup>43</sup> Congressional Budget Office, *Future Investment in Drinking Water and Wastewater Infrastructure* (Washington, D.C.: CBO, 2002), available at [www.cbo.gov/showdoc.cfm?index=3983&sequence=0](http://www.cbo.gov/showdoc.cfm?index=3983&sequence=0).

<sup>44</sup> Kentucky Governor's Water Resource Development Commission, *Water Resource Development: A Strategic Plan* and *Water Resource Development: A Strategic Plan for Wastewater Treatment* (Frankfurt: the Commission, 1999, 2000); North Carolina Rural Economic Development Center, *Clean Water: Our Livelihood, Our Life* (Raleigh: the Center, 1998); data from Ohio Public Works Commission, Capital Improvement Reports, provided on 22 July 2004, and analyzed by UNCEFC; Tennessee Advisory Commission on Intergovernmental Relations, *Building Tennessee's Tomorrow: Anticipating the State's Infrastructure Needs* (Nashville: the Commission, 2004); West Virginia Infrastructure and Jobs Development Council, *Public Water Systems & Public Wastewater Systems Inventory & Needs Assessment Report 2002* (Charleston: the Council, 2002).

<sup>45</sup> Thompson & Litton, for LENOWISCO and Cumberland Plateau Planning Districts, *Virginia Coalfields Regional Water Study* (Duffield, Va.: LENOWISCO, 1998), available at [www.lenowisco.org/lenowisco%20library.htm](http://www.lenowisco.org/lenowisco%20library.htm).

development groups (as in Maryland, North Carolina, and Tennessee) and funding agencies (as in Kentucky and West Virginia).

### **Purpose**

The stated goal or purpose of a needs assessment dictates how it is carried out, what types of needs are included, and how the data are presented. Surveys such as those done by WIN, AWWA, and the North Carolina Rural Economic Development Center are primarily used to provide information for policy debate. As a result, these surveys tend to be more top-down than other types of surveys. The numbers they generate are not very useful in understanding needs in smaller, or different, areas than were covered by the original estimate.

In other cases, survey results are used to allocate capital funds. For example, the DWNS is used to determine capitalization grant allocations for states' DWSRF programs.

Some surveys are used to register needs so that projects can be considered for funding. Examples are those conducted in Kentucky, Ohio, and West Virginia (see Table 3-2).

### **Frequency and Planning Period**

Needs surveys may be done on a one-time basis, periodically, or on an ongoing basis (see Tables 3-1 and 3-2). Studies such as the EPA *Gap Analysis* and the WIN report, and state surveys in Kentucky, North Carolina, and Virginia have been commissioned over the years to respond to special policy and information needs. The EPA needs surveys and state surveys in Tennessee and West Virginia are done at regular intervals. Needs databases maintained by funding organizations such as the Kentucky Infrastructure Authority, the Ohio Public Works Commission, and the West Virginia Infrastructure and Jobs Development Council are updated continually to reflect newly identified projects.

Surveys of capital needs solicit information for stated planning periods, typically 5–20 years. Surveys that are used to evaluate projects for funding focus on shorter-range planning periods. The databases maintained by the Kentucky Infrastructure Authority and the Ohio Public Works Commission primarily include needs (facilities) scheduled (or desired) to be constructed within five years. Both organizations also collect data for longer horizons, but the data are assumed to be incomplete and less accurate. The DWNS asks systems to identify all their needs for twenty years. The CWNS requires that facility needs be documented and includes all needs documented at the time of the

survey, whether they are for five years or longer. Thus the planning period for the CWNS varies from facility to facility.

### Methodology

Understanding the different methodologies provides insight into how data from each of the surveys can and should be used to generate accurate estimates for Appalachia. No two needs surveys are alike. Some begin with the collection of project estimates at the system level, then aggregate them to the state or national level. This bottom-up approach is used by the CWNS and, to a lesser extent (because of sampling), by the DWNS.

The CBO classifies reports as top-down or bottom-up. However, many surveys are really hybrids of the two techniques.<sup>46</sup> For example, the AWWA survey uses a detailed engineering analysis of twenty systems to model needs across the country.

Information at the local level, if used at all, is collected differently for different surveys. The EPA provides general guidelines to states in collecting needs information, but the actual process varies. Some states hire contractors to collect information or conduct analyses. Other states rely almost exclusively on survey responses, with little follow-up. Still others visit each surveyed system.

