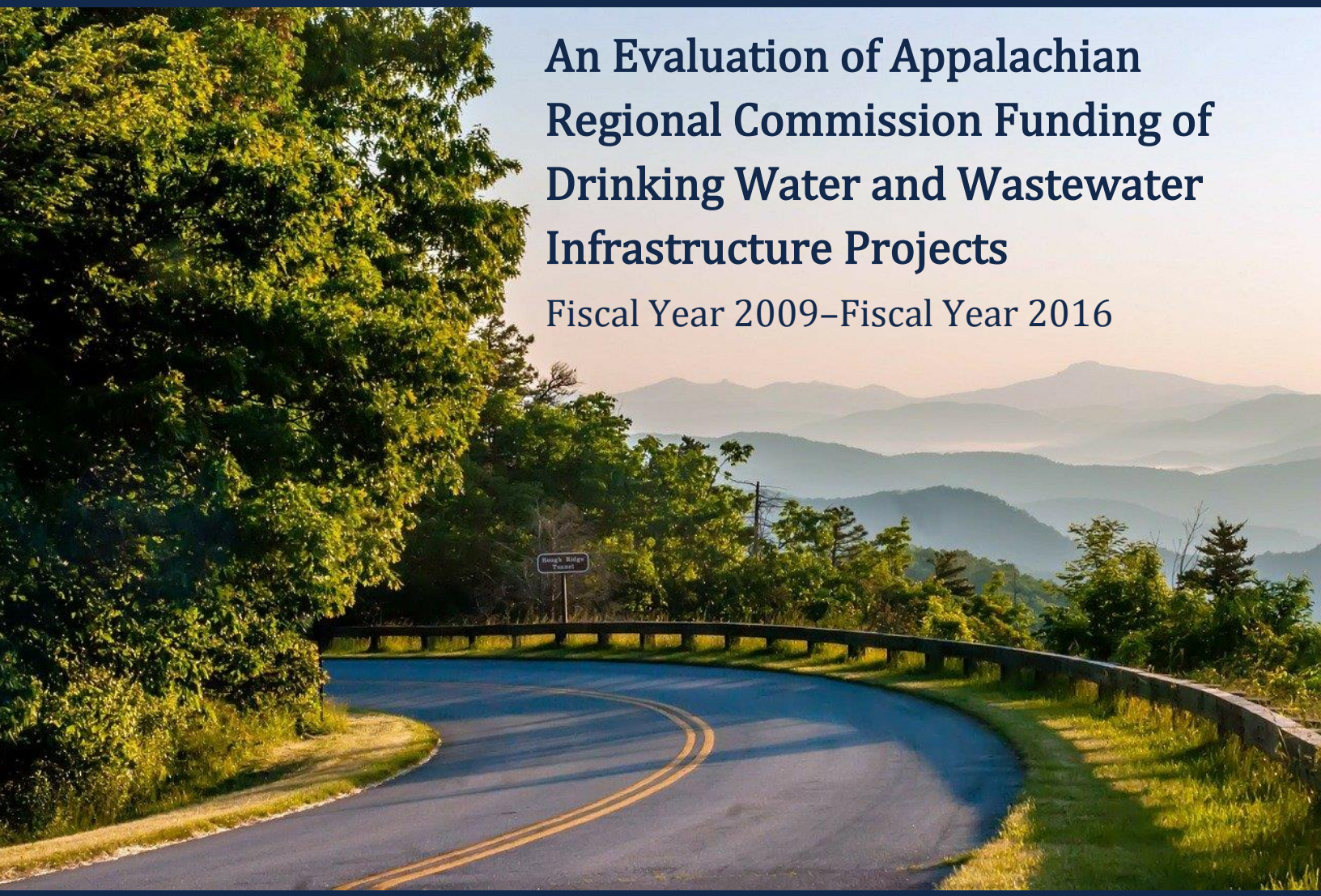

An Evaluation of Appalachian Regional Commission Funding of Drinking Water and Wastewater Infrastructure Projects

Fiscal Year 2009–Fiscal Year 2016

May 2020

UNC SCHOOL OF GOVERNMENT
Environmental Finance Center

VIRGINIA TECH

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About the Environmental Finance Center

The Environmental Finance Center (EFC) at the University of North Carolina at Chapel Hill is a part of a network of university-based centers that work on environmental issues, including water resources, solid waste management, energy, and land conservation. The EFC partners with organizations across the United States to assist communities, provide training and policy analysis services, and disseminate tools and research on a variety of environmental finance and policy topics. The EFC is dedicated to enhancing the ability of governments to provide environmental programs and services in fair, effective, and financially sustainable ways.

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Executive Summary

One of the five strategic investment goals of the 2016–2020 Appalachian Regional Commission (ARC) Strategic Plan focuses on improving critical infrastructure to address community needs and economic development in the Appalachian Region (the Region). As part of this effort, ARC provides grants to communities to implement drinking water and wastewater projects. In 2019, a team from the University of North Carolina at Chapel Hill Environmental Finance Center (EFC) and the Virginia Polytechnic Institute and State University (Virginia Tech) conducted an evaluation of the ARC grants awarded for this purpose from fiscal year (FY) 2009 through FY 2016. The research team found that communities value the drinking water and wastewater projects, as evidenced by high demand, their key role in project completion, and how they serve to attract and actively leverage additional public and private sector funding. Findings showed the grant program successfully targeted the neediest locations, led to significant improvements in local economic conditions, and met or surpassed locally determined goals. Room for improvement still exists in some areas, including better data gathering and evaluation processes.

ARC funds drinking water and wastewater projects, which are in high demand across the Region: Between FY 2009 and FY 2016, ARC funded more than $115 million in 379 completed drinking water and/or wastewater projects. The projects were geographically dispersed across all 13 ARC states, and in more than half of ARC counties. This project portfolio enabled ARC to benefit a very large number of households across the Region. Although benefits to households were reported in only half of the projects after completion, more than 294,100 households directly benefited from projects funded by ARC.

ARC investments in the drinking water and wastewater sector are significantly combined with other public funding sources and highly leveraged from the private sector: In almost all cases, ARC funding is typically combined with funding from other public sources. For every $1.00 of ARC investment in water and wastewater projects, other local, state, and federal public funding sources provided $4.00 of project funding. This allows communities to pay for water and wastewater projects that are much larger in scope than what ARC investments could pay for on their own. In addition, ARC's $115 million in investments led to $3.8 billion in leveraged private sector investments in the Region.

ARC funds are an essential source of funding for many communities: Even when the percentage of ARC funding is relatively small, communities depend on ARC investments to complete the funding for needed infrastructure projects. Survey responses from project managers showed that at least 78% of the projects would not have been completed without ARC funding.

ARC water and wastewater sector investments led to significant improvements in economic development and conditions: Nearly 60% of ARC-funded projects were directly linked to improvements to businesses, job creation, and job retention. At least 17,410 businesses benefited from the water and wastewater projects that ARC funded, while at least 11,668 jobs were created and 22,179 jobs retained. However, ARC investments in drinking water and wastewater infrastructure projects were not as significantly linked to the creation of new businesses, possibly due to the difficulty of clearly identifying such cases.

Counties in which ARC invested in water and wastewater projects experienced greater reductions in unemployment rates and greater improvements to median household incomes than counties without ARC investments in water or wastewater projects. However, larger data sets of projects over longer periods of time would be needed for a more robust analysis of impacts on economic trends.
ARC investments likely improved public health and natural resource protection, but these impacts are not as clearly identifiable: Survey respondents indicated that approximately 30% of the ARC-funded projects that benefited households provided those benefits mostly to households that were not already connected to the water or wastewater system; in other words, by expanding or extending service to additional households. Furthermore, nearly half of the drinking water projects were awarded to community water systems that were out of compliance with regulatory standards designed to ensure environmental and public health. However, there was no evidence that the projects led to significantly higher improvements in compliance rates than in water systems without projects. Lack of data connecting ARC projects with specific water systems and discharging wastewater facilities—or the environmental and public health concerns leading to the project creation—hinders the ability to evaluate ARC's investments in this sector to achieve its strategic goals of preserving natural assets in the Region.

ARC funding was awarded to communities that were more economically constrained than others: Two-thirds of ARC's investments in water and wastewater were awarded to communities in areas and counties labeled as "distressed." Those communities also received higher levels of ARC project funding than others. Communities that received ARC investments for water and wastewater had higher unemployment rates, lower overall employment, lower median household income, and higher poverty rates than the other communities in Appalachia that did not receive ARC water and wastewater funding. Targeting investments in communities with more economic constraints supports ARC's strategic goal of improving economic development in communities that need the investments the most.

Between FY09–FY16, ARC successfully concentrated funding for drinking water/wastewater projects in Appalachian communities that face more economic challenges than other communities

Most projects accomplished or exceeded set goals: Survey responses indicated that 71% of ARC projects completely addressed the intended main challenge or opportunity. The majority of projects with reported outcomes on benefits to households and businesses met or exceeded forecasted outcomes in each measure at the conclusion of the projects. These results suggest that most water and wastewater projects funded by ARC were successful in achieving their intended goals.

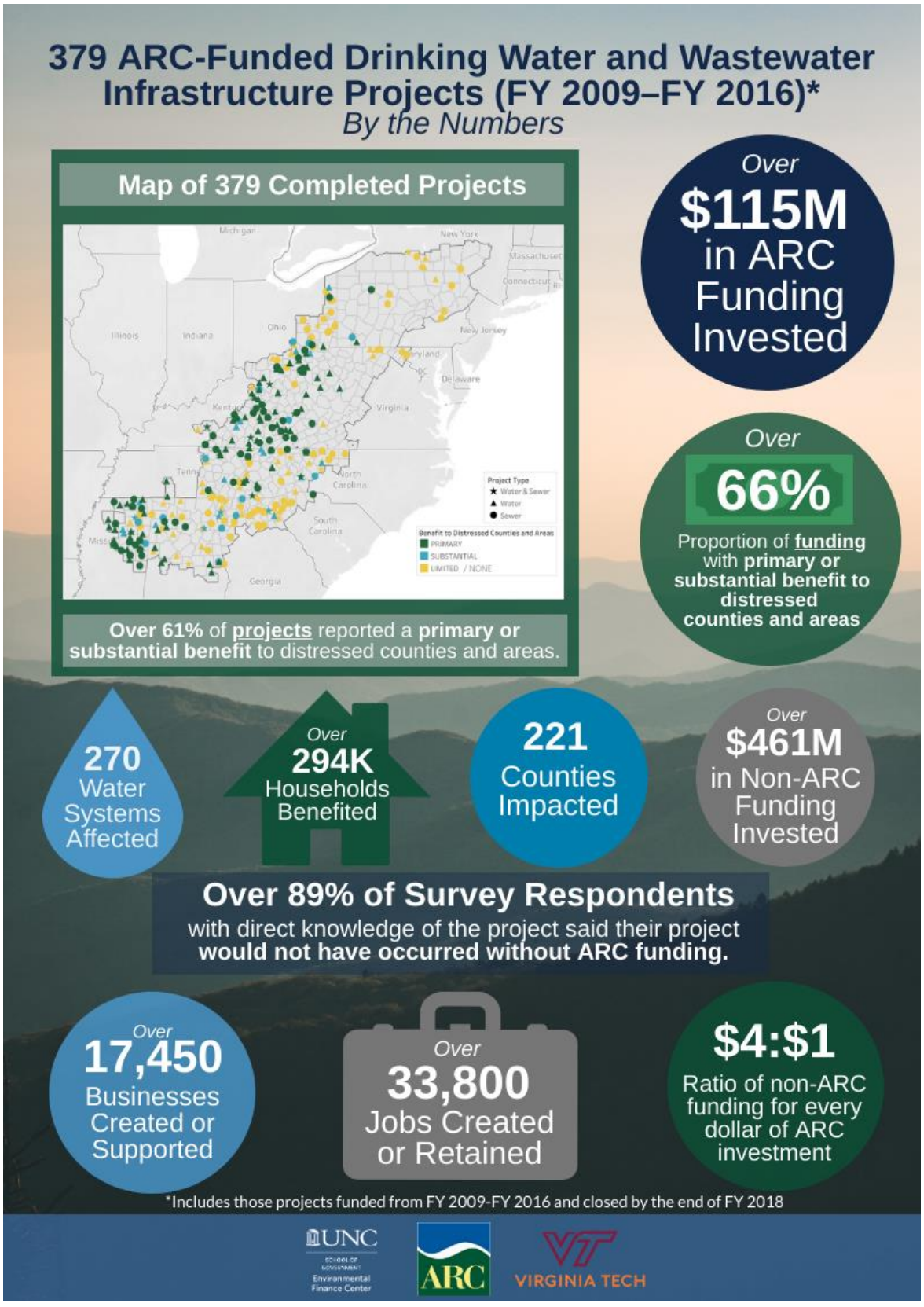
No significant systemic process challenges were identified, but some concerns were raised: At least 70% of the survey respondents indicated that the projects were completed on time, and 82% on budget; however, more than 10% of the projects were not completed on time or budget. Discussions with project managers and the federal and state agency administrators that administer and manage the projects, known as basic agencies, identified challenges in implementing individual projects, but no single process challenge was identified as a systemic concern across most projects.

Strong partnerships with the basic agencies are critical to success: Many grantees stated that the key to successfully implementing ARC-funded projects was a strong partnership with the basic

agency administering the project funds. Conversely, other grantees noted that difficulties working with some basic agencies were a leading challenge to project implementation.

Data challenges limit the ability to fully evaluate ARC-funded project impacts: ARC's reporting system provides useful information to document many impacts; however, some challenges remain. Missing, inconsistent, or inaccurately reported data (particularly the lack of clarity of the actual meaning of zero-reported values) hamper impact evaluations. While a vast majority of survey respondents confirmed the accuracy of most of the data reported in ARC's database, a quarter provided a correction to the estimates of number of households and businesses that benefited from the projects. Some steps could be taken to improve data reporting for the usefulness of future program evaluations.

Water and Wastewater Portfolio Impact at a Glance



Introduction and Purpose of Report

The Appalachian Regional Commission (ARC) is a community and economic development organization working to improve the lives of residents living in 420 counties across 13 states. In pursuing this mission, ARC supports communities by providing grants for a variety of initiatives and projects including drinking water and wastewater infrastructure projects.

The Appalachian Region has significant water and wastewater needs. A comprehensive study in 2005 estimated the Region at that time would likely need $35 billion–$40 billion over 20 years for drinking water and wastewater infrastructure[1]. While ARC funds projects across many sectors (including energy, data and telecommunications networks, workforce training, healthcare, community revitalization, and arts/culture/tourism), drinking water and wastewater projects account for a significant amount of total ARC project funding, often more than any other single sector.

In order to understand the impact of its water and wastewater project portfolio on communities that receive funding, ARC contracted with a team of researchers to evaluate the 379 drinking water and wastewater projects approved between fiscal years[2] (FY) 2009 and 2016 and completed by FY 2018[3]. Evaluations such as this provide ARC with independent third-party reviews of its spending, outputs, and outcomes on a community level, and each year, one is conducted on a specific program area. Through this process, ARC can better understand the impact of its investment in water and wastewater projects and receive unbiased feedback and recommendations related to future support in this sector.

ARC relies on extensive stakeholder involvement to develop five-year strategic plans that articulate the impact goals of ARC initiatives. In addition to a specific "critical infrastructure" goal, water and wastewater infrastructure also address other ARC goals involving economic development, resource protection, and public health. All of ARC's efforts, including its water and wastewater portfolio, are expected to further ARC's mission and strategic plan. The three strategic plans covering the periods[4] in place during the time the evaluated projects were approved all include water and wastewater infrastructure development as part of one of the primary goals.

The 379-project portfolio was evaluated in the context of ARC's stated strategic goals with a focus on community economic development and quality of life. A multidisciplinary team from two university-based public service programs with diverse expertise in evaluation, economics, water and wastewater finance and management, and social science carried out the evaluation. The evaluation followed a mixed-methods approach, combining quantitative and qualitative data analysis to provide a multifaceted picture of the impact of the water and wastewater dollars in the Region. Many of the evaluation findings were based on the creation of a dataset and analysis of project-level data from ARC's

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[1] Hughes, J., et al. (2005). *Drinking Water and Wastewater Infrastructure in Appalachia: An Analysis of Capital Funding and Funding Gaps*. The UNC Environmental Finance Center, Chapel Hill, NC.

[2] Federal fiscal years begin on October 1 and end September 30 of the denoted year, to which ARC adheres.

[3] In order to be included in the pool of projects evaluated, funding for the project had to be approved during FY09–FY16 and closed out by the start of this evaluation (September 30, 2018). ARC approved funding for another 139 drinking water and wastewater projects between FY09–FY16, but since they were not closed out by September 30, 2018, these projects were excluded from this evaluation.

[4] 2005–2010, 2011–2016, and 2016–2020

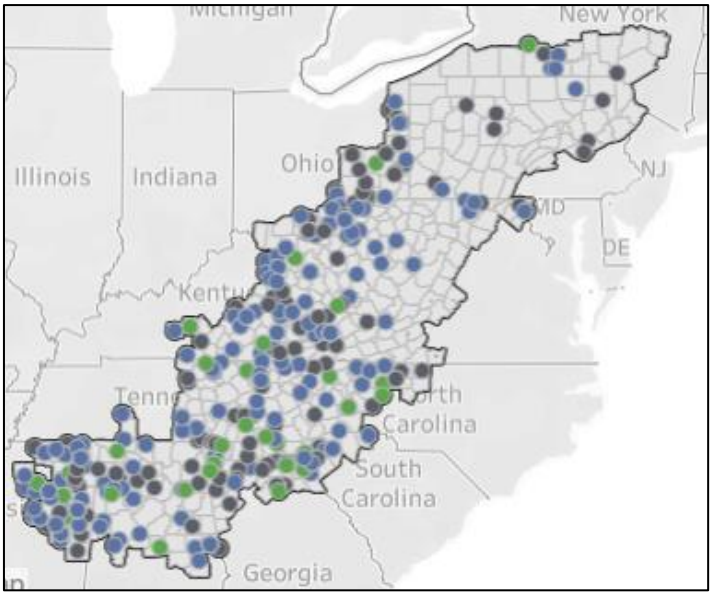
ARCnet database, the U.S. Environmental Protection Agency (EPA) Safe Drinking Water Information System (SDWIS), the U.S. Census Bureau's American Community Surveys, and the Bureau of Labor Statistics. This data analysis was supplemented with analysis of information collected from a survey of grantees. See Appendix A: Evaluation Methodology for more information on the development of the evaluation database.

The quantitative analysis was supplemented with information gained from project case studies and feedback sessions. In addition, the team collected and reviewed research documents on innovative water and wastewater practices in areas of design, technology, finance, and partnerships that could be incorporated into future projects. Finally, the team invited 15 experts within the field to read and comment on the literature and practice review and to ensure no major innovations were missing.

Description of Project Portfolio

Between FY 2009 and FY 2016[5], ARC invested more than $115 million in 379 completed drinking water and wastewater projects across the Region[6], as shown in Figure 1. ARC funding is usually combined[7] with funding from other sources. In addition to the $115 million from ARC, other sources provided $462 million to fund the projects, resulting in a total portfolio project cost of $577 million. Table 1 shows the number, total project cost, and ARC-funded portion in each ARC state. Because states influence what types of projects are completed within their borders, there is considerable variability in the number of projects and amount of funding approved for drinking water and wastewater projects by state. Some states, for instance, may prioritize funding for data/telecommunications projects over water. Mississippi and Ohio completed the greatest number of drinking water and wastewater projects in the portfolio (67 and 63, respectively), while Tennessee and Kentucky projects accounted for the most ARC funding for drinking water and wastewater projects (slightly less than $21 million and $20 million, respectively). ARC funded a greater proportion of total project costs in Tennessee, Mississippi, and West Virginia than in other states.

Figure 1: Locations of the 379 Evaluated Projects



Between FY 2009 and FY 2016, communities within 221 out of the 420 counties (53%) making up the Region had a drinking water or wastewater project. Projects were awarded in all three ARC counties in

[5] In order to be included in the study, funding for the project had to be committed between 2009 and 2016 and completely closed out by 2018.

[6] Excluding $55 million in drinking water and wastewater projects that were not yet closed by September 30, 2018.

[7] ARC grants require at least a 20% match, although the vast majority (87%) of the projects funded more than 20% of the project cost through non-ARC sources of funding.

Maryland and in more than 80% of the ARC counties in Mississippi, Ohio, and South Carolina. Nearly half of the counties with projects (104 out of 221 counties) had more than one drinking water and wastewater project during that time frame. Meigs County in Ohio had grantees for 11 different projects, while eight other counties also received more than five projects that were approved and completed within those eight years.

Based on the project descriptions, projects were categorized as a water only, wastewater only, or combined water and wastewater project. Nearly all (360) projects involved some type of construction. Typical construction projects included replacement or installation of water or sewer lines, rehabilitation of water or wastewater treatment plants, or water tank rehabilitation. A smaller number focused primarily on planning and research (10) and the purchase of equipment (9).