The North Carolina Department of Environment and Natural Resources takes a very active role in the DWNS. EPA sends the department the survey, and the department hand-delivers it to systems. The department follows up with site visits to assist systems, especially small ones, in filling out the survey. It also conducts local meetings if there are several utilities in an area. After it collects the surveys, the department does an extensive review of the costs before sending the surveys on to EPA.

On the other hand, the Maryland Department of Environment uses a private contractor to conduct the state's CWNS. The department collects some data but sends them on to the contractor to interpret and review.

Needs surveys done by state organizations, such as the Kentucky Infrastructure Authority and the West Virginia Infrastructure and Jobs Development Council, use a variety of methods to gather information. The Kentucky Infrastructure Authority's Water Resource Information System is a database that collects infrastructure data through a Water Project Profile system. Individual development districts in Kentucky identify water and wastewater needs in their district and enter them as project profiles.

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<sup>46</sup> CBO, *Future Investment*.

The Water Resource Information System database is used as an electronic clearinghouse to connect needs and funding.

The West Virginia Infrastructure and Jobs Development Council collects needs data through its voting members, who meet monthly to assess needs. The council includes representatives from the Bureau for Public Health, the Department of Environmental Protection, the Water Development Authority, the Housing Fund, and the Economic Development Authority. West Virginia's eleven regional planning and development councils assist communities in entering projects into a database that tracks pending and funded projects, as well as unserved needs.

### **Accuracy**

The current systems for assessing and assigning dollar values to infrastructure capital needs are far from perfect. Indeed, there is strong evidence that the estimates, particularly for rural systems without planning staff, are less than actual capital needs. Lack of incentives to provide accurate information and lack of planning resources at the state and local levels are some of the factors that affect the accuracy of the estimates and contribute to a general sentiment on the part of state officials that the surveys are inaccurate.

Of all the national surveys and studies, the CWNS faces the most challenges in accurately portraying needs. For example, the 2000 CWNS shows a documented need in Accident, Maryland, of \$206,000. Actual project investments have been significantly higher. Between 2001 and 2004, Accident invested \$110,000 to correct sanitary sewer problems, and in 2004 it received and spent an additional \$2.9 million in grants and loans to repair and reconstruct its water and wastewater systems. For another example, Northfork, in McDowell County, West Virginia, needs a new treatment plant. According to the CWNS, however, Northfork has no needs.

Reasons for missing data can be linked to the manner in which the CWNS is implemented and the perceived incentives or disincentives that systems have for providing information. Another major factor relates to the capacity of a particular system to provide information. Ironically the systems with some of the greatest needs, such as Northfork, also have the fewest human and financial resources to identify, plan for, or report needs.

At the time this report was written, Jasper, New York, was about to spend \$2.86 million on a new sewer system. Not only do the town's needs not appear in the CWNS, but the name Jasper does not appear in the comprehensive list of New York systems used to identify needs. Jasper is not included because until Jasper spends its money, it

does not have a system or a facility. The CWNS is a bottom-up survey beginning at the level of existing systems.

The lack of incentive to respond to surveys affects the DWNS as well, even though the information is used for funding allocations. Systems that have not used the State Revolving Fund (SRF) programs, or systems that are not allowed access to the SRFs (such as private, for-profit systems in North Carolina and West Virginia), have little direct incentive to help their state acquire more federal SRF funds.<sup>47</sup>

The UNCEFC research team's interviews with state needs coordinators in the Appalachian states highlight the variation in how EPA and state surveys are implemented and how the quality of the data is perceived. Perceptions about the CWNS ranged from "not worth the paper it is printed on" to being "very accurate" for the state. The state whose coordinator perceived the CWNS as "very accurate" approaches the CWNS with the belief that Congress might start using it to allocate the federal Clean Water State Revolving Fund (CWSRF) monies among the states on the basis of each state's portion of the national needs, as it does with the DWNS.

The other group of state officials who have the closest ties to these surveys are those who manage funding programs, some of whom use the data as part of their funding process. One surprising result of the UNCEFC survey was the discovery that many funding program managers are unaware of the EPA needs surveys (30 percent of respondents were unaware of the DWNS, and 40 percent of the CWNS) despite the use of the EPA data to make state allocations. When asked to comment on the accuracy of EPA and state surveys, funding program managers had the most doubts about EPA survey accuracy and were generally more accepting of the state surveys' estimates. Sixty percent of the respondents said that the state surveys accurately estimate their state's needs, while 70 percent and 60 percent said that the DWNS and the CWNS, respectively, underestimate their state's needs). (For the results of the UNCEFC survey of funding program managers, see appendix D.)