Table 1: ARC Investments in the 379 Evaluated Projects by State

State	Number of Projects	ARC Funding of Total Project Costs	Total Project Costs (Including Non-ARC Funding)	ARC Funding Portion of Total Project Costs
Alabama	38	$6,109,377	$29,226,822	21%
Georgia	35	$9,728,160	$47,794,756	20%
Kentucky	49	$19,609,072	$112,923,160	17%
Maryland	8	$2,240,000	$11,367,305	20%
Mississippi	67	$14,738,216	$39,574,221	37%
New York	6	$746,100	$12,228,753	6%
North Carolina	23	$5,703,679	$28,268,851	20%
Ohio	63	$14,178,713	$116,999,147	12%
Pennsylvania	10	$1,976,355	$35,933,356	6%
South Carolina	14	$6,388,274	$30,964,551	21%
Tennessee	52	$20,939,266	$54,774,401	38%
Virginia	5	$2,500,000	$16,510,698	15%
West Virginia	9	$10,394,000	$40,519,950	26%
Total	**379**	**$115,251,212**	**$577,085,971**	**Average 20%**

Figure 2: Photos of Infrastructure from Two Case Study Projects

Hydroelectric turbine from Frostburg, Maryland, Case Study Project

New Rose Hill water tower (background) and old water tank (foreground) from Dickenson County, Virginia, Case Study Project

The diversity of project goals and purposes is illustrated by Figure 3, which shows a word cloud created by counting the words in the project description as recorded in ARC's project database.

Figure 3: Word Cloud Created by Counting Words in ARC's Project Database

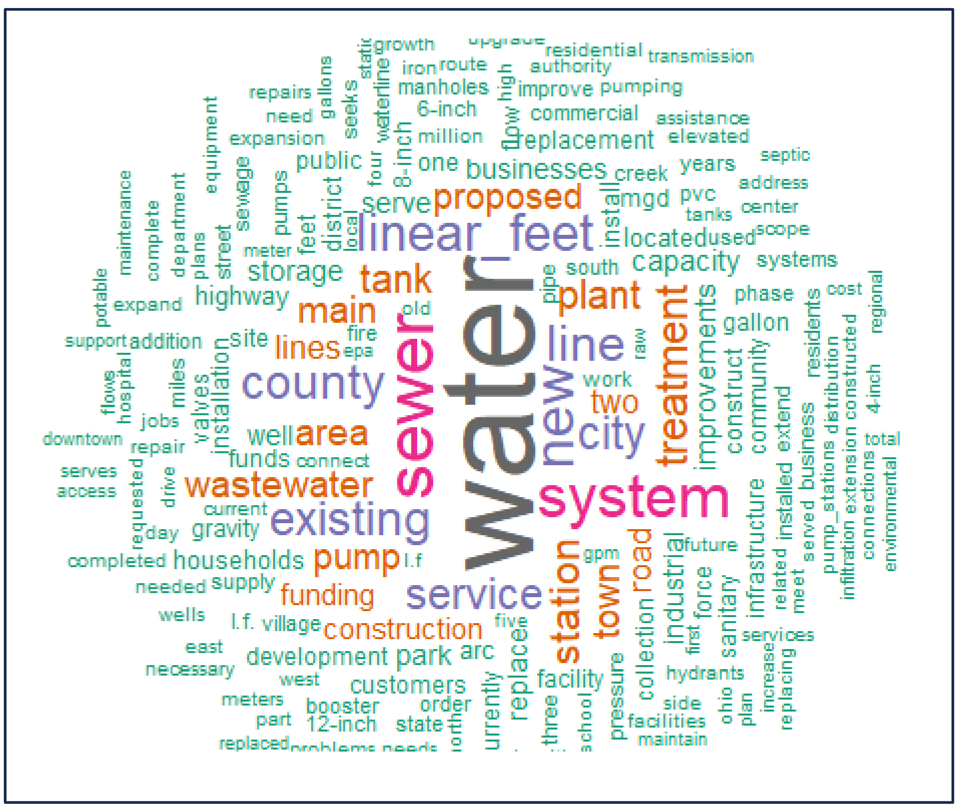
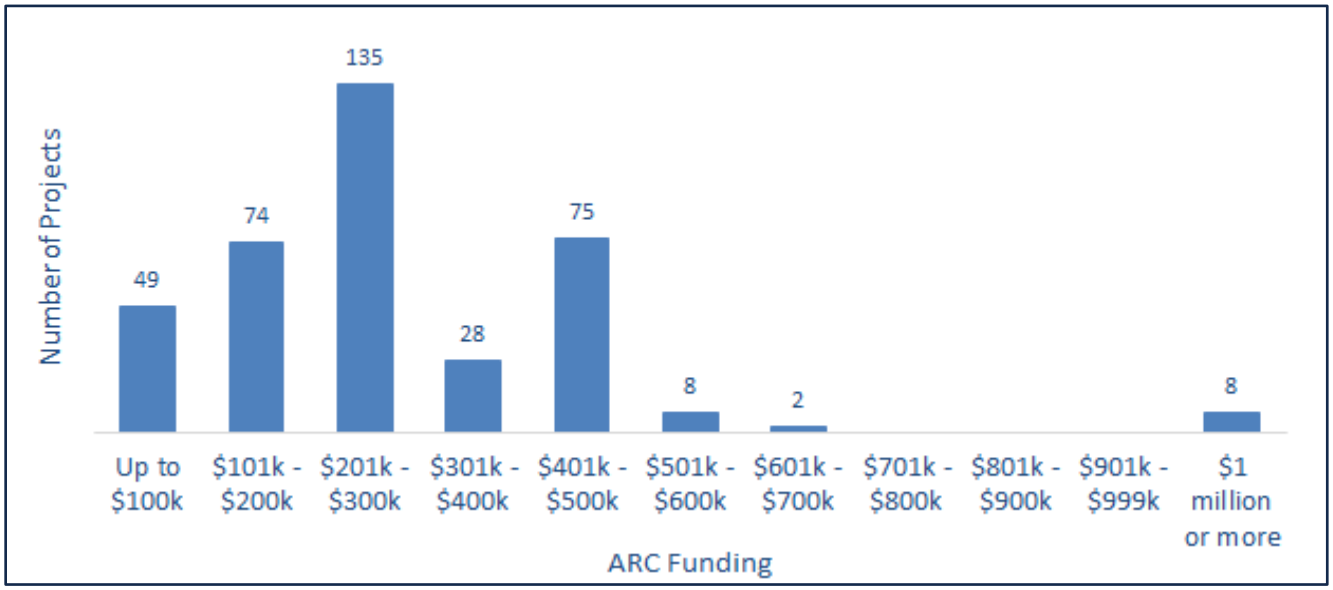


Figure 4 shows the distribution of projects, by ARC funding to each project, within the portfolio. Most projects in the portfolio received less than $500,000, and the median project contribution amount was approximately $250,000. Only a small number of projects relied on ARC for greater levels of funding; eight projects received an ARC investment of $1 million or more—seven in West Virginia and one in Mississippi.

Figure 4: ARC Investments in the 379 Evaluated Projects, by Investment



Overall, ARC grants leveraged an additional four times as much project funding from other public sources. The $577 million in project costs were split between local funding (45%), ARC funding (20%), state funding (20%), and other federal funding sources (15%). Each project's funding mix was unique, and the percentage of ARC funding in each project varied across the portfolio. For approximately 45% of the projects, ARC provided half or more of the funding.

In order to provide ARC with customized in-depth analysis, the research team developed an analysis and visualization tool that can be used to study subsets of projects such as projects from a particular state. This tool will remain internal to ARC, providing the opportunity for Commission staff to further evaluate and visualize the impact of this portfolio.

Impact of Project Portfolio on the Region

As described previously, ARC works with stakeholders across the Region to develop strategic plans that define the vision and goals ARC strives to achieve through its project funding. One of the five primary strategic goals of the current ARC Strategic Plan focuses on improving critical infrastructure. The excerpt below from the 2016–2020 Strategic Plan highlights some of the impacts ARC hopes to achieve related to their infrastructure investments:

> *ARC infrastructure investments will address local community needs as well as strategic, innovative approaches to economic development. ARC will provide leadership in helping communities develop long-term plans for effective development*

and deployment of the infrastructure needed to support economic competitiveness and quality of life. To create the greatest impact, ARC will leverage resources and bring together government agencies and the private sector to build the critical infrastructure needed to strengthen the Region's economy[8].

The research team relied on project data from the ARCnet database as well as primary data from a survey to analyze the project portfolio's impact. Major documented impacts are described below.

Business and Employment

At the time of the project close, 223 of the projects (59%) reported direct benefits to businesses and/or jobs in the communities. This measure achieves one of ARC's goals to spur economic development through infrastructure programs in the Region. A total of at least 17,410 businesses benefited from the completion of the projects, at an average of 2.9 businesses per $10,000 in ARC funds among projects that directly benefited businesses.

In addition, at least 11,668 jobs were created and at least 22,179 jobs were retained from 101 projects, at an average rate of 10.9 jobs created or retained per $10,000 in ARC funding among these projects. Nine surveyed projects reported that 41 new businesses were created as a direct result of the drinking water or wastewater project. These estimates are likely to be underreported, for reasons explained in the section "Did projects achieve their projected quantitative outcomes?"

Project Spotlight: Florence Industrial Park Improvements
Lauderdale, AL | FY 2013

This project included **$80,000 of ARC funding** to improve infrastructure for a new automotive supplier locating to the industrial park in Lauderdale, Alabama. The automotive supplier constructed a 104,000 square foot facility and required water and wastewater line extensions for the site. The automotive supplier **created 135 new jobs in the area.**

For more information, see the full case study in Appendix H.

Household Benefits

Many projects were designed to improve the lives of individuals and households in ARC communities. A total of 53% (202) of the evaluated projects reported direct benefits to a total of at least 294,100 households[9].

These 202 projects received $63 million in ARC grants. In addition to providing public health benefits, this investment also reduced what rate payers in these communities would have otherwise had to pay to achieve the same benefits—$214 on average per household across the portfolio. This value is derived from the total value of ARC grant funding and the total households benefitting from the infrastructure

[8] Excerpt from 2016–2020 Strategic Plan

[9] Grantees are required to provide an estimate of the number of households served and number of households improved that were affected or received the benefit of the project. In most projects, the two numbers were identical. We defined "households benefited" as the larger of the two numbers, which was verified or corrected by the survey respondents.

projects, to generate a per-household benefit of grant funds. This benefit is expanded when including additional grants and low-interest loans leveraged from other public sources to pay for these projects.

There is some evidence that the number of households benefiting from projects could be underreported to ARC. An additional 86 projects in the portfolio indicated at the time of project approval that another 75,456 households would benefit from the projects but did not record any benefiting households at project close. As explained in the section "Did projects achieve their projected quantitative outcomes?", while it is possible that the projects did not end up benefiting any of those households, a more likely explanation for this is that the grantees were not required or were unable to precisely identify numbers of benefited households and the metric was recorded as zero by default. During the data verification phase, 25% of survey respondents found discrepancies with the number of households benefited, and 24% of survey respondents found discrepancies with the number of businesses benefited reported to ARC (and provided a correction). The survey respondents found more discrepancies with the households benefited metric and the businesses benefited metric than any of the other impact metrics.

Project Spotlight: Haysi to Big A Mountain Water, Phase III

Dickenson and Buchanan Counties, VA | FY 2009

This project included **$500,000 of ARC funding** and was the third phase of a four-phase construction project aimed at **extending public water service to previously unserved areas of Dickenson and Buchanan Counties** in Virginia. The terrain of the area makes construction of water lines quite challenging to underserved areas. ARC funding supplemented other funders to make the project financially feasible.

For more information, see the full case study in Appendix H.

Private Sector Investment

Some ARC water and wastewater projects serve as a catalyst for bringing private sector investment to communities. For instance, a manufacturer might commit to a $3 million plant expansion after an ARC project supplies more reliable water service. Out of 134 projects for which leveraged private investment was confirmed by survey respondents, 32 projects (24%) reported leveraging $2.7 billion in private sector investments. This includes one project in Sullivan County, Tennessee that reported a $1.6 billion private sector investment tied to an ARC wastewater project. Considering that the ARC contribution for these 134 projects was $38.7 million, there was $69 in leveraged private investment to every dollar of ARC's investment in the projects. Even excluding the $1.6 billion private investment in the Kingsport Sewer System Upgrade in Sullivan County, Tennessee, ARC's funding leveraged nearly $28 in private investment to every dollar of ARC's investment in the 133 projects.

Environmental Protection and Public Health

One of ARC's current strategic goals highlights the Commission's interest in protecting and improving the Region's natural assets as a way to promote public health as well as economic opportunity:

Preserve and strengthen existing natural assets in support of economic opportunities that generate local and regional benefits. Natural assets, such as forests, land, water, and mountains, provide a strong base for the Appalachian economy. Restoring assets and providing for responsible stewardship of these assets, through activities such as improvement of mine-impacted lands, clean-up of streams and other waterways, and sustainable agriculture and forestry, can unlock even greater economic development potential for the Region[10].

Insufficient wastewater treatment continues to plague many parts of the Appalachian Region. ARC does not collect information for projects that allows them to be easily matched with existing discharge facilities. This makes quantifying the exact impact on surface water difficult; however, many of ARC's wastewater projects directly benefit surface bodies of water in the Region by reducing the quantity and severity of sewage discharges due to aging sewer collection lines and treatment facilities. The project in Lewis County, Kentucky, which addressed combined sewer systems, and consequently, combined sewer overflows into the Ohio River during periods of heavy rain, is an example of an investment that provides direct environmental benefits as well as economic benefits.

Many ARC drinking water projects alleviate or solve issues where the drinking water system that provides water to residents is unable to comply with federal Safe Drinking Water Act standards. The Environmental Protection Agency, along with each of the state primacy agencies, monitors and tracks violations of these standards at each community water system across the country. The project data collected by ARCnet provided enough detail that the research team was able to identify most of the reported violations associated with the systems that received ARC funded drinking water system improvements. Out of the 210 community drinking water projects, nearly half (103) were awarded to community water systems that were out of compliance, having had a recent violation of some kind, or that were threatening environmental and public health and safety of the communities.

In some cases, the projects provided water and/or sewer service to households that were not served prior to the project. Project representatives that completed the evaluation survey indicated that at least 30% of the projects that benefited households provided benefits mostly to households that had no service prior to the project.

Project Spotlight: Vanceburg Combined Sewer Overflow Phase I

Lewis County, KY | FY 2010

This project included **$189,900 of ARC funding** to address combined sanitary and storm sewer systems. During periods of heavy rain, Vanceburg, Kentucky was experiencing combined sewer overflows into the Ohio River, putting them under a **consent judgement by the state** and requiring action. Phase I included scoping 17,500 linear feet of line, largely in downtown, to identify repairs.

For more information, see the full case study in Appendix H.

[10] Strategic Investment Goal 4, Action Item 1; 2016–2020 Strategic Plan

Improved Community Economic Conditions

Agencies that support water and wastewater projects as an economic development tool may hope, in addition to the direct benefits such as jobs created or households served, that the projects ultimately have a holistic impact on a community's overall economic wellbeing. For example, if a family has a source of high-quality water and an environment free of wastewater contamination, they will be healthier and more financially stable as a result of being able to work more and not having to pay for bottled water. Measuring these types of impacts is extremely difficult given the factors that impact a community's overall economic health. Furthermore, many of the water and wastewater projects evaluated had only been completed for a few years, and economic benefits associated with these projects could be expected to take much longer to come to fruition. Despite these limitations, the research team carried out exploratory bivariate analysis on the subset of projects that closed in or prior to FY 2015. This analysis allowed the research team to assess quality of life indicators three years post-project close in counties within the Region that received and completed water and wastewater projects, and compare the change in these indicators to counties within the Region that did not receive and complete similar projects[11]. We assessed trends in the indicators from the project approval year to 2017.

Across these projects (n = 217):

- Unemployment rates fell by an average of 3.9%, statistically significantly faster than a decline of 2.0% for non-project ARC counties during the same time period;
- Median household income grew by an average of $4,381, statistically significantly faster than an increase of $3,346 for non-project ARC counties during that time; and
- 178 more people on average were employed per county compared to non-project ARC counties.

During the same period, community characteristics also changed. ARC counties with completed projects saw:

- Average population growth of 629 residents;
- Increased proportions of residents aging in place;
- Growth of renters as a portion of households,
- Faster increase in the share of housing built since 1980 compared to non-project ARC counties; and
- Growth in the proportion of people living in mobile homes.

While some of these results are positive, it must be pointed out that the economic conditions improved across project counties after the Great Recession. An experimental analysis was carried out to compare the economic trends of counties in the Region that received a water/wastewater project with those ARC counties that did not.

[11] This includes ARC counties that could have 1) received funding for water or wastewater projects prior to 2009; 2) received funding for non-water/wastewater projects; or 3) received no project funding.

Unemployment rates dropped more in the counties that benefited from a project in the ARC water/wastewater portfolio than counties without any projects from the portfolio. While there is a plausible explanation for this positive finding (water and wastewater projects help create and retain jobs), a simple bivariate analysis over such a limited time period should not be relied on as conclusive proof of a correlation. However, future evaluations could be structured to do more robust analysis using larger data sets of projects looking at positive economic trends over longer periods.

Evaluation of Project Performance and Implementation

The evaluation survey assessed performance of the projects in meeting the initial community-stated goals or expectations.

Did the project address the specific challenge/opportunity it was designed to address?

The evaluation survey asked respondents to identify the specific challenge or opportunity that was associated with ARC water or wastewater projects. The project representatives identified an incredibly wide array of challenges, from "providing a source of clean drinking water to households for the first time" to "increasing water pressure at an industrial site." For a complete list of the cited challenges and opportunities, see the survey results in Appendix G: Summary Survey Results.

A total of 71% of survey respondents said their project completely solved the main challenge or opportunity it was designed to address, while 23% said the project partially solved that challenge or opportunity. The remaining survey respondents did not know if the project solved the main challenge.

Survey respondents were also asked to assess if the project met or partially met the specific economic development and quality of life objectives of the project. The success rate for both types of objectives were similar: 89% reported meeting and 10% reported partially meeting economic goals, whereas 94% reported meeting and 5% reported partially meeting quality of life goals.

Did ARC projects successfully target the communities with the greatest economic needs?

ARC prioritizes supporting counties and areas designated as "distressed" or otherwise economically challenged. More than $62 million of the evaluated portfolio funding (54%) was awarded in 179 projects to distressed counties. When expanded to include projects that primarily or substantially benefitted distressed areas even within non-distressed counties, the funding climbed to $76 million of the projects (66%).

Furthermore, grantees in distressed counties received higher levels of ARC project assistance than in other counties and areas. ARC funds provided 26% of the total project costs in the distressed counties, compared to 16% of total project costs in non-distressed counties. This is at least in part due to the lower match requirements for projects awarded to distressed counties than to other counties, enabling more of the total project costs to be funded by ARC.

An analysis was conducted on characteristics of the communities that received ARC water and wastewater grants during the evaluation period compared to ARC communities that did not. There was statistical evidence demonstrating that projects were awarded to communities that were generally more distressed than other communities in Appalachia. Specifically, ARC funded projects in counties that were suffering from higher unemployment rates (by 2.1 percentage points on average), lower employment overall (by 14,241 people employed on average), lower median household income (by $5,732 on average), and higher poverty rates (by 4.4 percentage points on average) than other counties within the Region at the same time period. Projects were awarded to counties that had smaller populations (by 27,844 people on average) and higher proportions of people living in mobile home units (by 4.7 percentage points on average). These results are statistically significant at the 5% level. A statistical comparison between ARC counties that received drinking water/wastewater grants and those that did not is shown in Appendix D: How Counties with Projects Compared to Other ARC Counties.

Did projects achieve their projected quantitative outcomes?

Individuals charged with monitoring ARC projects are asked to report anticipated project impact at the outset of the project. These metrics include the number of households improved, businesses served, businesses created, jobs created, and jobs retained as potential outcomes of the project at the time of project approval. At the time of project close, the same metrics are revisited and reported in ARCnet as "at close" numbers. Outcomes reported at the project close (for projects with nonzero outcomes) were compared with the projected outcomes at the beginning of the project to determine if projects achieved their projected outcomes.

Table 2 shows a summary of how at-close outcomes compared with projected outcomes for projects (where the reported at-close outcomes exceeded zero). In the case of every impact measure, the number of projects that met or exceeded their projected outcomes was significantly greater than the number of projects that fell short of their projected outcomes.

Table

Table 2: Comparison of Outcomes at Close Versus Projected Outcomes at Approval (for Projects with Nonzero at Close Outcomes)

Performance measure	Number of projects with lower outcomes than projected at project approval	Number of projects with the same outcomes as projected at project approval	Number of projects with higher outcomes than projected at project approval	Net difference between at-close and projected outcomes
Households benefiting	38	105	58	17,177 more households benefiting than projected
Businesses benefiting	21	121	51	3,230 more businesses benefiting than projected
Businesses created	0	1	8	40 more businesses created than projected
Jobs created	7	38	26	5,263 more jobs created than projected
Jobs retained	5	26	27	12,231 more jobs retained than projected
Leveraged private investment	8	19	33	$2.2 billion more investment than projected

On aggregate, projects with reported at-close outcomes achieved greater outcomes in each impact measure than what was projected: 17,177 more households and 3,230 more businesses benefited from these projects than was originally anticipated. However, a significant number of projects that projected outcomes at approval did not report on those outcomes, or reported zero, at close. These included:

- 86 projects with 75,456 projected households to benefit from the projects,
- 113 projects with 6,566 projected businesses to benefit,
- 5 projects with 20 projected businesses to be created,
- 37 projects with 4,150 projected jobs to be created, and
- 18 projects with 2,347 projected jobs to be retained.

The absence of reported at-close outcomes for these projects complicates the assessment of overall project impacts. There are several reasons why there are no reported at-close outcomes for these projects. Firstly, prior to 2012, projects did not report outcome values at close, and at-close outcomes were only required after 2015. Secondly, at-close outcomes on jobs created and leveraged private investments are reported within three years after project completion, thereby reducing the number of projects in this portfolio for which at-close outcomes on jobs created and leveraged private investment can be reported and assessed. These factors are evident in the analysis, since more than 80% of the

listed projects with projected outcomes at approval and no reported at-close outcomes were for projects that closed in or before 2015. These projects were not required to report at-close outcome estimates.

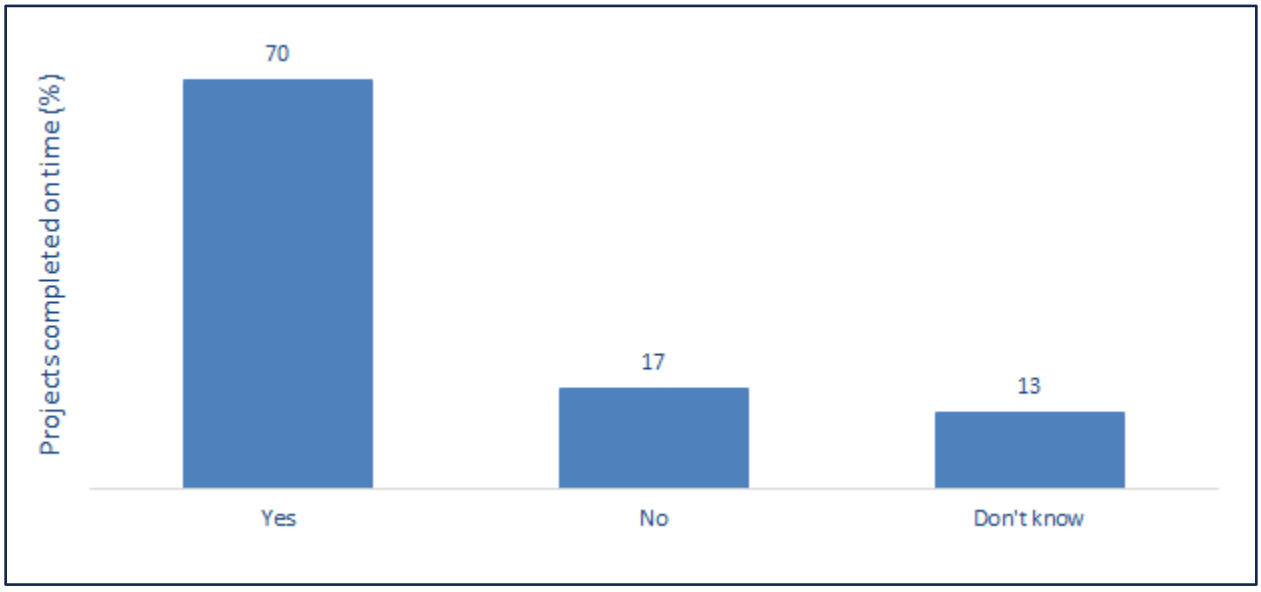
Nevertheless, a small proportion of projects that closed after 2015 had projected outcomes but did not report at-close outcomes for households and businesses that benefitted from the projects; approximately 11% and 16%, respectively. These may have been data entry or recording errors, or zeros may have been recorded because the project did not produce an at-close outcome, or because the grantee was unable to estimate a numeric value (ARCnet defaults to zeros when a value is not recorded). How many of the 75,456 households and 6,566 businesses failed to actually benefit from these projects by the time the projects were completed affects the assessment of whether the ARC projects achieved their projected quantitative outcomes on aggregate, but this is very difficult to determine. Based on the fact that most of these projects were not required to report at-close outcome estimates suggest that a significant number of these households and businesses received the project benefits but were simply not reported. This suggests that ARC's projects provided greater outcomes at the time of project completion than what was assessed and identified earlier in this report.

Were the projects completed on time and within budget?

As seen in Figure 5, according to a survey of project representatives, 70% of respondents reported the anticipated project timeline was met.

Figure 5: Was the anticipated project timeline met?

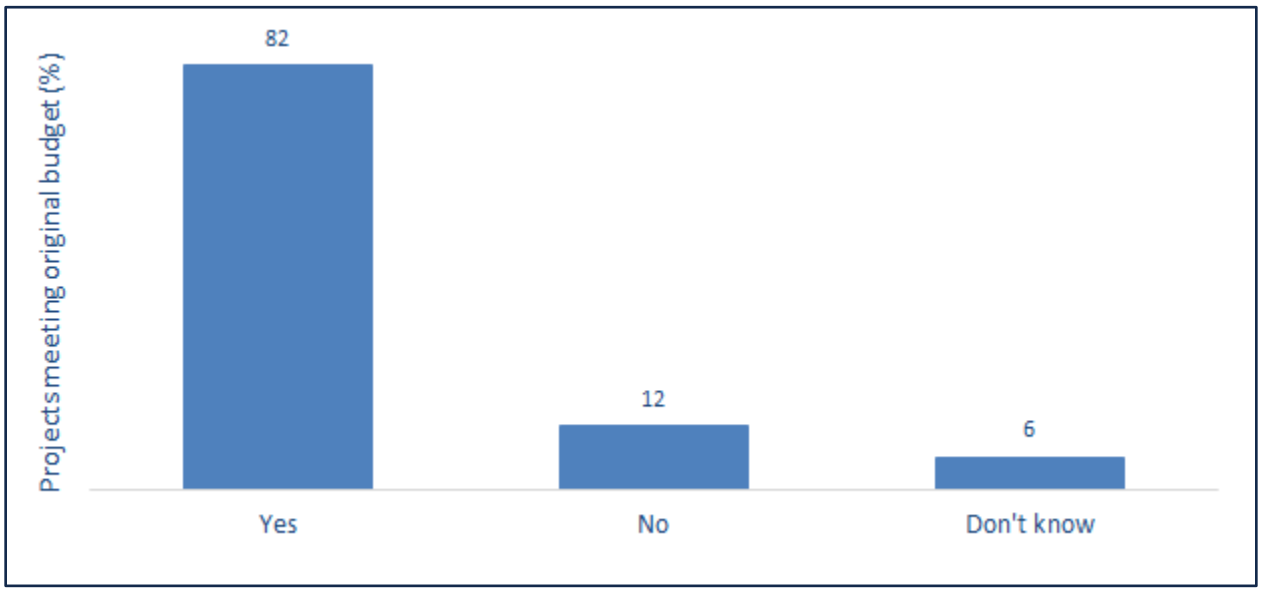
(n = 206)



A separate survey question examined whether projects were completed within the original budget. Out of 206 respondents that answered this question, 168 (82%) indicated that the original project budget was met, as shown in Figure 6.

Figure 6: Was the original project budget met?

(n = 206)

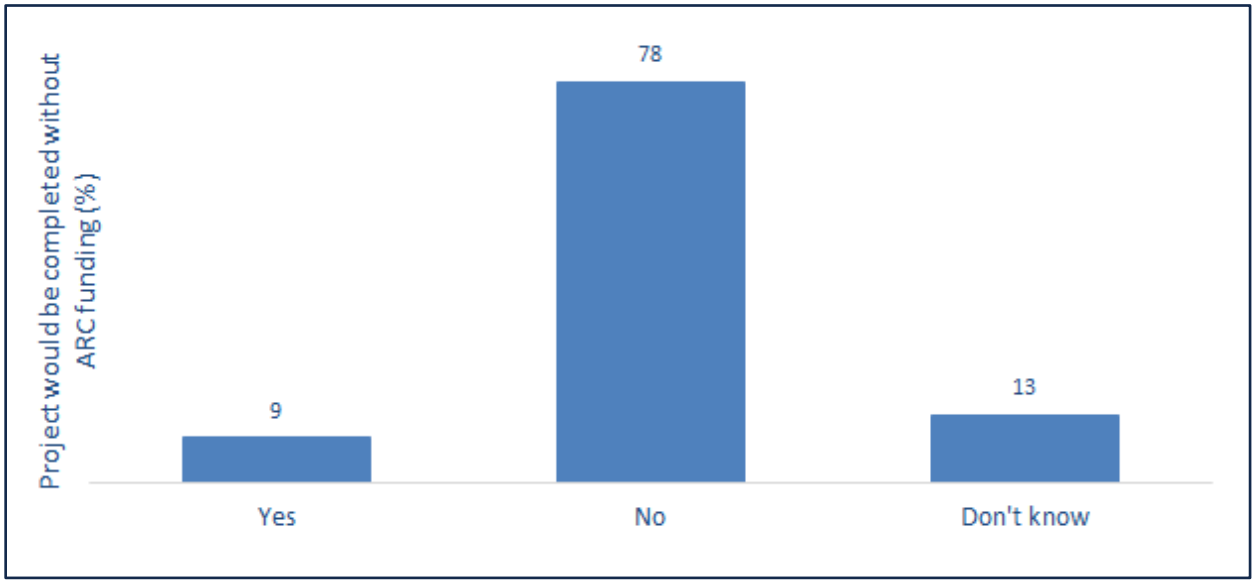


Would the project have been completed without ARC funding?

Another survey question examined whether survey respondents believed projects would have been completed without ARC funds. 204 respondents answered this question, and as shown in Figure 7, 159 of those (78%) indicated that the project would not have been completed without ARC funds, while another 13% were unsure. This suggests that the availability of ARC funding was critical to achieving the outcomes associated with the project.

Figure 7: Would the project have been completed without ARC funding?

(n = 204)



When asked a more specific question about the role of ARC funding in completing the project, 61% stated that ARC funding allowed a previously identified project to begin, and 31% stated that ARC funding was instrumental to both project planning as well as implementation of the project.

What are challenges related to project administration?

Many survey respondents were satisfied with project administration. A few projects experienced complicated reimbursement processes and delays where a number of federal basic agencies were involved with challenging reimbursement. One respondent reported difficulty during ARC's transition from paper to online project reporting.

Some projects had difficulty finding reliable contractors at a reasonable cost in the rural project location. Others encountered complications with the environmental review process due to site conditions.

How accurate is project reporting in capturing actual performance?

Several survey respondents identified and corrected inaccurate ARCnet project field values. Among these measures, the least changes were made to businesses created (6.5% of values reviewed by survey respondents) and the most were made to residential connections benefiting from the project (25%) or business/non-residential connections benefiting from the project (24%). A small number of survey respondents updated ARC recorded project funding, closed date, or administrative agency.

Based on the low number of corrections to ARCnet data, it appears that the data are either fairly reliable and/or would be difficult to improve without significant effort from the grantees. Nevertheless, the absence of recorded at-close outcome values when nonzero projected values were originally made—particularly among projects that closed in or before 2015—suggest that the at-close outcome values can be made more accurate but might be impractical or difficult to do so.

One particular outcome metric appears to be less reliable than others: Only nine projects in ARCnet indicated that new businesses were created as a direct result of the drinking water or wastewater project. ARC defines a new business as one that was created in the community (and not relocated from another area) as a result of the ARC project. The result of only nine out of 379 grantees reporting new businesses being created is a much lower response rate than all other outcome variables, even when accounting for the reporting requirements. The low number of projects associated with new businesses could be due to the difficulty of linking a business specifically to a project. An additional reason is because, in most cases, the data was entered soon after the project closed—possibly before new businesses were able to take advantage of the project.

ARC performance measures do not separate upgrades of existing infrastructure from construction of new infrastructure, and the cost of new construction is often substantially higher than upgrades. This can give an unbalanced estimate of project benefits. For example, three projects in Tennessee involved upgrading or constructing new water or sewer lines of approximately the same length: 20,000 linear feet of pipe. Project TN-16635 included replacing 20,000 linear feet of water lines, service assemblies, and installation of isolation valves for a total project cost of $500,000, while TN-17174 was a rehabilitation project of 20,000 linear feet of water lines with total project cost of $625,000. At the

same time, TN-17189 involved new construction and installation of 25,344 feet of sewer lines for a total project cost of $3.5 million.

What external challenges impact the ability of ARC to reach its goals through the water portfolio program?

Many of survey respondents described project challenges that are beyond the control of ARC and its partners. While ARC cannot directly influence these broader environmental issues, they should be considered in future grant making. Higher-than-expected costs during construction was one of the most cited challenges. For example, one respondent reported that *"[c]onstruction bids were higher than estimated. Contractors were busy and not interested in completing a 'small' project."* Indices such as the construction cost index show evidence that water and wastewater project costs have increased faster than other costs over the last 17 years. Many ARC projects take years to complete, with an average time span of 3.5 years between project commitment and close.

Some survey respondents cited project delays as one of the main project challenges. Such delays delay benefits and increase costs.

Water and wastewater construction are quite specialized; finding qualified contractors in rural areas can also be challenging as mentioned by several of the survey respondents.

Factors that led to the Region's general economic challenges include falling populations, loss of traditional industries, high unemployment, and low incomes, all of which can have a significant negative impact on the long-term sustainability of water/wastewater projects. Ninety-nine (45%) of the counties that received ARC funding in this project portfolio had a population decline between 2009 and 2017, according to the U.S. Census Bureau. Population declines mean that many water systems will have fewer customers in the future to cover the costs of their systems.

Numerous reports have been written on the struggles low-income households face to cover the cost of basic services. While ARC funding helps offset some of the capital costs that would be borne by customers, the high cost of ongoing operation and maintenance of small systems leads to some of the highest water and sewer rates in the communities least able to afford them. Many ARC projects are designed to attract new businesses, which can not only help the general economy of an area but also add to the water customer base. As this evaluation points out, many ARC projects are successful in meeting their targets, but not all of them do. The project in Steuben County, New York (highlighted in the case studies) provides an example where infrastructure was added to accommodate growth at an industrial site, but changes in the manufacturing market left the site undeveloped. Now, approximately 3 years after project completion, the industrial site remains undeveloped.

In a worst-case scenario, a community with a declining population can be left with new infrastructure to maintain and new costs to incur without the expected revenue. This phenomenon suggests that project planners should hope for the best but should model scenarios assuming the worst (or suboptimal) outcomes. In some cases, modeling future financial scenarios may suggest that traditional, higher-cost, centralized infrastructure may not be sustainable in some communities. Current literature suggests some movement towards "innovative" technology to decentralize infrastructure. The Red Bird Water

Kiosks in Beverly, Kentucky, and the Zero Mass Water panels in McDowell County, West Virginia, highlighted in Appendix J: Literature and Practice Review are examples of strategies to address these challenges.

Policy Implications of Overall Findings, and Recommendations

►Continue investing in water and wastewater infrastructure as a method to leverage investment and promote community economic health and quality of life.

ARC's investment in the water and wastewater sector between FY 2009 and FY 2016 led to significant impacts in multiple ARC strategic areas, including public health, natural resource protection, and economic development. This investment has been highly leveraged with funding from local communities and other state and federal funding agencies. For every dollar of ARC investment, other sources provided four dollars of funding.

Survey respondents felt strongly that many projects would not have occurred without ARC funding, even when the percentage of funding was relatively small. While normally accounting for a relatively small portion of total project costs, ARC funding is seen by grantees as being essential to the project being completed. Approximately 80% of survey respondents reported that their projects would not have been completed without ARC support and investment.

►Re-examine and consider modifying the project monitoring system.

Significant turnover due to retirements and job changes among communities receiving ARC grants has impacted the ability to assess longer-term impacts and goals of projects. At least 25% of project grantees listed in ARC's project portfolio could not be reached until the project team identified alternative project representatives or updated email addresses for previously identified individuals. This signifies the importance of continuing to capture relevant project outcomes data at the time of project close or soon thereafter.

A critical component is to re-examine some of the metrics being recorded. ARC's current reporting system provides sufficient information to document most of the project impact. However, evidence exists of missing and inconsistent data that can hamper impact reporting.

In some cases, the research team identified fields that appear to be misunderstood by some of the individuals who entered the data. For example, the *Improved* and *Served* fields are similar enough that they appear to be widely misunderstood or understood in different ways by reporting individuals. The research team recommends combining these to one new field: "number of households/businesses that benefited." If distinguishing between new and existing customers is important, a project-level, primary type of benefit field with three possible values could be added: "improve service to existing customers," "add ability to serve new customers," or "both serves new customers and improves service to existing customers."

Adding automatic data verifications into ARCnet could improve data quality (for example, by requiring the funding field total number to equal the sum of the funding subtotals).

Instead of defaulting outcome variables to zero in ARCnet, the variables should default to null in order to distinguish between instances where values for some outcome variables cannot be estimated and those where the outcome measure is actually zero. Alternatively, if data entry in all outcome variables is forced, a unique number (perhaps a negative number) can be used to identify a "cannot be estimated at this time" response that is different than zero. ARCnet could then be programmed to identify all null/"cannot be estimated at this time" responses every few months, requesting the grantees to attempt to estimate those missing outcome variables for a given period of time after a project is closed in order to improve reporting.

►Consider alternative evaluation approaches to capture longer-term impacts and performance.

This study followed a similar approach to past evaluations and used the best available data to assess impact and evaluate project performance. The current information system is able to capture short-term project impacts but not long-term performance outcomes. Assessing long-term impact would require designing a longer-term evaluation protocol that would likely need to focus on more mature projects completed 8 to 10 years prior to evaluation. Experience from our evaluation and the high level of staff turnover suggest relying more on on-site visits and interviews than surveys and self-reporting. This type of evaluation could provide additional insight in assessing what types of water and wastewater projects have the most sustainable, long-term benefits.

►Broaden the evaluation of environmental and public health impacts by using the Environmental Protection Agency's water/wastewater identification protocols to identify which systems benefited from projects.

The current system does not include significant environmental and public health impact indicators, and relying on self-reported public health impacts can be challenging. Associating projects with the Environmental Protection Agency's public water system identification numbers could provide a broader view without requiring self-reporting. The Environmental Protection Agency (EPA) uses a Safe Drinking Water Information System (SDWIS) identification number to identify all regulated water systems and a National Pollutant Discharge Elimination System (NPDES) permit number for all wastewater treatment facilities. Adding these fields to required project data for drinking water and wastewater projects would allow ARC to easily identify the characteristics of the systems that benefited from projects and to evaluate whether projects had a positive impact on environmental compliance.

►Continue fostering and improving partnerships with basic agencies.

Many grantees stated that the key to success on ARC projects was a strong partnership with the basic agency. For example, many grantees and some feedback session participants expressed the key to a successful project was a helpful basic agency. Based on responses from grantees, the movement towards state basic agencies seems to have had a positive impact on project administration. At the same time, one of the key challenges noted was when the basic agency was not effective in supporting the community. For instance, a feedback session participant expressed that the state will no longer use ARC funds for infrastructure construction projects, only for planning and feasibility studies, due to past delays and challenges with basic agencies. The same participant described an instance where an entire project was lost due to delays with the basic agency. Since the success of ARC projects from the

grantees' perspective can often hinge on a strong partnership with the basic agency, ARC could consider investigating ways to further engage with and nurture partnerships with agencies that have strong connections with ARC communities.

►Be conservative when projecting project costs and future customers.

Due to the rising and unpredictable cost of construction, ARC should confirm that project estimates are conservative at the project outset and take into consideration factors such as construction delays that will lead to higher project costs. In some circumstances, the rising costs of traditional water and wastewater infrastructure combined with the declining populations and income in some areas may make non-traditional, lower-cost emerging approaches (such as smaller distributed infrastructure) more appealing in the future. Non-traditional, lower-cost infrastructure solutions should be considered when possible. See Appendix J: Literature and Practice Review for examples of these approaches.

►Consider future operating and maintenance requirements when awarding projects.

Many ARC projects involve assets and equipment that will require significant maintenance to sustain its designated purpose and serve the community as designed. Poor maintenance can be attributed to a lack of qualified staff and lack of ongoing financial resources—two things the data suggests are common in many ARC communities. In response to the chronic poor maintenance of publicly funded capital, at least one ARC state, North Carolina, recently introduced legislation that authorizes funders to require grantees to follow ongoing minimum financial and maintenance requirements. For example, maintain a repair and rehabilitation fund and/or maintain rates at a level that provides funds for capital repair and replacement, not just basic operating costs. Requirements alone will not solve the problem, but these policies can elevate the importance of considering maintenance prior to awarding a grant and potentially support workforce development and ongoing training to communities after project construction.

Appendix A: Evaluation Methodology

Establishing an Evaluation Protocol and Key Research Questions

The team began the evaluation process by reviewing the proposal and outlining each component of the mixed methods approach. This proposed approach included both quantitative and qualitative methods, and a series of deliverables based on each research method. The team met regularly to determine the critical research questions. Based on these questions, sub-questions were added that, when aggregated, form the basis of the answer to the overarching question. This exploratory process led to an 18-page document with all possible sub-questions to evaluate this portfolio of projects, with the intention of reducing this list to an attainable research methodology.

The unit of analysis and potential data sources were outlined based on these sub-questions. The team assessed the feasibility of attaining these potential data sources through external sources, the survey, case studies, or feedback sessions. For those sub-questions with data that could feasibly be attained via one of these four methods, the team ventured to move forward in answering that question. In cases where the data was not available or easily attainable, the team moved on from that question to refine the evaluation protocol.