In 1997, EPA carried out follow-up visits in 200 communities included in the 1995 DWNS and found significant underreporting. As a result, for its *Gap Analysis*, EPA used multipliers that significantly inflated needs survey data to estimate actual needs (see Table 3-3).

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<sup>47</sup> The Safe Drinking Water Act permits private for-profit systems to access SRF funds. However, many states—North Carolina, among them—have enacted state rules that limit access to not-for-profit or public government systems.

**Table 3-3. Adjustment Factors Used by EPA in One Approach to Estimating National Drinking Water Needs from 1997 DWNS**

Characterization of Community Water System	Pipe Needs	Non-Pipe Needs
Large Systems (serving more than 40,000 people)	1.61	1.49
Medium Systems (serving 3,300 – 40,000 people)	1.61	1.49
Small Systems (serving fewer than 3,300 people)	1.00	1.00

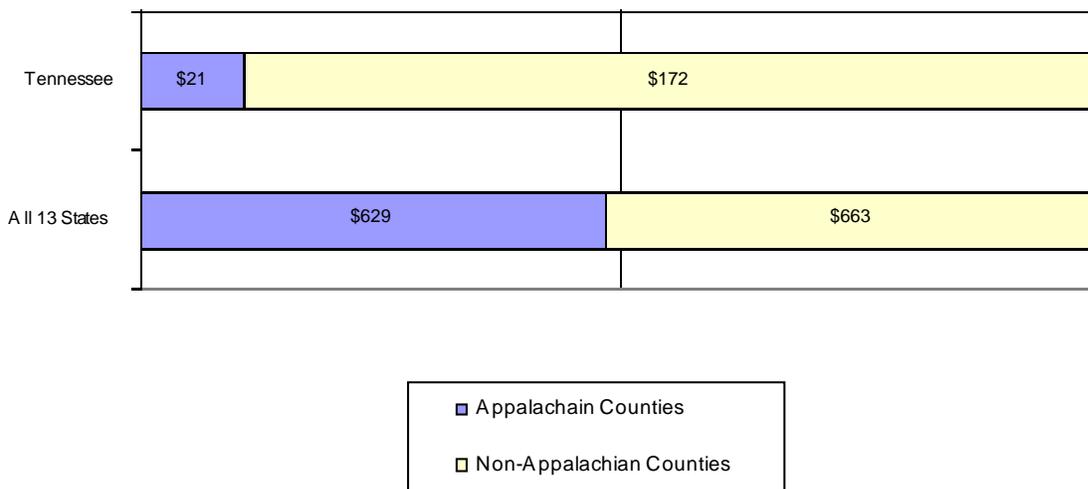
Source: Reprinted from Environmental Protection Agency, *The Clean Water and Drinking Water Infrastructure Gap Analysis* (Washington, D.C.: EPA, 2002), 31.

At the state level, the situation in North Carolina illustrates the sensitivity of needs surveys to the resources that state governments can devote to them. The 1999 DWNS occurred at the same time that North Carolina Public Water Supply officials were managing the largest public infrastructure funding initiative in the history of the state. They had few extra resources to perform follow-up visits. According to the North Carolina DWNS coordinator, in 2003 the staff was able to devote considerably more effort to follow-up visits. The provisional results of the 2003 needs survey far exceed the 1999 numbers. That is especially surprising, considering that the state pumped at least \$388 million into water systems from 2000 to 2003. The likely conclusion is that the need was there in 1999 but not captured.

Data from needs surveys suggest that when states do not have sufficient resources or incentives to carry out the surveys, overall numbers are low, and harder-to-reach areas such as those found throughout Appalachia are particularly underreported. For this reason, in conducting the DWNS, EPA carries out structured visits with a sample of small systems (those with fewer than 3,300 customers) rather than relying on state-provided data. Unlike the DWNS, the CWNS relies on state-collected information for small systems.

The needs results for Tennessee from the 2000 CWNS illustrate the potential magnitude of underreporting in some states. Tennessee officials, like many consulted for this project, expressed concern that the CWNS is not currently used for a purpose that benefits the state and that as a result they find it difficult to make the survey a priority. In estimates of the clean water needs of Appalachia, Tennessee is clearly a major outlier, with a much lower estimate of needs per capita than the average for Appalachia as a whole (see Figure 3-1). The level of reporting in the Appalachian counties of Tennessee is low, thereby underestimating Appalachia's overall needs. The data for Tennessee also suggest that when a state is unable to do much follow-up work, rural areas with limited staff are likely to report even less in needs, as suggested by the sharp disparity between the Appalachian counties' and the non-Appalachian counties' estimates of needs per capita.