After concluding this process, the team created a matrix of key themes and research questions, sub-questions, and the corresponding data sources. This matrix continued to be a resource for the team going forward, guiding the research methodology outlined in the following sections.

After establishing the evaluation protocol and determining the key research questions, the team began the quantitative analysis using data contained in the ARCnet database. The data was analyzed for potential data irregularities. Surveys were sent to individuals familiar with the projects to verify key performance data. Additional data from several sources were linked to project-level ARCnet data. A summary of some of the specific data management steps and issues encountered is presented below.

ARCnet Data Collected and Provided in Access Database

The project team was provided with a login to ARCnet. Data were accessed via the custom reports tab. Custom reports incorporate data from the following views:

- Allocations
- BAMR Report
- Basic Agency (BA)
- BA Funding
- Counties
- Districts
- Funding
- Grantees
- Local Development Districts
- Notes
- Payments
- Performance
- Projects
- Recoveries
- State

Substantial numbers of data fields were duplicated from view to view. The team downloaded all columns and records from *Projects* for projects in the portfolio. Post-2012 records from the view *Projects* were difficult to download. ARC staff informed the project team that the download limitation

stemmed from a large number of columns included in the view. It was easier to download pre-2012 data.

The project team selected columns from additional views that removed duplicate fields as much as possible. This reduced the number of columns included in data view downloads, but some duplicate fields were still included. The views included were *Basic Agency*, *Grantees*, *Notes*, *Payments*, *Counties*, *Funding,* and *Performance,* as these views appeared to contain records relevant to water and wastewater projects. The project team developed a data dictionary describing fields viewed in downloads. Any view beginning with "WS" in the data dictionary included only records from the project portfolio. Other views were downloaded in their entirety to support more complete data exploration. The data dictionary describes the contents of specific data fields.

The project team manipulated some data to merge with ARCnet data for analysis. Project notes were stored in HTML format and were often difficult to read in tabular format. HTML tags were stripped from the data and results were stored in the "cleaned" table. Some projects were linked with multiple counties. In order to analyze project impacts on counties within the Region, the project team created a table called "Project County Association" with one project row for each associated county.

The table "WS Survey Merge" captures the subset of data that was presented for verification in the project evaluation survey. A field in that table ("System_type") was created by the project team to provide consistency to project descriptions. Project types in ARCnet changed in 2012. Prior to this year, project types included in the portfolio were "Water System (New)," "Water System (Upgrade)," "Sewer System (New)," "Sewer System (Upgrade)," "Water & Sewer (New)," and "Water & Sewer (Upgrade)." After 2012, project types were "Community Infrastructure" and "Business Site Development" while subtypes contained utility-specific descriptions: "Water System," "Water Tank," "Sewer System," and "Water and Sewer System." "System_type" captures "water," "sewer," or "water and sewer system" for projects based on project descriptions. This provides consistency for additional analysis of project types.

In general, records pertaining to funding were complete in ARCnet. ARCnet included complete or nearly complete data on funded amounts, basic agencies, project approval and close dates, and project descriptions. While ARCnet included information on grantees and their contact details, it became apparent during the evaluation that there had been significant turnover among those contacts. Bounce rates for emails were high, and the evaluation team committed substantial effort to researching, identifying, and reaching out to current appropriate contacts.

The current project reporting system is not sufficiently detailed to readily identify ARC's relative investment in different types of water and wastewater projects. The existing project categorizations are relatively general. Many individual project descriptions provide more insight on the relative investment in different types of water and wastewater projects, but that is not a reliable method for characterizing the entire project portfolio. The team identified some ARCnet project performance fields that were incomplete or inconsistent for some projects, but not at a scope or scale that severely impaired the ability to evaluate project performance and impact.

In some cases, the research team identified fields that appear to be misunderstood by some of the individuals that entered the data. For example, the *Improved* and *Served* fields are similar enough that they appear to be widely misunderstood or understood in different ways by reporting individuals. A potential solution would be to combine these to one new field, "number of households/businesses that benefited." For further differentiation, a project-level, primary type of benefit field with three possible values "improve service to existing customers," "add ability to serve new customers," or "both serves new customers and improves service to existing customers" could be added if distinguishing between new and existing customers is important.

Adding automatic data verifications into ARCnet could improve data quality (for example, by requiring the funding field total number to equal the sum of the funding subtotals).

The most consequential of the project performance fields found to contain some level of unreliable data:

- Project performance criteria: ARCnet contains numerous performance criteria and only some of those were considered relevant to water and wastewater projects. Many of the potentially relevant fields had zero values for multiple projects:
  - Businesses created
  - Businesses served
  - Businesses improved—this metric was introduced in 2012. Prior to 2012, projects did not report this measure. After 2012, however, most projects had businesses improved equating businesses served with no difference between the two measures.
  - Communities served
  - Communities improved
  - Households improved
  - Households served—this metric was introduced in 2012. Prior to 2012, projects did not report this measure. After 2012, however, most projects had households served equating households improved with no difference between the two measures.
  - Jobs created
  - Jobs retained
  - Leveraged private investment
  - Linear feet—some projects with data entered in this measure were to replace or rehabilitate sewer lines to fix inflow and infiltration problems, while others involved the construction of new water or sewer lines. The amount of effort and funds differs vastly between the two project types.
  - Million gallons
  - Million gallons per day—this field captured treatment plant projects but also sometimes captured elevated storage projects, for which the correct unit is million gallons.
- When at-close outcome variables are recorded as zero (by default), it becomes difficult to assess the performance of a completed project since it is difficult to determine whether the value is actually zero or is missing or has not yet been reported. Using null or unique negative numbers to identify values that are not actually zero would improve future performance evaluations.

- The values entered for project types and subtypes changed in 2012 with modifications to ARCnet, making it difficult to evaluate projects at subtype levels for this entire performance evaluation period.

Linking to EPA Water and Wastewater Regulated System IDs

The project team was able to identify the EPA system ID associated with many of the projects by cross-referencing the names included in the grantee field or the project description field.

The project team was able to identify water systems in more cases than sewer systems. By connecting the public water system ID and water system population to a project, the team was able to complete some analysis of water systems and populations served by utilities benefitting from ARC funding. The table "WS Grantees" identifies the public water system ID where possible, the sewer system ID where possible, and contains separate rows for those projects associated with both water and sewer.

Once a project was given the relevant EPA ID(s), the research team was able to identify which projects benefited communities with past compliance problems. The percentages were then calculated of water systems that benefited from ARC projects that had and did not have violations for the three years prior to project approval.

Secondary Socioeconomic Data Sources

The project team sought out socioeconomic data from a variety of sources. This data was used primarily to describe the characteristics of the counties receiving ARC funds. The project team incorporated data from the U.S. Census Bureau and the Bureau of Labor Statistics (BLS) in these analyses as follows:

From the U.S. Census Bureau American Community Survey:

- County population
- County median household income
- County poverty rate
- Percent of population in rental housing
- Percent of housing constructed before 1980 (a proxy for housing construction date)
- Percent of population in mobile homes
- Percent of households with indoor plumbing

From the Bureau of Labor Statistics:

- County unemployment rate
- County labor force

Project counties are those that had at least one project in the ARC water/wastewater portfolio; control counties are those that did not have any projects in the portfolio. A panel dataset was developed using the R software environment and tables of data were developed for each year between 2009 and 2016. For each year, the project table described data fields for project counties in the year of project approval, and the control table described data fields for control counties in the year in question. The overall

dataset included all rows for years 2009–2016 project tables and the average of 2009–2016 control county data.

The research team averaged BLS data for the three years prior to project approval. For example, 2009 data for fields from BLS-averaged county results from 2007, 2008, and 2009. The U.S. Census Bureau's 5-year American Community Survey data was used to represent the values for the last year in the 5-year survey period. For example, the 2005–2009 American Community Survey data was used to report the 2009 population socioeconomic data for the counties.

In assessing the population and socioeconomic differences between counties that received project funding for the evaluated water and wastewater projects and ARC counties that did not receive similar funding throughout this evaluation period (the control group), t-tests were conducted. The population and socioeconomic measures of the counties in the control group were compared to the measures of the counties in the project group at the same year of evaluation. For example, the 2009 measures for the control group were tested against the 2009 measures of the project counties for projects that were approved in 2009. The results of these comparisons are shown in Appendix D: How Counties with Projects Compared to Other ARC Counties.

Survey Confirmation of Data

The project team developed a survey to confirm data with ARC grantees. The survey questions were developed to focus on the highest priority data and then confirmed with ARC staff. Survey questions included closed-ended questions intended to confirm or update ARC data, as well as open-ended questions to provide context about the experience of completing a project and to describe key project takeaways. The survey was created in Qualtrics, an online survey platform, and each grantee was provided a survey pre-populated with information from ARCnet via a unique link. The survey is summarized in Appendix K: Sample Survey.

With previous evaluations having struggled with response rates for the survey, the research team designed the survey to maximize the response rate. The team's experience working with rates surveys for the Water and Wastewater Rates Dashboards in states across the country was implemented to target increasing this response rate. The first draft of the survey gathered all information the team was interested in, and then cut down significantly to ensure it was easy to answer and did not require a significant amount of time or induce survey fatigue. Some questions required validation of ARCnet data, others asked generally about whether the project served new or existing water/wastewater connections, and a few open-ended questions were written to gain more information about the project administration and process.

After drafting questions internally and attaining ARC feedback, the team obtained expert advice on question wording from the Odum Institute, a social science hub within the University of North Carolina at Chapel Hill. This process involved ensuring questions were worded so the responses were reliable and valid, including an in-person consultation where each question was assessed and refined. After this consultation, the team moved into the piloting process.

The survey pilot process was designed to attain feedback on the survey content and wording and the ability of the grantee to answer the questions without guessing. This process included sending the grantee the unique link for their survey with the request that they take it upon receipt, and then scheduling an hour of time to follow up. This follow-up included a question-by-question analysis of the survey, providing the grantee the opportunity to explain how they interpreted the question and their ability to answer it.

To conduct the piloting process in a fashion that best allowed for candid and reliable feedback, two survey pilot lists were generated. The team created one group of the oldest, hardest-to-reach respondents. This list was based on the year of project funding, and the specific states the team did not have experience working in. The second group was limited to the projects that should be easiest to reach. These were funded more recently and took place in states where the team actively works. Based on these lists, the team used a random number generator to attain five projects from each list to pilot.

Despite some challenges with getting pilot participation, eight project surveys were completed and the survey was refined. The survey was then sent to all ARC grantees via email and unique link. MailChimp software was used to distribute emails, and those emails were initially sent to grantees recorded in ARCnet. This survey email included an attached PDF sample survey for grantees to use; information about the team, the evaluation, and how the survey would be used; pre-populated information about the project; and a unique link to the survey. This email text was approved by ARC and then sent to a broad distribution list of over 200 unique emails.

MailChimp provides data on “hard bounces” (when the email message has been permanently rejected because the email address is invalid) and “soft bounces” (a temporary delivery issue or, in this case, an extant professional email account for a recipient who no longer works for the organization) that allowed the team to target new contact information for certain projects. Approximately 50% of those initial contacts generated bounces, requiring the team to invest additional resources to update contact information in order to maximize response rate.

The team hired two undergraduate student research assistants to find new email addresses, update contact information, and redistribute the surveys. These students often called the town or utility associated with the project to find a new email address or point of contact. In some cases, the calls were never returned. In other cases, the person who knew the most about the project had left their position and no one was familiar enough to answer the survey. In these cases, the team moved on, instead focusing on getting responses that were reliable and valid.

This original survey was sent out three times, providing the grantees nearly two months to complete it. Response rates to that survey version were approximately 45%. In order to increase the response rate still further, the project team developed a “short form” survey containing the most meaningful questions from the original mailing. The ultimate survey response rate was 60%.

Case Study Selection

Following consultation with ARC, the research team created a few key case study categories to address the desired output of the evaluation. These categories included innovations in design, technology,

financing, partnerships, and regionalization, with focuses on economic development and revenue generation by the grantee utility. Descriptions for all the projects in the portfolio were reviewed, added to each category, and then ranked within each.

Based on these rankings, the team aimed to pick the top choices within each category and ensure that all 13 states within the Region were represented. After the team completed this process, the final list was sent to ARC for review and 16 case studies were selected. All 13 states were represented, with additional projects selected in Virginia and Tennessee. All 16 grantees were contacted to gauge interest in participating in the case study process.

Most of the grantees responded that they were interested in participating, but the team did not hear back from grantees in a few states, including those with limited projects such as New York and Pennsylvania, as well as other states where projects were a bit older, such as Georgia and Alabama. After three attempts at contacting these grantees, the team decided to take a new strategy. Using the survey responses, the team targeted grantees who had completed the survey as a new pool of potential case studies.

In addition to using the survey respondents as a new pool, the team was aided greatly by ARC State Program Managers and individuals from LDDs in connecting with grantees. The team completed 14 case studies in total, with two case studies in Virginia and Tennessee.

Case Study Interview Process

After grantees were contacted, one-hour interviews were scheduled via the Zoom Meetings platform. The team created a protocol with a series of questions that built the narrative, including the need that drove the project, background on the community and its water/wastewater utility, outputs and outcomes of the project, any challenges encountered, and the future for water and/or wastewater infrastructure in the community. All grantees were asked if they would be receptive to site visits. Most accepted and five were selected.

All grantees were told that the interviews would be recorded. These recordings were automatically transcribed using the Zoom Meetings platform. These transcriptions were then cleaned using the recording and coded using qualitative methodology. A team member, Dr. Tiffany Drape, took the qualitative portion of the team through a 2-hour session on coding transcripts, after which the team took to the transcripts to ensure the critical portions of the transcript were captured for the final narrative.

Upon the conclusion of the coding process, the five site visits were scheduled. The team traveled to five sites and conducted follow-ups on the original narrative. The site visit team included one student research assistant, a film studies minor, who recorded the site visit interviews and produced short videos for ARC and the communities. These videos are supplementary to the written narratives.

While site visits were being conducted, the team began writing up the case study narratives. During the process, the team reached back out to grantees for photos and additional information to fill in gaps in the narrative.

Feedback Sessions

The team conducted two feedback sessions as part of the evaluation. These feedback sessions were intended to feed into the policy memorandum for ARC, providing insights on what ARC is doing well and what could be improved going forward. The idea was to gather three to five grantees and provide them the opportunity to share experiences in a group setting, with team members there to facilitate and take notes.

The team was planning to lead sessions at conferences and invite grantees from the portfolio. After receiving no response from any grantee contacted about the conference, the team determined that the limited capacity in these ARC counties likely lends itself to challenges related to attending all-day conferences. After failed attempts to gather grantees at local conferences, including the Alabama/Mississippi Water Jam (Joint Annual Meeting), the team quickly moved to change the strategy.

The team was scheduled to lead sessions at the ARC Summit in Asheville, North Carolina. The team decided this was the avenue to conduct feedback sessions, although with a different audience, and gather valuable insights. The team contacted representatives registered for the summit from LDDs in each of the 13 states using a random number generator in Excel to select representatives. Ten representatives signed up, with five attending. The session lasted approximately 30 minutes and included four questions related to experience with ARC water/wastewater infrastructure; the benefits and challenges of working with ARC; and recommendations.

After the ARC summit, the team, along with help from Bret Schwartz at the National Association of Development Organizations (NADO), contacted an additional six representatives from LDDs in the Appalachian Region. The team scheduled two virtual feedback sessions, hosted via Zoom Meetings. The first session included three individuals from LDDs and lasted approximately 30 minutes, using the same question from the in-person session. The second virtual session had no attendance and thus was not conducted.

Both sessions were recorded, transcribed, and coded according to the questions asked and feedback received. This qualitative data provided state-level insights into priorities amongst states and commonalities between them.

Appendix B: ARC Grantmaking Process Description

Role of ARC Headquarters and State Offices in Approving Projects

Periodically, ARC sets project guidelines to comply with the Appalachian Regional Development Act of 1965 (ARDA) and their current Strategic Plan. These project guidelines establish the basis for project funding, including the requirement that a project support development in the Appalachian Region and meet one of ARC's defined strategic goals. According to ARDA, a funded project should move the Region toward an outlined objective within a strategic goal as part of ARC's Strategic Plan.

In FY 2014, ARC began the process of redefining its strategic goals to better promote its vision and mission. ARC engaged over 3,000 stakeholders from the Appalachian Region to chart a path forward and ensure the goals and objectives of the commission best addressed the challenges faced in rural Appalachia. In 2015, ARC moved forward with its current strategic plan, highlighting five key goals at the forefront of ARC from FY 2016 through FY 2020.

Mission: *To innovate, partner, and invest to build community capacity and strengthen economic growth in Appalachia.*

Vision: *Appalachia is a region of great opportunity that will achieve socioeconomic parity with the nation.*

These five goals focus on economic opportunities, ready workforce, critical infrastructure, natural and cultural assets, and leadership and community capacity. Together, these five goals address the biggest needs in Appalachia. Of those goals, Goal 3: Critical Infrastructure, aims to address water and wastewater infrastructure needs across the Region. Within this goal, Action Objective 3 outlines the premise for ARC water and wastewater funding; it includes the objective of ensuring that communities have access to the infrastructure they need to meet economic development and community objectives.

Each state within the Region takes these ARC investment goals and outlines state-level objectives. In many cases, these objectives mirror the action objectives, but with an added level of specificity. For example, in Kentucky, State Objective 3.2 is to "Provide quality infrastructure including water and sewer." Underlying this objective are three sub-objectives addressing clean water access, sewer access, and access and quality of all utility services. Other states within the Region have similar language in their state plans to that of Kentucky, but the difference often lies in highlighting state-specific challenges and priorities.

Based on strategic goals set by ARC and state-level objectives, certain projects are funded. In the case of water and wastewater, if a state has elected to make this infrastructure a priority, qualifying projects and future grantees can apply for ARC funding. This evaluation assesses the impact of these qualifying projects in the Appalachian Region, looking specifically at those funded between FY 2009 and FY 2016.

ARC is a unique federal-state partnership, relying on collaboration between the federal government, states, and local governments. The Commission consists of the governors of the 13 states within the region, and a federal co-chair, who is appointed by the president. Strategic goals are set based on a collaborative strategic planning process, drawing in stakeholders throughout the region. Based on this framework, each state within the region establishes priority areas. Each year, ARC funds approximately

500 projects throughout the region, allocating funds to each state, and providing the states significant flexibility in deciding how to spend the funds. In general, states must ensure funded projects are within the region and address one of the five strategic goals outlined by ARC. In addition, a certain amount of allocated funds must go to projects that benefit distressed counties or areas.

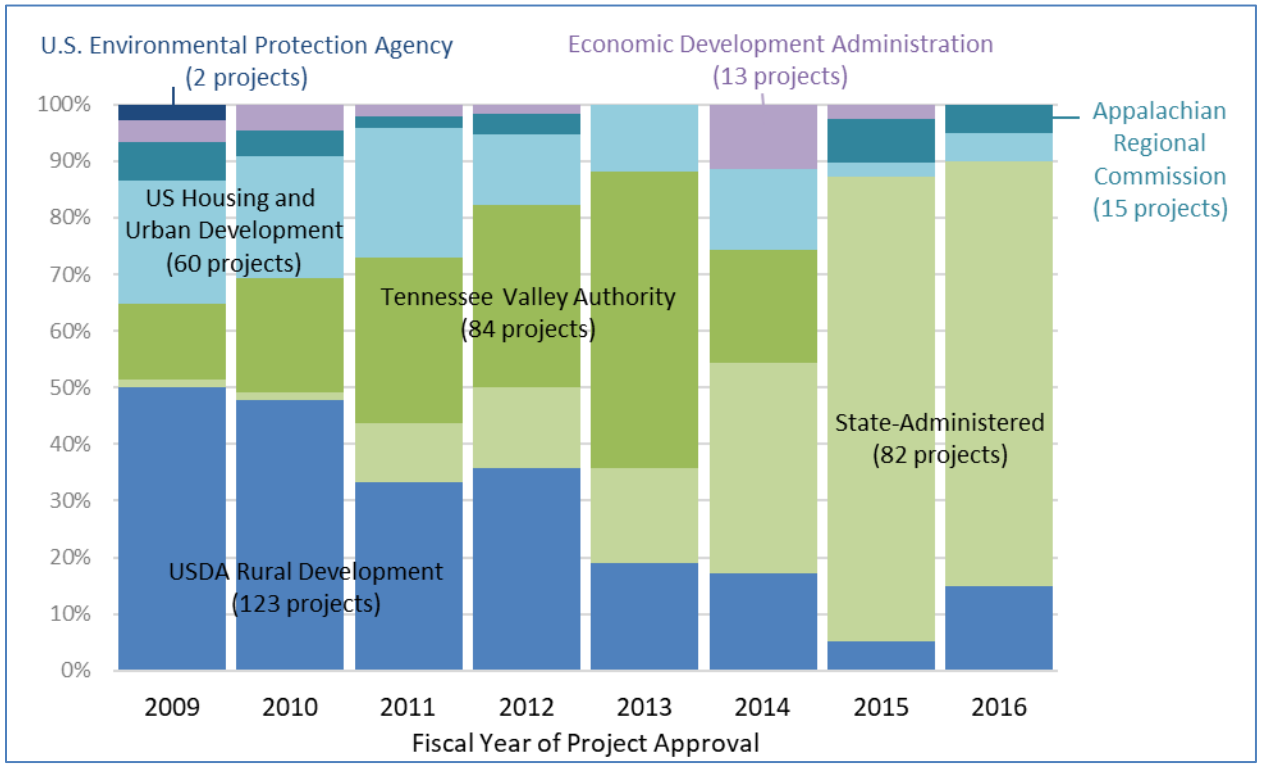
Each year, ARC communicates with the states regarding their allocation. This allocation corresponds to the fiscal year and is parsed into separate funds with specific qualifying projects. For example, in Kentucky, one fund—the Central Appalachia Distressed County Infrastructure Fund—only provides money for water and wastewater projects. Two other funds can be used for water and wastewater projects but are not exclusive to these project types. Based on project type and the fund amounts, qualifying projects apply through the respective state and follow the process outlined above.

Agencies Administering Drinking Water and Wastewater Projects in FY 2009–FY 2016

While ARC provides funding for projects, construction grants are not distributed directly to the grantee community. Instead, ARC designates an administrative agency that manages the funds for the grantee community and assists the grantee in project management. In fact, of the 379 evaluated drinking water and wastewater projects, only 15 were administered directly by ARC. These grants were non-construction projects, such as feasibility studies. The remaining were administered by one of five other federal agencies or a State Basic Agency, shown below in Figure 8.

The United States Development Agency's (USDA) Rural Development program administered the largest number of projects at 123, although their share of projects dropped from nearly half of all drinking water and wastewater projects in FY 2009 and 2010 to around 12% in the last three years. Likewise, the Tennessee Valley Authority has not administered a drinking water or wastewater project since FY 2014. Since FY 2014, state basic agencies, the state-level entity that acts as the administrative, compliance, and fiscal agent on construction projects, have increasingly been the administrative agency of ARC-funded projects, rising from administering 1% of projects in FY 2009 to 75% in FY 2016. ARC started adding state agencies to its basic agency program around 2010.

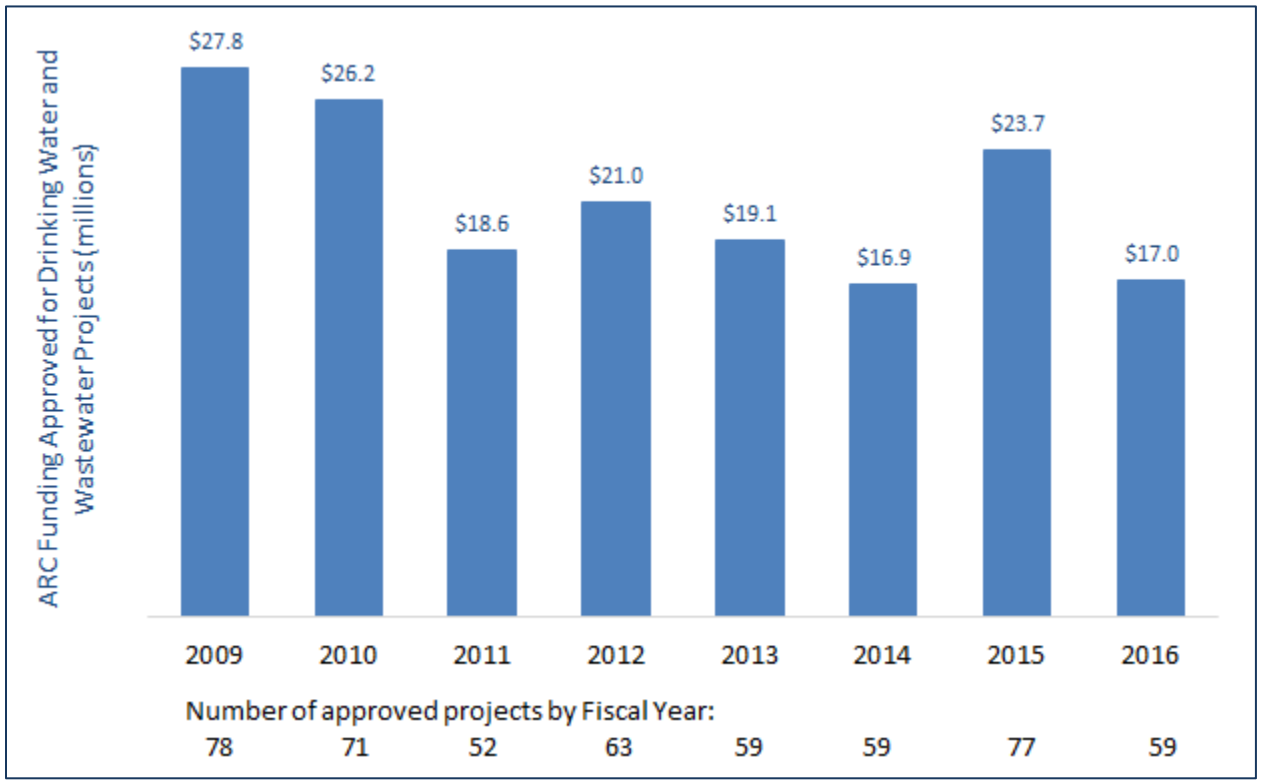
Figure 8: Evaluated Drinking Water/Wastewater Projects by Approval Year and Administrative Agency



Appendix C: Analysis of All Projects Approved during Evaluation Period

This evaluation focused on the portfolio of 379 projects that were opened between FY 2009 and FY 2016 and closed by the end of FY 2018. However, between FY 2009 and FY 2016, an additional 139 projects were approved but not yet closed by the time of this evaluation. Several additional analyses were carried out on the full portfolio of the 518 approved projects. Between FY 2009 and FY 2016, the total funding amount committed and the number of approved drinking water and wastewater projects fluctuated each year, with the highest number of projects (78) approved in FY 2009 and the lowest number of projects (52) approved in FY 2011. ARC funding is important for leveraging funding for drinking water and wastewater projects, as evidenced by the uptick in the number of projects and ARC funding in FY 2009 and FY 2010; during those years, there was a nationwide increase in infrastructure projects stimulated by low-interest loans and grants from federal agencies due to the American Recovery and Reinvestment Act (ARRA) of 2009. A greater number of the Region's communities leveraged those sources of funding by applying for and receiving ARC grants than in subsequent years.

Figure 9: ARC Funding for All 518 Drinking Water and Wastewater Projects Approved FY09–FY16



Appendix D: How Counties with Projects Compared to Other ARC Counties

At the time of project approvals, counties that received ARC funding for water or wastewater projects during the evaluation period had smaller populations, lower median household income, higher poverty, higher unemployment, lower number of people employed, and higher share of residents living in mobile homes and in newer homes, compared to ARC counties that did not receive ARC funding for water and wastewater projects throughout the evaluation period. These differences are statistically significant and shown in Table 2.

Counties that received ARC funding for water or wastewater projects in the early part of the evaluation period and were closed by 2015, had witnessed greater socioeconomic improvements by 2017 than ARC counties that did not receive funding for water or wastewater projects during the same period. Counties that completed projects between 2009 and 2015 had, by 2017, a greater increase in median household income, greater reduction in unemployment rate, and a greater reduction in the share of residents living in older homes than in other ARC counties without water and wastewater projects, while the proportion of population above 65 years of age and residents living in mobile homes also increased faster. These differences are statistically significant and shown in Table 3. It is important to note that these relative improvements may be correlated with having the drinking water and wastewater projects, although there are many other factors that also directly influence changes to these conditions. The counties that did not complete water and wastewater projects during this period may have had other ARC projects occurring in their communities to spur economic development.

Table 3: How Counties with Water/Wastewater Projects (n = 208) Compared to Other ARC Counties (n = 221) at the Time of Project Approvals

The 95% range values (2.5th percentile to 97.5th percentile) are shown in parentheses.

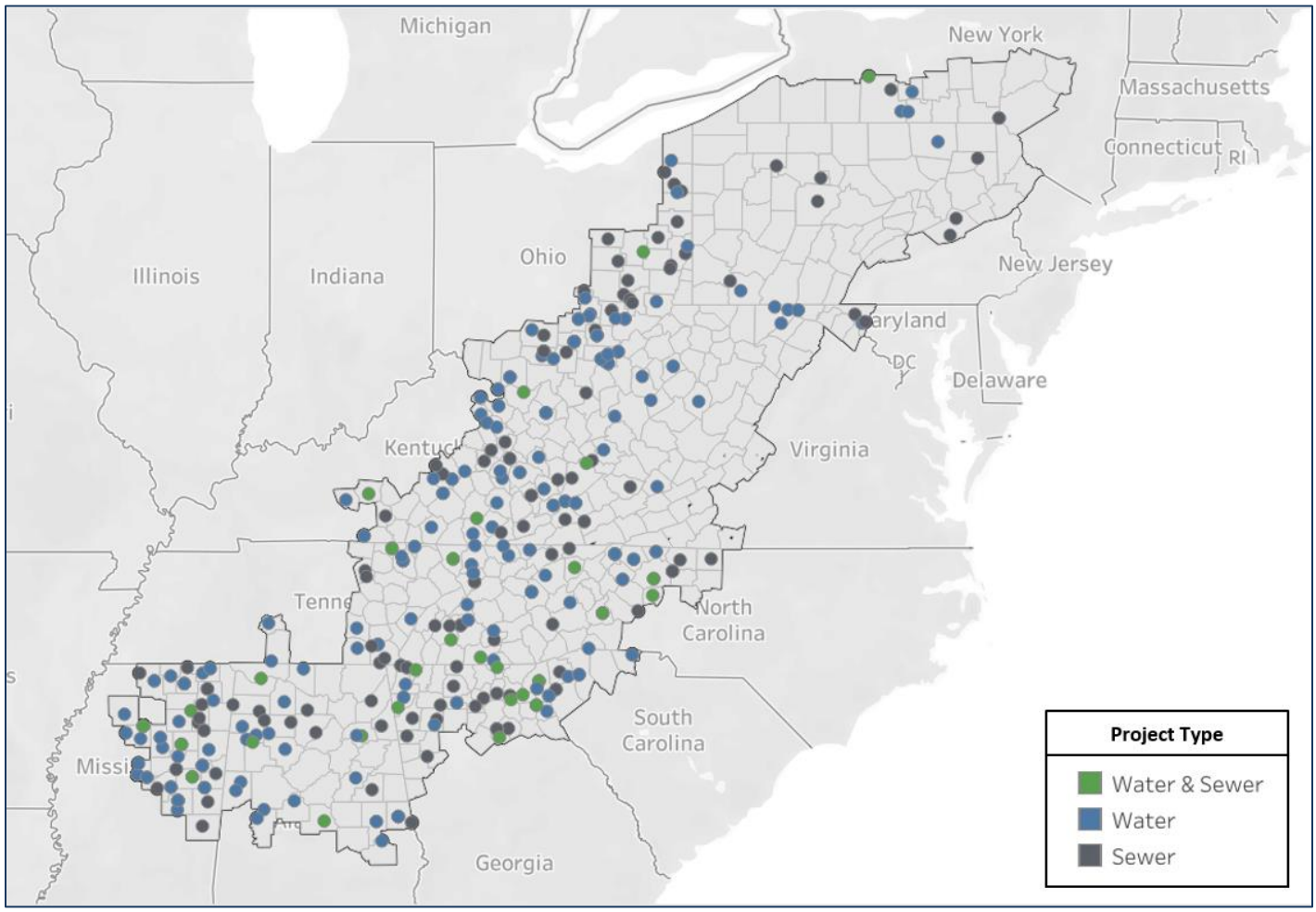
Community characteristic:	Average and 95% range for counties with approved drinking water/wastewater projects at the time of project approval:	Average and 95% range for counties without any approved drinking water and wastewater projects throughout FY 2009 to FY 2016, weighted by number of projects approved in each year:	How were counties with projects different from counties without projects, on average?	Was the difference statistically significant at 5%?
County population	45,239 (8,661–144,565)	73,083 (7,007–280,074)	Lower county population	Yes
% of county residents aged 65 and over	26.0 (20.2–31.0)	27.0 (19.6–32.4)	Differences are not statistically significant	No
Median household income	$36,171 ($27,572–$48,213)	$41,903 ($30,972–$55,645)	Lower median household income	Yes
Poverty rate	16.4 (9.2–24.8)	12.0 (6.8–18.8)	Higher poverty rates	Yes
Unemployment rate	10.0 (6.4–14.0)	7.9 (5.6–10.6)	Higher unemployment rates	Yes
Number of people employed	18,710 (3,237–63,829)	32,951 (2,838–123,992)	Lower employment	Yes
% of county residents living in rental housing	10.1 (7.5–13.1)	25.5 (17.9–35.0)	Differences are not statistically significant	No
% of county residents living in homes constructed prior to 1980	53.1 (35.6–74.8)	57.3 (32.9–79.6)	Lower % of housing built before 1980	Yes
% of county residents living in mobile homes	19.7 (6.4–31.3)	15.0 (3.9–27.5)	Greater % of residents living in mobile homes	Yes
% of county residents living in homes with complete plumbing	99.2 (98.1–99.9)	99.3 (98.3–99.8)	Differences are not statistically significant	No

Table 4: Changes to Socioeconomic Characteristics between Project Approval and 2017* in Counties with Projects Completed by 2015 (n = 154) Compared to Other ARC Counties (n = 274)

The 95% range values (2.5th percentile to 97.5th percentile) are shown in parentheses.

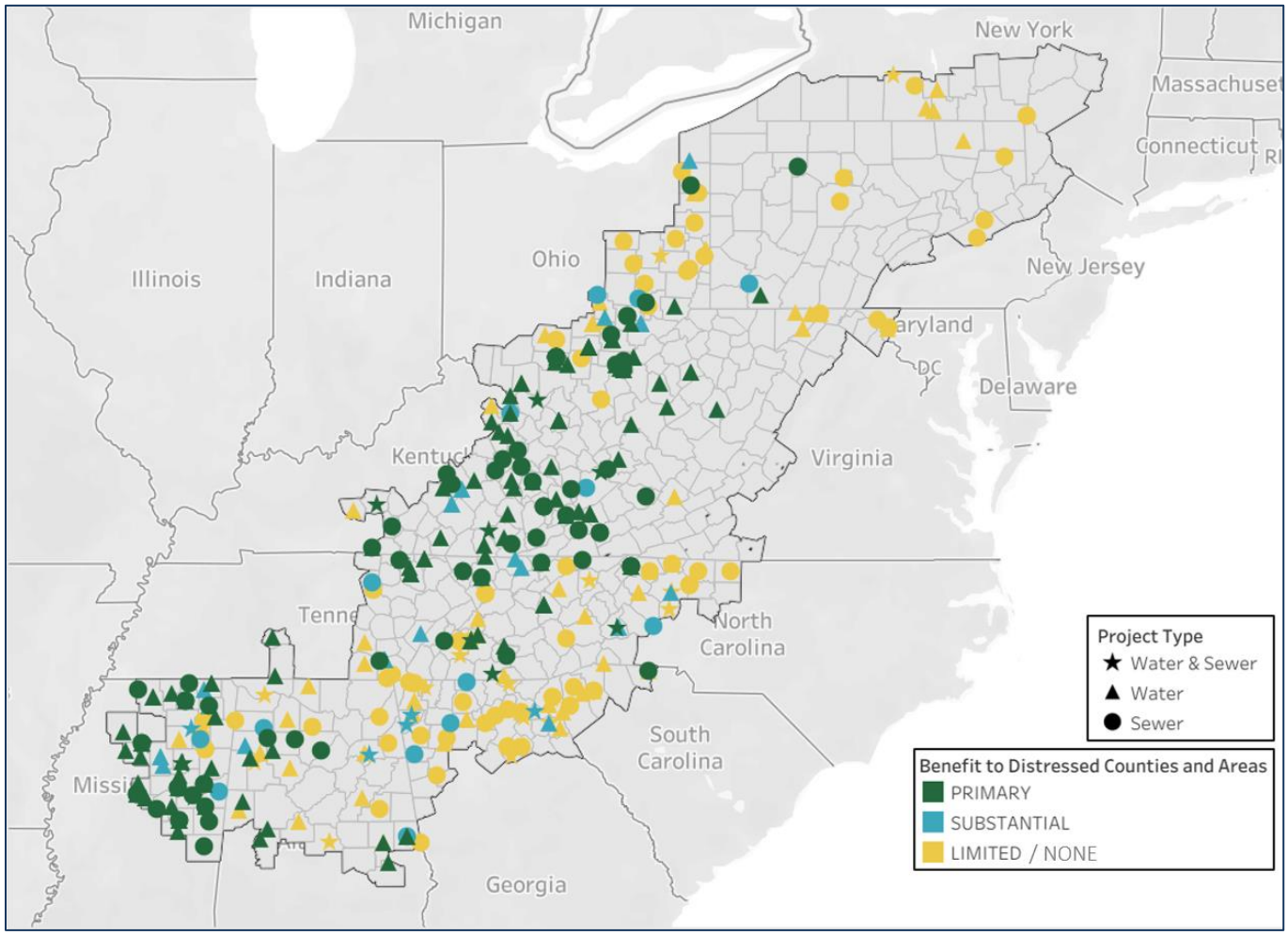
Community characteristic	Mean change from project approval to 2017* in counties with approved drinking water and wastewater projects (*at least 3 years after completion of project):	Mean change in equivalent timeline for counties without any approved drinking water and wastewater projects throughout FY 2009 to FY 2016, weighted by number of projects approved in each year:	How did changes in counties with projects differ from counties without projects, on average?	Was the difference statistically significant at 5%?
County population	+629 (-2,287 – +5,514)	+1,085 (-1,612 – +7,772)	Differences are not statistically significant	No
% of county residents aged 65 and over	+4.0 (1.1 – 8.2)	+2.9 (0.8 – 5.1)	Greater increase in county residents aged 65 and over	Yes
Median household income	+$4,381 (-$90 – +$9,413)	+$3,346 ($169–$6,519)	Greater increase in median household income	Yes
Poverty rate	+0.1 (-4.1 – +5.1)	+0 (-3.4 – +3.0)	Differences are not statistically significant	No
Unemployment rate	-3.9 (-7.1 – +0.4)	-2.0 (-3.9 – -0.1)	Greater reduction in unemployment rates	Yes
Number of people employed	+178 (-3,005 – +3,257)	+299 (-2,254 – +5,040)	Differences are not statistically significant	No
% of county residents living in rental housing	+1.8 (-2.6 – +6.6)	+1.0 (-2.1 – +3.8)	Greater increase in % of renters	Yes
% of county residents living in homes constructed prior to 1980	-5.0 (-10.8 – +0.1)	-3.2 (-7.8 – +0.1)	Greater reduction in % of county residents living in homes constructed prior to 1980	Yes
% of county residents living in mobile homes	+0.2 (-4.4 – +5.5)	-0.2 (-3.1 – +3.2)	Greater increase in and of county residents living in mobile homes	Yes
% of county residents living in homes with complete plumbing	+0.1 (-1.2 – +1.4)	+0.1 (-0.6 – +0.7)	Differences are not statistically significant	No

Appendix E: Map of 379 Projects in Portfolio, by Project Type



Note: In areas with multiple projects in the portfolio, dots may overlap.

Appendix F: Map of 379 Projects in Portfolio, by Benefit to Distressed Counties and Areas and Project Type



Note: In areas with multiple projects in the portfolio, dots may overlap.

Appendix G: Summary Survey Results

Introduction

This document describes the survey results for Appalachian Regional Commission projects.

The original ARC project portfolio included 392 water and wastewater projects approved between 2009 and 2016 and closed by 10/1/2018. When revised projects were submitted, these were recorded as a separate project ending in R1 or R2. A specific example was MS-17795 and MS-17795-R1. ARC indicated that in most cases, projects like MS-17795-R1 would contain the same project description and other data as MS-17795. Original projects were combined with the revised projects for a final project portfolio of 379 projects, with project approval dates set to the approval date of the original project and close date set to the date of the revised project. The survey was emailed to contacts for all 379 remaining projects.