**Figure 3-1. Documented Clean Water Needs per Capita, Tennessee Counties versus All Counties in Appalachian States, 2000**



Source: Environmental Protection Agency, Needs Report data for *Clean Watersheds Needs Survey 2000*, available at [www.epa.gov/owm/mtb/cwns](http://www.epa.gov/owm/mtb/cwns), downloaded and compiled by UNCEFC. Total headquarters-accepted needs are used in this analysis. Population estimates from Census Bureau, Census 2000, Summary File 1, Table P1.

### Undocumented and Unidentified Needs

The preceding section comments on the underreporting of needs that should have been included according to the definition of the surveys. In many parts of Appalachia, a far greater issue than underreporting of needs is the purposeful exclusion of needs from consideration because of the focus of the surveys and the criteria that they use to define needs. For example, capital needs for upgrading or repairing individual septic tanks are not systematically included in the CWNS. As described in chapter 2, the average Appalachian family is much less likely to be served by a centralized wastewater system than the average U.S. family is.

Needs data often are presented and used for policy purposes without reference to the types of infrastructure needs included in the numbers. Both of the EPA needs surveys are oriented toward centralized systems, although some participating states include system extensions (extensions of water distribution lines and sewer collection lines) aimed at providing service to new customers with existing health or environmental problems. Neither survey includes cost estimates for improving existing decentralized systems for communities and households. Providing centralized water and wastewater services in many parts of Appalachia is not technically or financially feasible. However, the existing decentralized systems still require significant capital investments, ranging from installation of new systems where straight piping occurs, to complete replacement of failed systems. The Kentucky wastewater needs study

estimates that \$3.5 billion–\$7 billion will be needed to bring current onsite systems into compliance.

Two other types of needs that put pressures on local communities but are rarely included in needs surveys are infrastructure to accommodate growth and economic development. The need for the former is a problem in some southern parts of Appalachia that have more than doubled their population in the past 20–30 years. Although needs assessments that are used primarily for infrastructure funding, such as the DWNS and the assessment of the Ohio Public Works Commission, understandably focus on capital infrastructure, policy-oriented studies like the EPA *Gap Analysis* and the CBO study show that operation and maintenance needs also are significant.

Since many projects identified as needs in Appalachia are for new infrastructure, many communities soon will face completely new capital-related operation and maintenance needs. The West Virginia Infrastructure and Jobs Development Council's needs inventory in 2002 includes seventy-eight wastewater facilities for utilities or local governments that do not currently provide centralized wastewater treatment service. Among them are the six new facilities proposed for McDowell County (see Table 3-4). The 2000 CWNS needs estimates do not include the \$22.3 million in capital needs for the new Davy, Dry Fork Public Service District, and McDowell County Commission wastewater facilities. Further, in each of these cases, once the facilities are constructed, the communities will become responsible for all the costs associated with operating the facility, as well as the costs of providing the necessary ancillary services linked to billing, customer service, and utility management. Hence the Appalachian needs estimates obtained from the federal needs surveys, already not including the capital needs required for many of the new facilities in the region, also underestimate the total financial needs of the communities by not including the operating and maintenance costs of systems that will come online.

**Table 3-4. New Wastewater Treatment Plants and Collection Systems Proposed for McDowell County, W.Va.**

System Name	Assessment of System Needs	Needs
Anawalt	Construct gravity sewer lines, force mains, 3 pump stations, etc.	\$ 4,800,000
Davy	Construct treatment and collection system	2,943,000
Dry Fork Public Service District	Construct treatment and collection system (Cucumber, Bishop, Avondale, Squire, and Bradshaw)	13,839,000
Elkhorn Public Service District	Wastewater collection system	9,146,200

<b>System Name</b>	<b>Assessment of System Needs</b>	<b>Needs</b>
Jeager	Construct treatment and collection system	3,167,000
McDowell County Commission	Construct treatment and collection system (in Mohawk and Panther)	5,474,000

*Source: West Virginia Infrastructure and Jobs Development Council, Public Water Systems & Public Wastewater Systems: Inventory & Needs Assessment Report (Charleston, WV: the Council, 2002).*

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