Calculating Data

Basic Survey Information

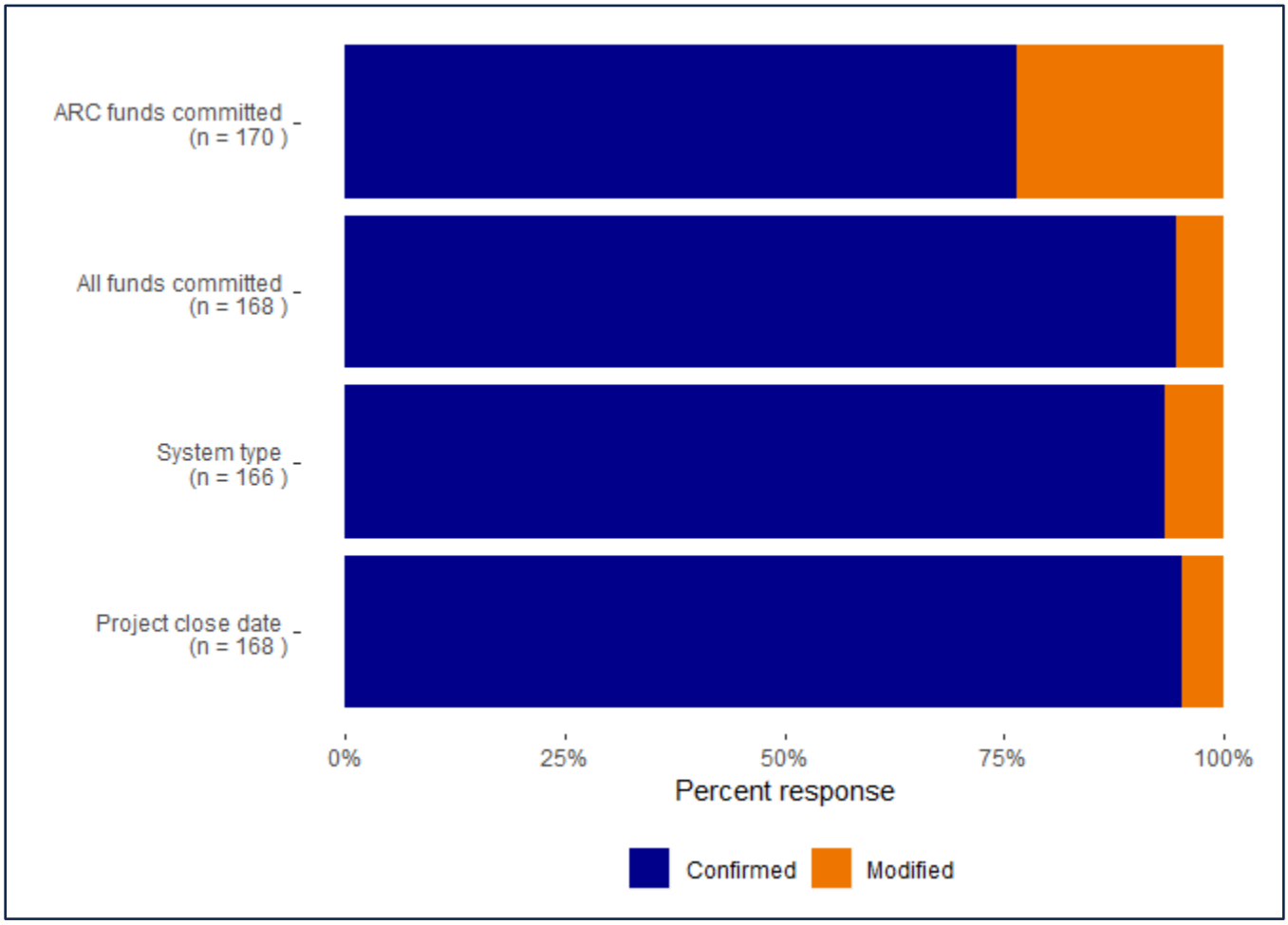
Of 379 surveys sent, 229 were returned for a 60% response rate. Surveys incorporated existing ARCnet data and asked respondents to either confirm or update results. Figure 10 shows responses to requests for basic project information.

Data displayed and verified were:

- Project funding provided by ARC
- Overall project funding
- System type (rather than use ARCnet system type, this was coded from the project description as water, sewer, or water and sewer)
- Project close date

The values shown in Figure 10 represent basic project information found in ARC records.

Figure 10: Basic Project Information



Economic Development and Quality of Life Project Outcomes

Economic development outcomes reflected in the survey responses include businesses created, jobs created, jobs retained, and leveraged private investment. These are based on measures collected by ARC and stored in ARCnet. Quality of life outcomes are number of residential connections benefiting from the project and number of business connections benefiting from the project. The quality of life outcomes, while also reflective of ARC measures, represent a different approach to displaying usual ARC data.

As described by ARC staff, "benefiting" value represents a strategic aggregation of two values from ARCnet, "served" and "improved," with the understanding that "improved" is often a subset of "served." Staff also noted that this definition was revised in 2012. On review of ARCnet data, the project team noticed that prior to 2012, values were recorded as "households improved" or "businesses served." Post-2012, ARCnet had "households improved" = "households served" while "businesses served" = "businesses improved." Acknowledging that survey respondents were unlikely to know the distinction between "served" and "improved," the project team phrased questions as, "How many households benefitted from the project [with "households improved" from ARCnet displayed], and how many

business/non-residential connections benefitted from the project [with “businesses served” from ARCnet displayed]?”

Economic Development Outcomes as of April 2020

The following tables and charts illustrate the economic development seen in the Region as of April 2020, followed by measured quality of life outcomes.

Table 5: Economic Development Outcomes

Names	Count	Min	Max	Mean	Median
Number of businesses created	9	1	18	5	1
Number of jobs created	71	1	1,442	164	75
Number of jobs retained	58	6	5,000	382	128
Leveraged private investment	60	$19,908	$1,600,000,000	$63,027,969	$10,500,000

Figure 11: Were economic development outcomes met?

n =143

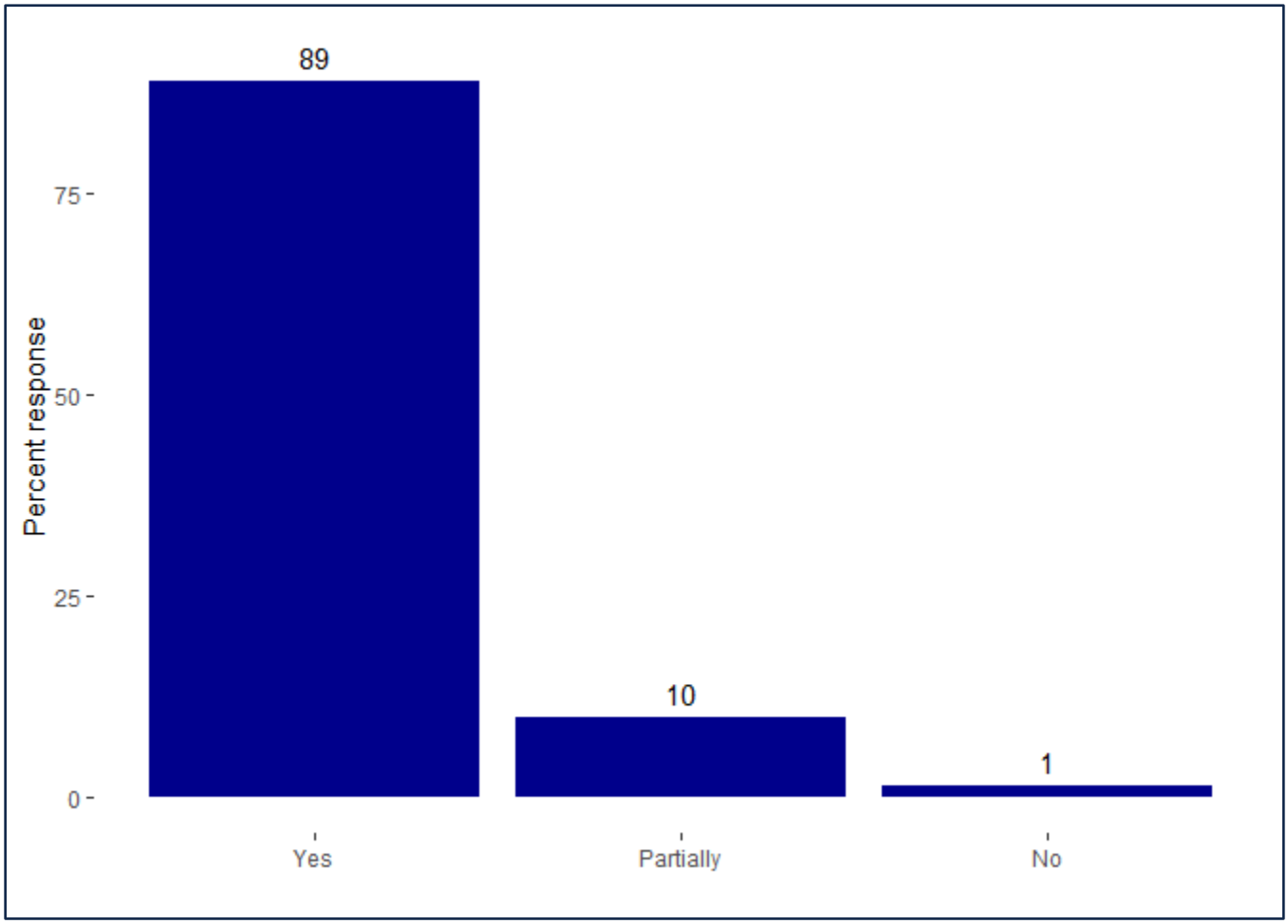
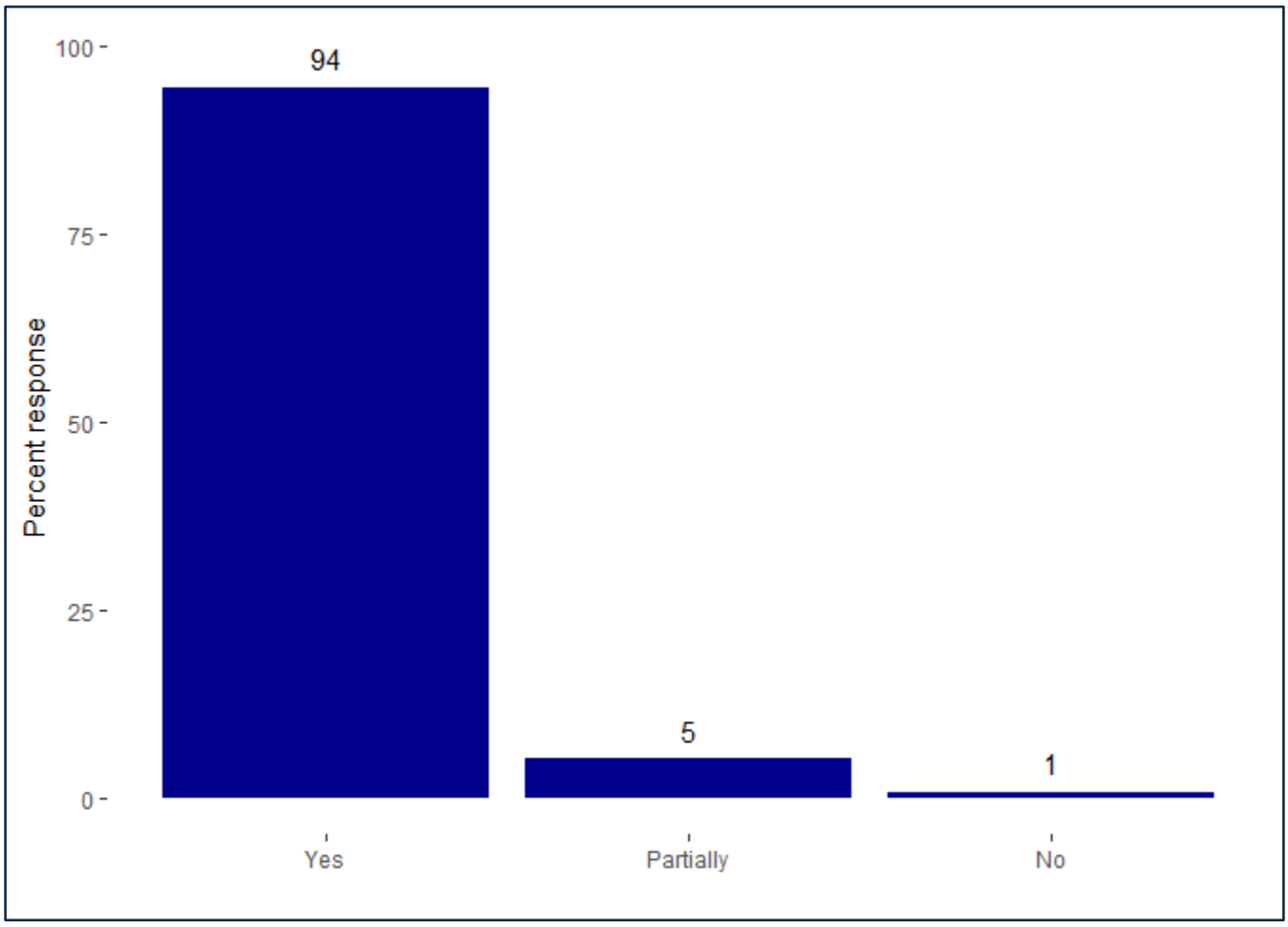


Table 6: Quality of Life Outcomes

Names	Count	Min	Max	Mean	Median
Businesses benefiting from the project	193	1	2,151	90	15
Households benefiting from the project	201	1	80,000	1,463	278

Figure 12: Were quality of life outcomes met?

n =158

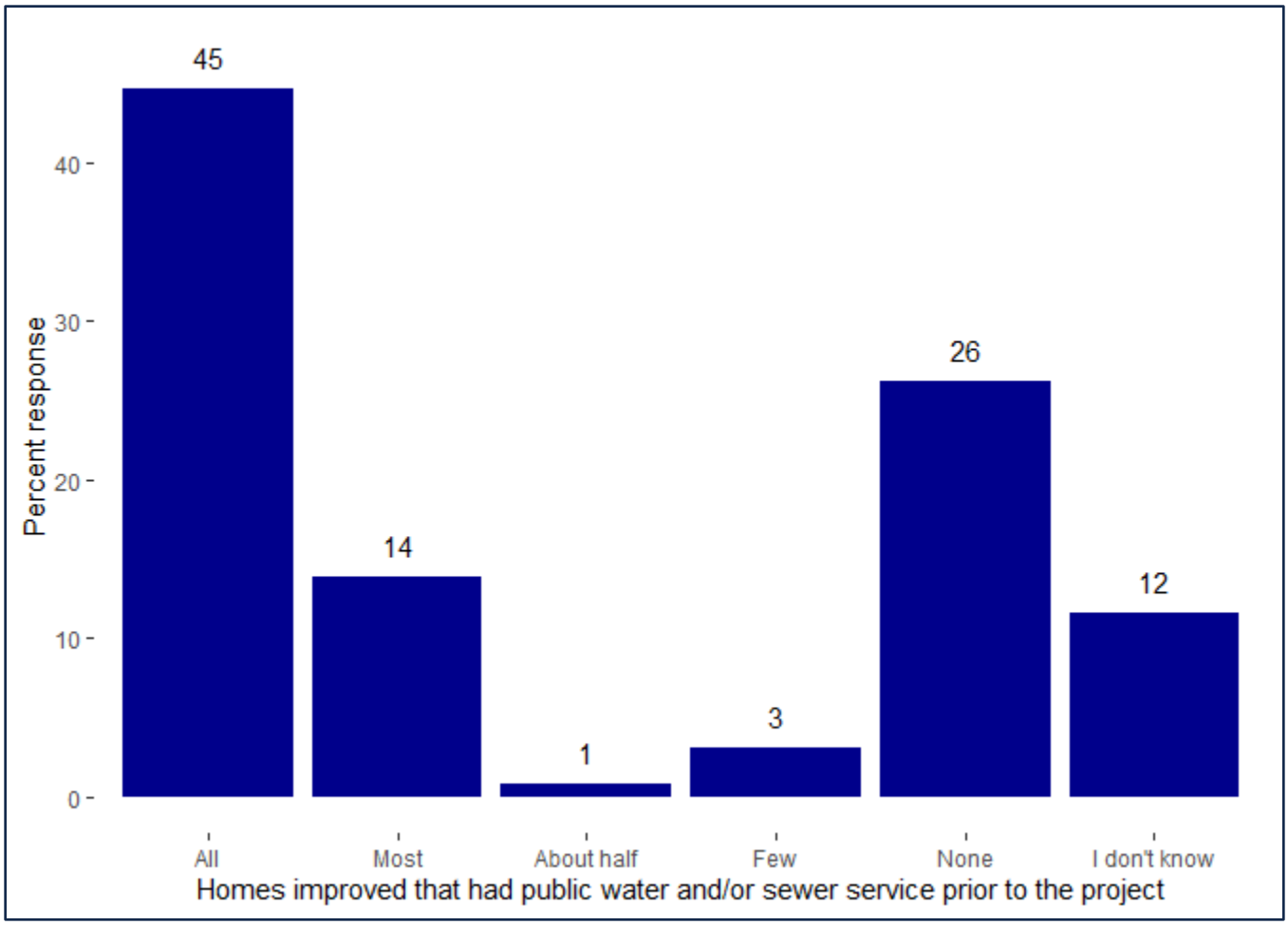


Residential Connections

Respondents were asked to describe whether residential connections supplied by the project already had service before the project began.

Figure 13: Which of the following best describes these residential connections?

n = 130

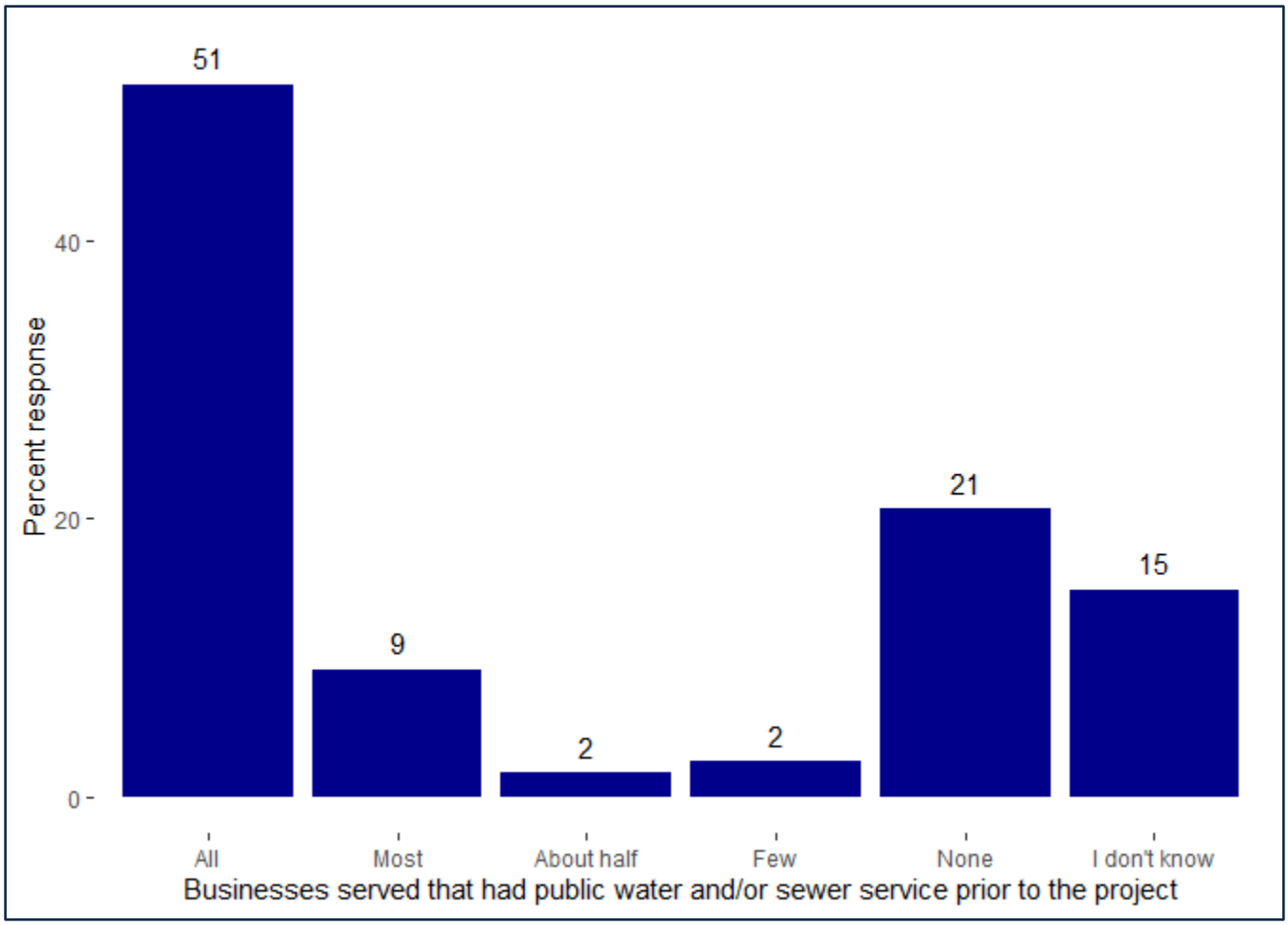


Business/Non-Residential Connections

Respondents were asked to describe whether business or non-residential connections supplied by the project already had service before the project began.

Figure 14: Which of the following best describes the business/non-residential connections?

n = 121



Were projects completed on time and on budget?

Survey respondents indicated whether projects were completed by the anticipated completion date, whether projects were completed within the original budget, and whether projects could have been completed without ARC funding.

When respondents provided additional explanation of schedules and budgets, the project team reviewed and assigned the responses to one of the categories "Yes," "No," or "I don't know."

Figure 15: Was your project completed by the anticipated completion date?

n = 206

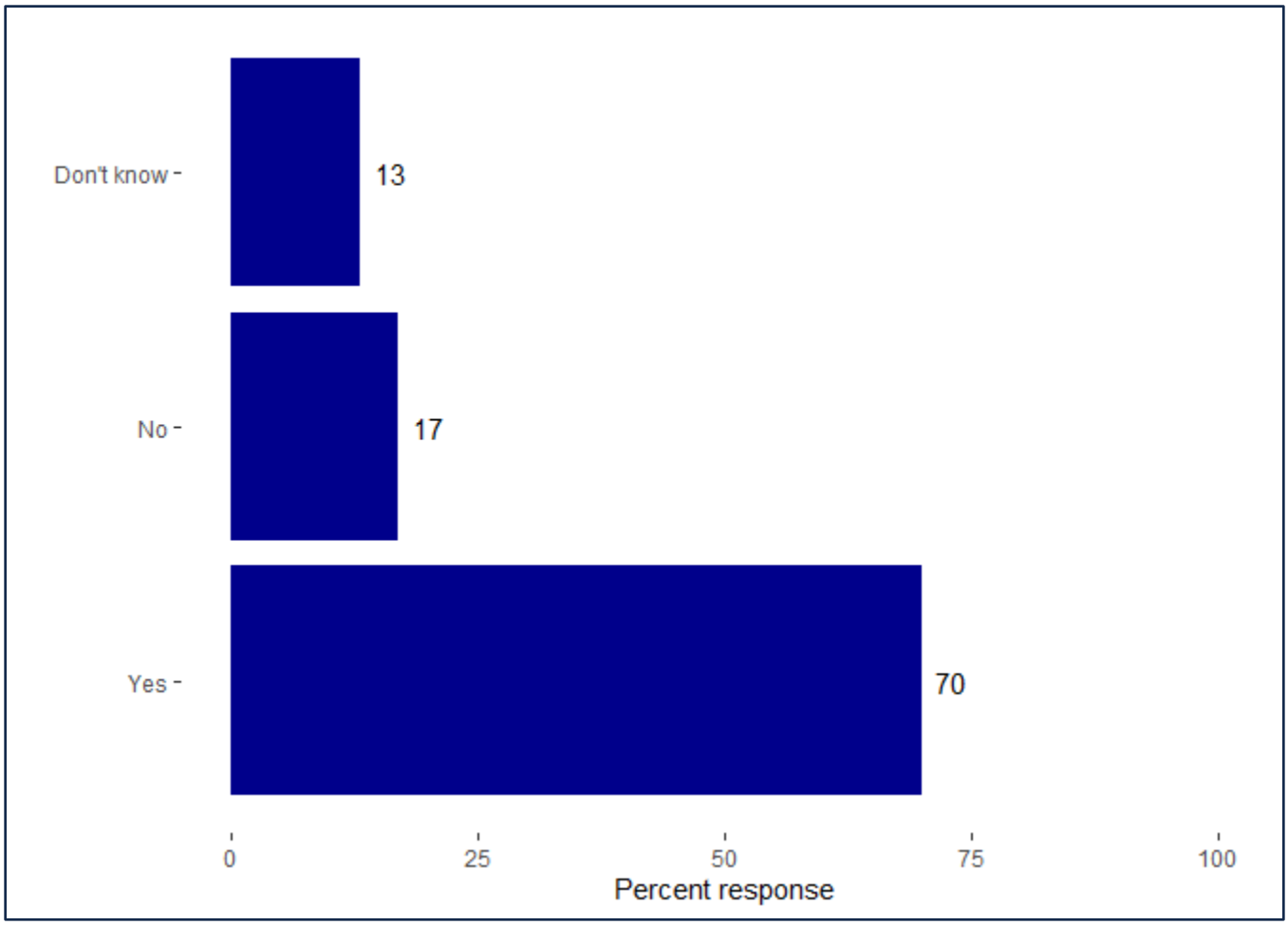


Figure 16: Was your project completed on budget?

n = 206

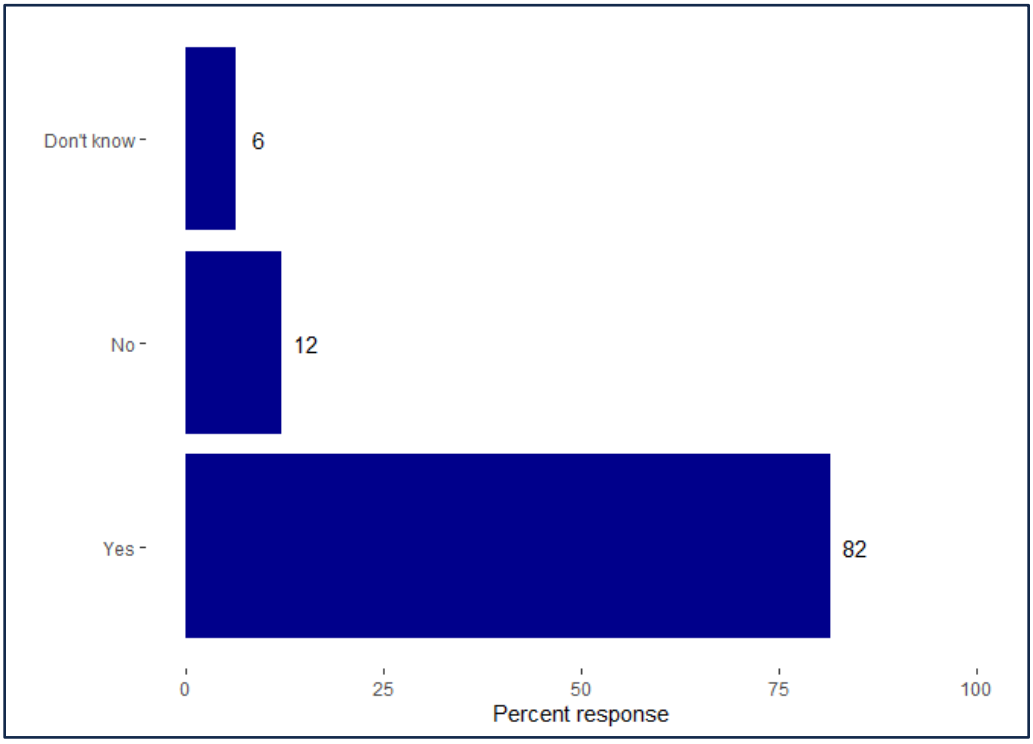
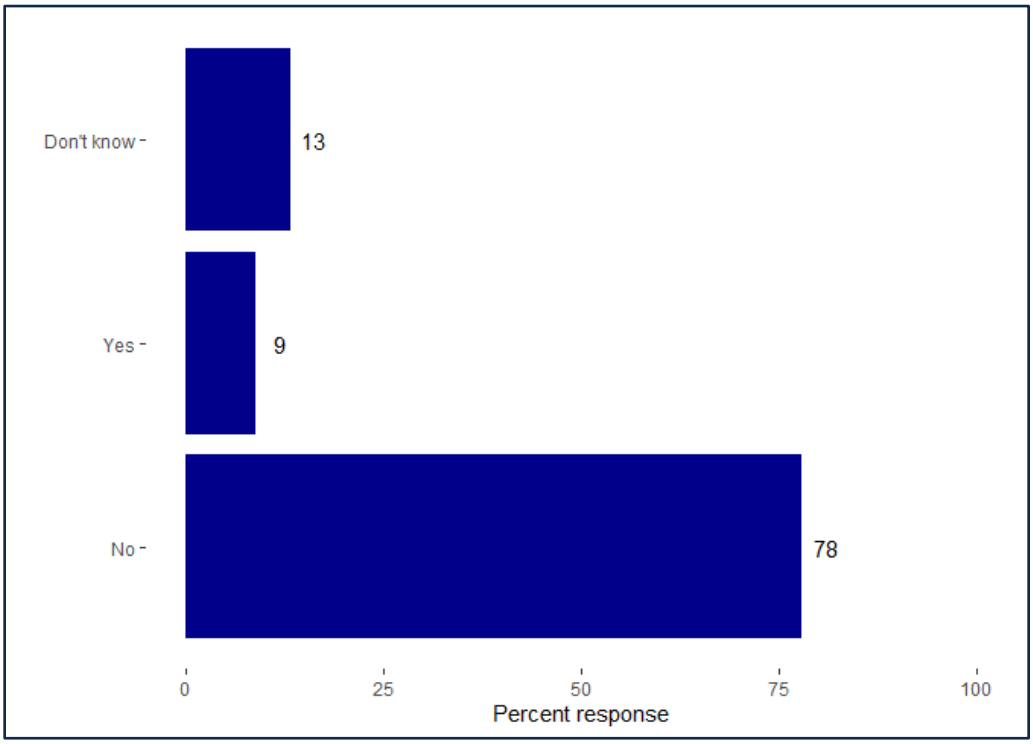


Figure 17: In your opinion, would this project have taken place without ARC funding?

n = 204



The final closed-ended question in this section provides more nuanced descriptions of how ARC funding impacted the project. Respondents described whether projects had been planned prior to receiving ARC funding or whether the project was not planned until after ARC funding was awarded.

Figure 18: Which of the following best describes the project funding?

n = 167

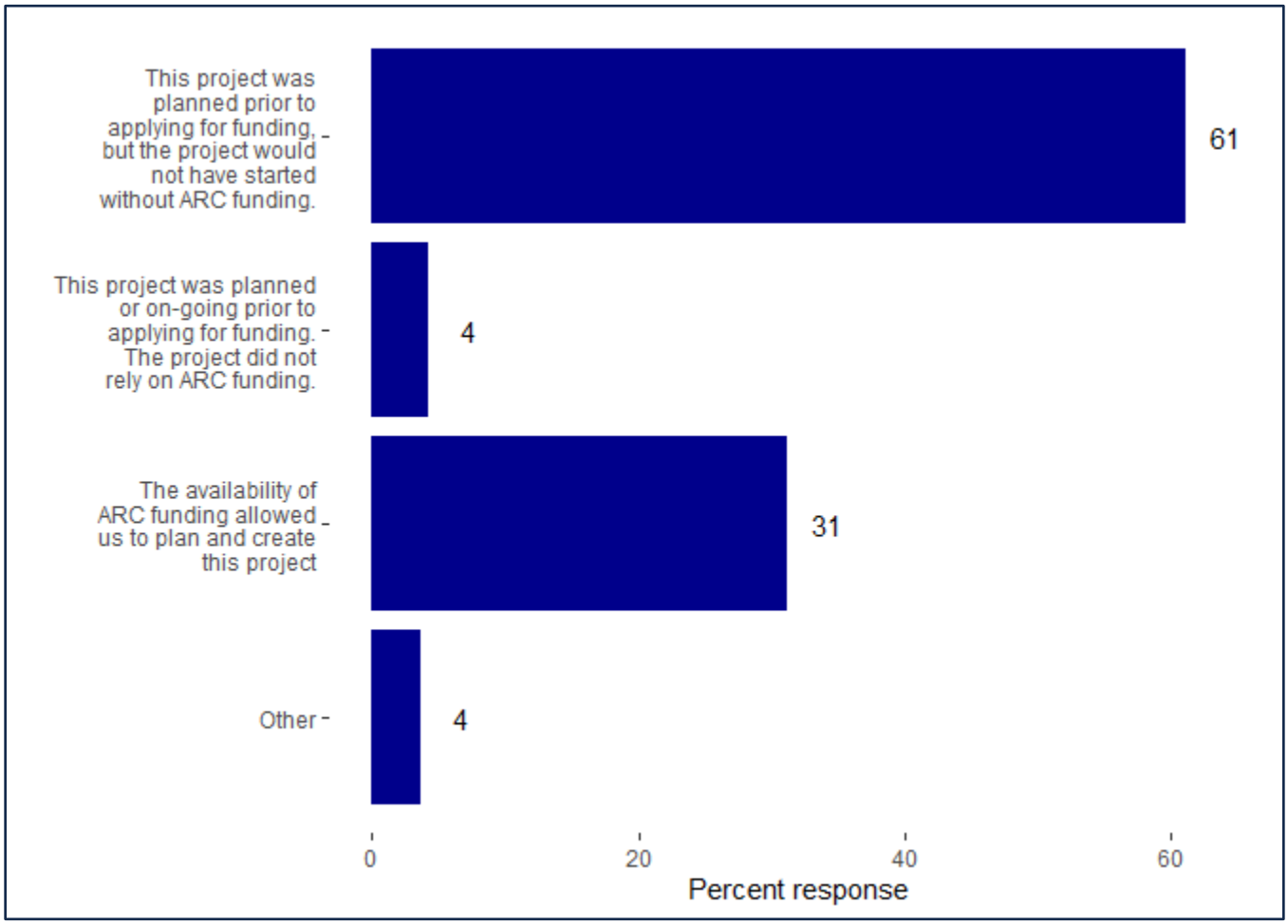


Figure 19: To what degree did this project solve the main challenge or opportunity it was designed to address?

n = 141

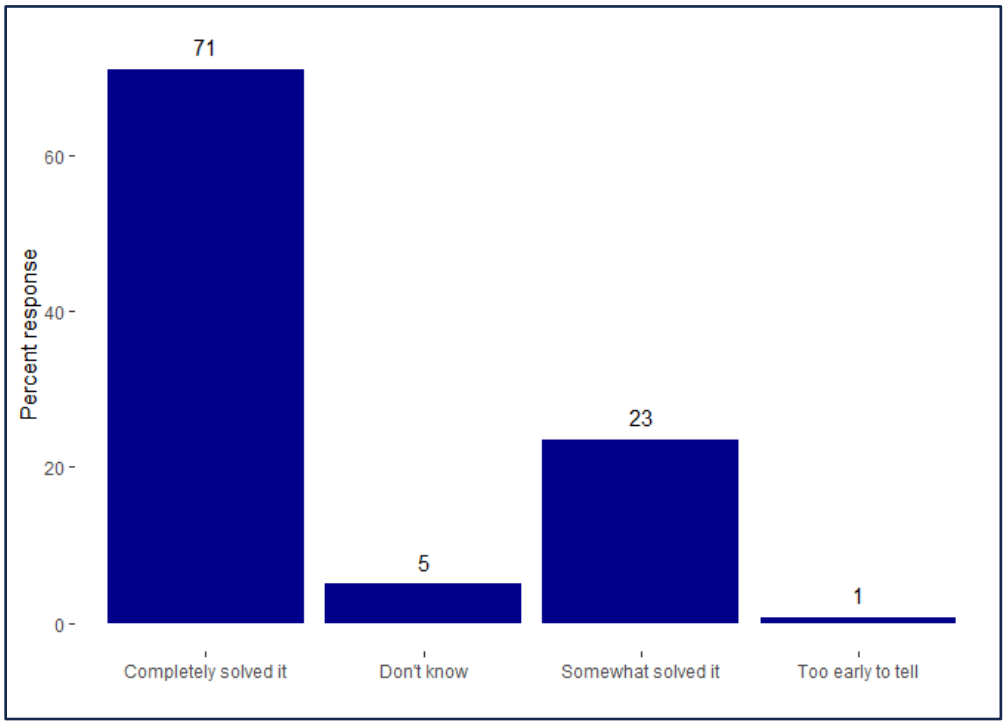
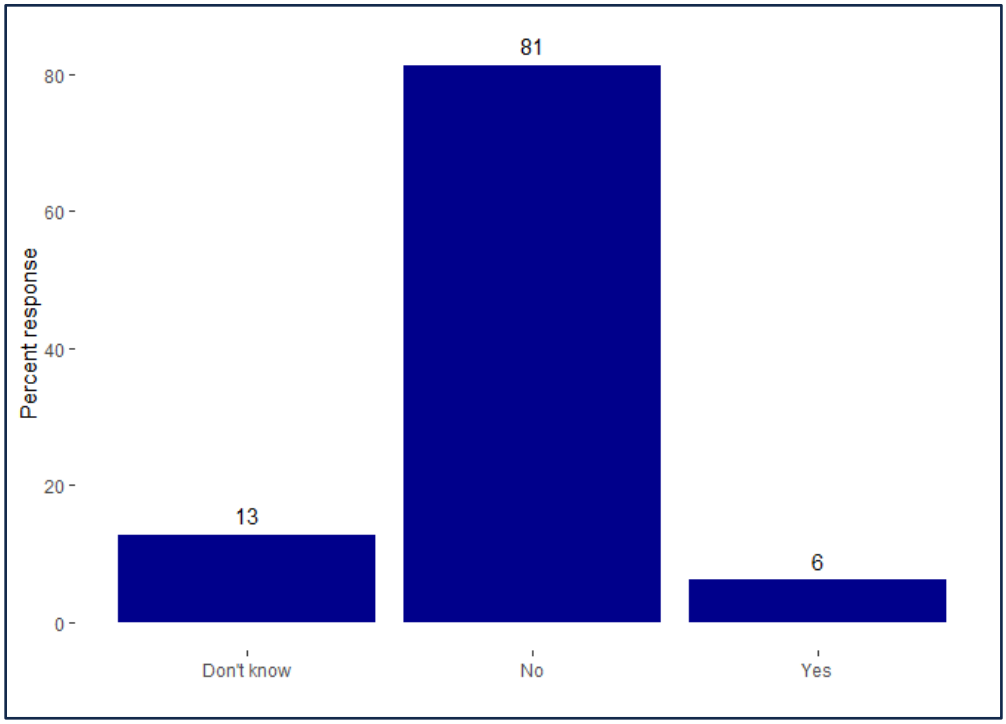


Figure 20: Did this project result in any unintended consequences or new challenges?

n = 165



Appendix H: Case Studies

1. **Alabama:** Florence Industrial Park Infrastructure Improvements
    - Lauderdale County, AL
    - FY 2013
    - Project Focus: Economic Development

2. **Georgia:** Barrow County Water Waste Improvements
    - Barrow County, GA
    - FY 2014
    - Project Focus: Educational Facilities

3. **Kentucky:** Vanceburg Combined Sewer Overflow Phase I
    - Lewis County, KY
    - FY 2010
    - Project Focus: Environmental Impact: Combined Sewer Overflows

4. **Maryland:** Frostburg Water Transmission & Energy Improvement
    - Allegany County, MD
    - FY 2009
    - Project Focus: Innovation in Technology/Design

5. **Mississippi:** Marshall County RockFon Infrastructure
    - Marshall County, MS
    - FY 2016
    - Project Focus: Economic Development

6. **New York:** Wayland Business Park
    - Steuben County, NY
    - FY 2014
    - Project Focus: Site Development | Infrastructure Challenges

7. **North Carolina:** Universal Building Water Line Expansion
    - McDowell County, NC
    - FY 2016
    - Project Focus: Educational Facilities

8. **Ohio:** Racine Water Line Replacement
    - Meigs County, OH
    - FY 2009
    - Project Focus: Water Loss & Finance

9. **South Carolina:** Pendleton/Clemson Wastewater Treatment Plant Upgrade
    - Anderson and Pickens Counties, SC
    - FY 2009
    - Project Focus: Environmental Impact & Growth
10. **Tennessee:** Decherd Water Transmission Line
    - Franklin County, TN
    - FY 2015
    - Project Focus: Economic Development
11. **Tennessee:** Kingsport Sewer System Upgrade
    - Sullivan County, TN
    - FY 2015
    - Project Focus: Leveraged Private Investment
12. **Virginia:** Big Caney Phase V Water Project
    - Dickenson County, VA
    - FY 2011
    - Project Focus: Water Access
13. **Virginia:** Haysi to Big A Mountain Water, Phase III
    - Buchanan and Dickenson Counties, VA
    - FY 2009
    - Project Focus: Water Access
14. **West Virginia:** Mercer/Summers Phase IV-A Water Line Extension
    - Mercer County, WV
    - FY 2011
    - Project Focus: Water Access

Florence Industrial Park Infrastructure Improvements

UNC SCHOOL OF GOVERNMENT Environmental Finance Center

TASUS Alabama Facility. Photo courtesy of TASUS website.

Lauderdale County, AL
FY: 2013

Michael Doyle
City of Florence Gas & Water Department

Fiscal Year: 2013

Project Type: Water

Funds – ARC: $80,000

Project Close: 10/30/2014

Benefits to Distress County and Area: None

Funds – Total: $160,000

Florence Industrial Park Infrastructure Improvements

BACKGROUND

Community Facts

The city of Florence, located within Lauderdale County in northern Alabama on the northern shore of the Tennessee River across from Muscle Shoals, is part of the Florence-Muscle Shoals Metropolitan Area. Florence had a population of 39,738 and Lauderdale County had a population of 92,780 as of 2014.[1]

Florence, Alabama, has experienced moderate growth in recent years, with a population increase of 9.6% between 2000 and 2014, compared to 8.3% statewide and 11.8% nationally. The unemployment rate fell from 10.1% to 7.2% in Lauderdale County between 2010 and 2014, and the state unemployment rate rose from 8.7% to 10.2% in the same time frame. As of 2014, the manufacturing jobs made up 9.6% of the labor force in the Florence-Muscle Shoals Metropolitan Area, especially manufacturing of components for the automobile industry. Median household income (MHI) in Florence in 2014 was 82% of the state MHI and 81% of the national MHI. The poverty rate was 6.8 percentage points above the state level and 11.1 percentage points above the national level.[2] Lauderdale County was classified as "transitional" in 2012, when the ARC grant was awarded, and 2014 when the project was completed.[3]

Water/Wastewater System Facts

As of 2014, the Florence Gas & Water Department serviced 66,900 people within 22,300 accounts. The residential water bill at 5,000 gallons per month was $20.13 and the residential wastewater bill at 5,000 gallons per month was $19.95. Operating revenues were $18.7 million in fiscal year 2013.[4]

Specific Need/Driver for the Project

TASUS Corporation located this $19.1 million manufacturing project within the Florence Industrial Park in order to supply North American Lighting, a Muscle Shoals-based corporation, with mold-injected parts needed to manufacture taillights for the automobile industry in Alabama.

TASUS needed water, sewer, electrical, and roadway extension in order to complete construction of this facility. Florence had Gerrard Drive extended in order to provide paved access to a storage area for city vehicles and equipment. Electrical was extended by the Tennessee Valley Authority (TVA).

PROJECT SPECIFIC INFO

Description of Project from Informant

The project involved the extension of both water and sewer to the future site of the TASUS Corporation within Florence Industrial Park at the intersection of Parkway Drive and Gerrard Drive. The sewer extension consisted of 1,680 linear feet of gravity sewer main along with seven manholes along the south side of the project site and parallel to Gerrard Drive. The water extension consisted of 1,060 linear feet of water line along Gerrard Drive.

Community Partners

Initial conversations regrading TASUS locating to the area were had between city officials in Florence and the corporation. As these conversations progressed, the local officials reached out to the Northwest Alabama Council of Local Governments, who facilitated piecing together the funding package for the

project. TVA was involved in the project administration and is a common partner and familiar figure for Florence.

The Shoals Economic Development Agency (SEDA) is often a player in attracting large industry to the area, and a common partner; however, the nature of this circumstance excluded them from participating.

Funding Outside ARC

The total cost of the project was $160,000, with $80,000 coming from ARC and the remaining $80,000 coming from the Florence Industrial Expansion Committee.

BENEFITS AND CHALLENGES

Challenges to the Project

No specific challenges were reported during the project. One challenge Florence is facing, that directly coincides with the outcomes of the project, is workforce development and workforce retainment. Those will be detailed in the "foreseeable challenges to the project" section below.

Positive Outcomes

The project was estimated to create 135 jobs and all of those jobs came to fruition. In fact, TASUS corporation performed some facility expansion in their facility in 2019, according to the grantee. Additionally, the new industrial presence places unemployment at a very low 3.7%, as of July 2019, in the Florence-Muscle Shoals Metro Area.

Foreseeable Challenges to the Project

Currently, communities in Northwest Alabama are experiencing challenges competing for high paying manufacturing and technical jobs with Huntsville, Alabama. In fact, Mazda Toyota Manufacturing is planning to construct a 4,000-employee plant in Limestone, Alabama, which is near Huntsville.

The grantee expressed concern with this new Mazda facility drawing skilled workers out of the Florence-Muscle Shoals Metropolitan Area. Additionally, the very low unemployment rate means there is not a ready workforce for future industry looking to locate to the area. This makes attracting skilled labor difficult as few skilled laborers are actively seeking employment in Northern Alabama. Therefore, workforce development is the largest challenge currently facing Florence in attracting new industry. However, the University of North Alabama is an asset for Florence in supplying young, capable employees for training in high-skilled positions like those created by TASUS in manufacturing vehicle lighting components.

FUTURE COLLABORATION

Next Project/Area That ARC Funding Might Be Needed or Used

The grantee did not identify any specific projects for future collaboration with the ARC. Future collaboration will be greatly assisted by their strong relationships with NACLOG and TVA.

Experience Working with ARC

The grantee, a representative from the Florence Water & Gas Department, found ARC to be easy to work with on this project. Future collaboration with ARC will be made easier given the existing relationship between the City of Florence and the Northwest Alabama Council of Local Governments (NACLOG), which services 37 governmental units in five counties including Lauderdale County and

Florence. NACLOG helps the member governments find funding resources for various projects, including economic development. NACLOG originally informed the grantee about the availability of the ARC funding used to finance the Florence Industrial Park water and sewer extension project in 2012.

The grantee also has a well-established relationship with the primary agency, TVA. Florence is a platinum sustainable community within TVA's Valley Sustainable Communities. Florence has achieved this honor by thoroughly integrating economic development efforts into its sustainability efforts within the Florence Forward sustainability program. This strong relationship will further assist in collaboration on ARC projects in the future.

References

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[3] Appalachian Regional Commission (ARC). (2019). Maps | ARC. Retrieved from https://www.arc.gov/research/MapsofAppalachia.asp.

[4] Environmental Finance Center at UNC-Chapel Hill. (2014). Alabama Water and Wastewater Rates Survey.

Barrow County
Water Waste Improvements

UNC SCHOOL OF GOVERNMENT Environmental Finance Center

Sims Academy facility at the Barrow County Educational Campus. Photo courtesy of Sims Academy.

Barrow County, GA
FY: 2014

Mike Renshaw
Barrow County Managers Office

Lisa Maloof
Barrow County Economic Development Department

Fiscal Year: 2014

Project Type: Wastewater

Funds – ARC: $300,000

Project Close: 7/10/17

Benefits to Distress County and Area: Limited

Funds – Total: $704,380

Barrow County Water Waste Improvements

BACKGROUND

Community Facts

As of the 2010 Census, Barrow County, Georgia, had a population of 69,367.[1] It is located just northeast of Atlanta and west of Athens, close to major universities such as the University of Georgia, Georgia Institute of Technology, and Emory University. In 2014, per capita income was $31,181 and the unemployment rate was 6.3%, with the 2010–2014 poverty rate at 13.5%. From 2010–2014, 82.3% of the adult population had at least a high school diploma. During the same period, just 16.6% had a bachelor's degree or higher.[1] Its economic status was listed as "transitional" in 2014 by ARC.[2]

Barrow County is a growing community in both population and commerce, becoming an increasingly affluent exurb of the Atlanta area and home of the Hartsfield-Jackson Atlanta International Airport. Barrow County's economy is centered around the life sciences, manufacturing, and distribution, and is home to 16 Fortune 500 company headquarters.[3]

Water/Wastewater System Facts

The Barrow County Wastewater Department serves 2,755 customers throughout Barrow County with public wastewater service.[4] However, this value only reflects about a quarter of the population, as only one in four Barrow County residents are served by public sewer, with the rest relying on septic tanks. The wastewater department has expanded their services to more retail and industrial customers in recent years as the county has grown in population and become increasingly attractive for commerce.

The county's wastewater rate structure has a monthly minimum of $17.00 covering up to 2,000 gallons. There is an additional $5.85 charge per every 1,000 gallons above 2,000.[5] At 5,000 gallons/month, an average residential customer could expect to spend $34.55 on wastewater service each month.

The county is currently constructing a new wastewater treatment plant that will be operational by the end of 2020. There are businesses that have plans to expand or locate in the area once this new facility increases the capacity of wastewater the county is able to treat.

Specific Need/Driver for the Project

In June 2013, construction began on the new Barrow County Joint Educational Campus in the county seat of Winder. This project represented a $27 million investment, creating a career academy and technical college with a total capacity of about 800 students between the two schools. The campus helps provide career and technical training for students to prepare them for jobs in local industries. Creating this new campus and facilitating commercial development in the area had been a long-term goal of the county. However, since the property on which the campus sits was formerly a cow pasture, it did not have access to water or wastewater infrastructure. Sewer service was vital to support not only the campus, but also surrounding businesses in a neighboring industrial park and potential future businesses, which may be more inclined to locate in the area if sewer service is available.

PROJECT SPECIFIC INFO

Description of Project

This project involved the construction of wastewater infrastructure to provide sewer service to the Barrow County Joint Educational Campus, which was constructed at the same time of this project. The 114-acre campus is comprised of a high school, the Sims Academy of Innovation and Technology, and a community college, Lanier Technical College. The schools' curriculums focus on supporting local industries and providing training in fields such as robotics, computers, automation, welding, business management, and health care. The wastewater infrastructure included 3,750 linear feet of a four-inch force main, a new pump station, and 700 linear feet of an eight-inch gravity sewer line with a 72,000 gallons per day capacity.

Lanier Technical College facility at the new Barrow County Educational Campus. Photo courtesy of Lanier Tech website.

Community Partners

The County Board of Commissioners, the Board of Education, and Lanier Technical College system were all important partners for this project. The land on which the campus was built was owned by the Barrow County Board of Education. The Board of Education donated a 20-acre portion of the land to Lanier Technical College so that the campus could be built. The construction of the campus itself was funded by the Georgia General Assembly, for a total cost of $16 million. The main driver for this new campus was the desire of the County Board of Commissioners and Board of Education to provide an educational alternative to the traditional academic curriculum of the Georgia public schools.

Funding Outside ARC

ARC grant money funded $300,000 of the project's total cost of $704,380. The remaining $404,380 was from local funding sources, the County Board of Commissioners, and the Board of Education, which were in the form of loans.

BENEFITS AND CHALLENGES

Challenges to the Project

The main challenge was the cost associated with connecting the campus to public sewer and providing the infrastructure to get the sewer to the county's collection system. No other challenges were reported.

Positive Outcomes

The overall campus construction project was a success, and both schools are open and at or near their capacities. The schools employ over 50 full-time faculty and currently enroll about 500 students, with the capacity to enroll about 300 more. The campus provides greater support for local industry with career-specific training for students. The campus represents something new and innovative for the county, since the schools provide educational opportunities for students that would not be available at a traditional academic high school or university. The campus is a certified GRAD (Georgia Ready for Accelerated Development) site, with training in advanced manufacturing, biotechnology, life sciences, information technology, entrepreneurship, retail services, and other vocations.

The existence of the campus would not have been possible without the sewer service provided by the ARC-funded project. Additionally, the new sewer line also serves many local businesses and provides potential for new businesses to locate to the area and connect to the sewer line. Businesses that have opened in the area have specifically cited the campus and its workforce development programs as reason for locating in the City of Winder. Specifically, advanced manufacturing companies are drawn to the area by the college's programs in engineering, mechatronics, and robotics, which are needed to support these high-tech industries. This project has helped secure much-needed infrastructure to ensure the long-term economic growth of the community.

Foreseeable Challenges to the Project

The anticipated future challenges involve upgrading and expanding the water system to meet future needs in the area and to match the wastewater upgrades. The Barrow County Water Waste Improvements Project brought the wastewater system up to current needs. However, future expansion will necessitate more sewer infrastructure; the supply side of water service is currently lacking the necessary infrastructure to be able to support the likely amount of growth in demand for water that the area will see in the coming years.

FUTURE COLLABORATION

Next Project/Area That ARC Funding Might Be Needed or Used

Barrow County is a quickly growing community, with increasing demand for residential communities and as a result, new jobs, retailers, and restaurants. The county has plans to expand its major industrial park in Winder and the broader industrial corridor in the center of Barrow County, which will eventually need upgrades to its infrastructure to serve more businesses and manufacturing plants. Because of this county growth, there will be no shortage of water and wastewater infrastructure projects that could be candidates for ARC grants.

Experience Working with ARC

The county had a very positive experience working with ARC for this project. They experienced no issues throughout the grant application process and said that they would continue to apply for ARC grants in the future. The only issue experienced is that ARC funds are limited and that they have more needs than there are potential ARC funds available to them. They encouraged others to go through the ARC grant process because it can be very helpful as a funding source, and the funds are not very difficult to apply for.

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Vanceburg Combined Sewer Overflow Phase I

UNC SCHOOL OF GOVERNMENT Environmental Finance Center

The Ohio River near Vanceburg, KY. Photo courtesy of Leigh-Anne Krometis.

Lewis County, TN
FY: 2010

Bill Tom Stone
City of Vanceburg Electric Plant Board

Fiscal Year: 2010

Project Close: 8/16/12

Project Type: Wastewater

Benefits to Distress County and Area: Primary

Funds – ARC: $189,000

Funds – Total: $600,000

Vanceburg Combined Sewer Overflow Phase I

BACKGROUND

Community Facts

Vanceburg is a city in Lewis County, Kentucky, that borders the Ohio River in the northeastern part of the state. At the 2010 census, its population was 1,518. Lewis County's 2010 census population was 13,870. In 2010, its per capita income was $20,653, its unemployment rate was 14.5%, and the 2006–2010 average poverty rate was 27.5%. From 2006–2010, 66.2% of the adult population had at least a high school diploma, while just 11.6% had at least a bachelor's degree.[1] Its 2010 economic status was listed as "distressed" by ARC.[2] In recent years, Vanceburg's population has declined as people have headed towards nearby metropolitan areas such as Lexington and Cincinnati, where economic opportunities are greater.

Water/Wastewater System Facts

Vanceburg's public utility provides electric, water, sewer, and gas services to residents of the city. It has been in operation since 1939.[3] According to EPA Safe Drinking Water Information System, Vanceburg's water system serves approximately 6,921 population.[4] As of 2020, the rates for sewer included a $2 surcharge, and a base rate of $14.18 for up to 1500 gallons. After 1500 gallons, residential customers are charged $6.95 per thousand gallons. The utility has a declining block rate, the first block ending at 98,500 gallons, and the last block starting at 1,000,000 gallons. An average residential customer using 5,000 gallons per month could expect to spend $40.81 per month on wastewater services.[5]

Specific Need/Driver for the Project

The city of Vanceburg was under a consent judgment by the state of Kentucky to eliminate the constructed sanitary bypass overflows (CSOs) in their wastewater system, which caused untreated, polluted wastewater to be discharged into the Ohio River and its tributary, Salt Lick Creek. The city was in violation of EPA regulations on water waste discharge. However, the small local utility was unable to fully correct the issue due to a lack of funds, though it did take some minor steps toward mitigation after the consent judgment was issued. Because it could not fund the project on its own, the utility, in collaboration with Buffalo Trace Area Development District (BTADD), secured funds from ARC as well as other agencies to replace and separate their storm runoff and sewer systems.

PROJECT SPECIFIC INFO

Description of Project from Informant

The storm runoff and sewer system in Vanceburg prior to this project was constructed between the 1920s and 1950s. The lines were old, deteriorating, and unable to cope with current needs, resulting in the consent judgment. The project first involved videoing 17,500 linear feet of sewer lines to check for blockages and inflow/infiltration, and to examine pipe conditions. Then, all the combined sewer lines were replaced by separate storm and sewer. In areas where the combined sewer was separated, either the old combined sewer was turned into sewer only and new storm lines were constructed, or the old combined lines were turned into storm and new sewer lines were constructed. The project began doing replacement and separation in downtown Vanceburg, where the worst overflows were occurring, which took about 14 months to complete. Then, the project moved on to other areas of Vanceburg, replacing and separating combined sewer lines over the course of another 10 months.

Community Partners

The city of Vanceburg worked very closely with BTADD, their local development district. BTADD worked with the city to secure funds from the various agencies for the project and provided further assistance through the duration of this project. BTADD helped them bring together relevant stakeholders, identify specific community needs related to this project, and aided them through the process of grant and loan applications. BTADD had knowledge of infrastructure project funding needs and familiarity with various funding agencies as a result of their experience doing these sorts of projects that the city and utility did not have. BTADD secured an engineering firm to come up with a cost estimate for the project so that the appropriate amount of funding could be applied for. Once all of the funds had come together, BTADD continued to work closely with the city, providing oversight for the project. Additionally, BTADD representatives came to open community meetings where local residents could inquire about the project or voice any concerns and supported the utility at city hall meetings.

Funding Outside ARC

The city of Vanceburg had five non-ARC funding sources for this project. They included local matching funds from the electric plant board, Community Development Block Grant (CDBG) funds from HUD, Economic Development Administration (EDA) funds, EPA funds, and a loan from the Kentucky Infrastructure Authority (KIA). BTADD was instrumental in securing much of this funding. Additional funding for maintenance will be funded by the utility through a 68% water rate increase. Until this project, the water rates had been unchanged since 1986, and while seemingly drastic, this 68% increase brings rates to the level that they would be if rates had been increasing 2.8% per year since 1986.

BENEFITS AND CHALLENGES

Challenges to the Project

Before the project began, the city of Vanceburg was under a consent judgment from the state and was threatened with the possibility of lawsuits. However, due to the nature of a small-town utility, they had nowhere near enough money to correct the issue. Ultimately, they were able to secure funds, but not until after faced with serious legal issues.

During the project, the major challenge was coordinating construction work to cause as little disruption as possible to the community. The removal of sewer lines involved tearing up sidewalks and roads, which shut down some areas of downtown Vanceburg to traffic, stripped some areas down to dirt roads and sidewalks and impeded other community activities. However, the city did go to great lengths to minimize their impacts. On one occasion, they had dug up some lines in front of a funeral home before a funeral was scheduled to take place, so they filled in the ditch the night before, and then dug it back up to resume work the next day. On another occasion, they created a makeshift dirt road as an access path to a local business that would have otherwise been blocked in by construction. Generally, many people had concerns about how such a large project would impact them and their community, but the city made it a priority to try to minimize the inconvenience.

Positive Outcomes

This project had several positive outcomes. First, and most importantly, the city was able to get out of the consent judgment placed on it by the state, because the new separated storm and sewer effectively solved the problem of sewer overflows sending contaminated wastewater through a bypass into the Ohio River and Salt Lick Creek. The city was able to block the old constructed bypasses with concrete. The removal of the consent judgment opens the city up to being able to expand for development of new

industry, and one local plant expanded their operations and added 60 jobs after the project was completed. Additionally, this project involved tearing up streets and sidewalks in order to replace sewer and storm drainage lines. While this posed an inconvenience for some residents during the project, the result was brand new sidewalks and streets for the entirety of downtown Vanceburg. This provided for a sense of revitalization in the community, as the old pavement and concrete had been old and heavily worn. The project was also successful in the sense that it was completed on time and within their budget. This reflects well on the city, as it shows the funding agencies that Vanceburg is a reliable partner when they are being considered for funds in the future.

Foreseeable Challenges to the Project

One challenge to this project for the future will be coordinating maintenance of the separated lines between the utility and the city. Traditionally, the storm runoff lines are not considered part of the utility, as there is no revenue generated by it. Usually its maintenance falls on the city. However, in a small town like Vanceburg, the city alone cannot properly maintain it, so it will require a joint effort of the city and utility. Essentially, coordination between the utility and city to divvy up responsibilities will be vital to the maintenance of the new storm runoff lines. If there are any issues discovered with a storm drain or line, they have asked that it be reported to the city, but the utility can aid the city with personnel and maintenance equipment.

Another issue facing the utility is the declining population in the area as people leave for larger cities where economic opportunities are better. For example, the city of Vanceburg purchases their electricity from Kentucky Power, which has seen the population of rural eastern Kentucky where they serve decrease substantially. This could cause problems related to water and electricity revenues, which are important for the financial health of the utility.

FUTURE COLLABORATION

Next Project/Area That ARC Funding Might Be Needed or Used

The city has been working with BTADD to apply for more loans and grants to fund other projects. There are some households in and around Vanceburg that are unserved or underserved by public water service. The city and utility would like to expand their reach to bring sewer to more households outside of the main downtown area. They are also interested in building a regional wastewater treatment plant that will allow more people, especially those in more rural areas of Lewis County, to be served by public sewer infrastructure.

Experience Working with ARC

The experience of the city of Vanceburg and BTADD with ARC has been very positive. They have a good working relationship with the people at ARC, where they are constantly calling and talking through project plans and asking for advice. It can often be tough to call an agency to ask for advice when you are unfamiliar with the people there, but ARC staff is very involved with local projects, allowing for better one-on-one lines of communication. ARC often helps them work through the details of plans and can provide information on troubleshooting and pointing to places where things may not go as planned and how to adapt and adjust to any difficulties that may occur over the course of a project. They value the advice that ARC gives, which has consistently been very helpful, so ARC is always kept in the loop of the details of ARC-funded projects that BTADD administers. The flexibility of ARC is also appreciated, as their funds have fewer strings attached than some other agencies.

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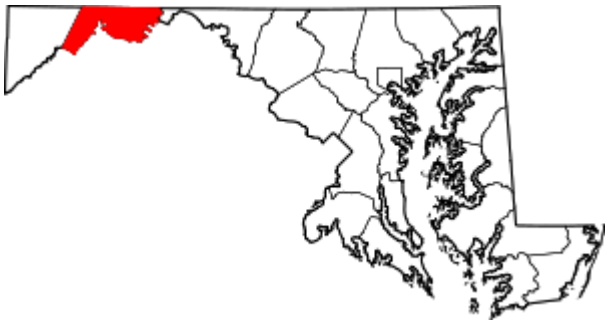
Frostburg Water Transmission & Energy Improvement

UNC SCHOOL OF GOVERNMENT Environmental Finance Center

Piney Reservoir in Frostburg, MD. Photo courtesy of Jason K. Litton and the City of Frostburg.



Allegany County, MD
FY: 2009

Elizabeth Stahlman
Chris Hovatter
City of Frostburg

Fiscal Year: 2009

Project Type: Water

Funds – ARC: $250,000

Project Close: 11/1/12

Benefits to Distress County and Area: None

Funds – Total: $1,672,510

Frostburg Water Transmission & Energy Improvement

BACKGROUND

Community Facts

Frostburg is a college town located on the eastern side of Allegany County, Maryland. The 2010 population was 9,002, representing a 10.47% increase from the population in 2000.[1] Allegany County is in western Maryland bordering West Virginia to the south and Pennsylvania to the north. It is a rural county with a 2010 population density of 177 persons per square mile. Population has been decreasing in the county; between 2010 and 2018, the population has reduced from 75,047 to 70,975 (-5.4%).[2] Regarding water access, currently 80 to 85% of the population is on public water and sewer.[3]

From 2013–2017, per capita income was $22,355 and the median household income was $42,771. Further, the poverty rate was 17%. For comparison, at the national level the 2013–2017 per capita income, median household income, and poverty rate were $31,177, $57,652, and 11.8%, respectively. Regarding education in Allegany, 89.5% and 18.2% obtain a high school diploma and bachelor's degree or higher, respectively whereas 87.3% and 30.9% is reported for the nation.[2]

The private sector dominates the workforce in Allegany County (79.5%). Within this sector most jobs are in education and health services (22.2%) followed by trade, transportation, and utilities (17.9%).[4] There has been a recent push to invigorate the industry sector in Allegany. The Barton Business Park for Advanced Manufacturing was recently developed to accompany the educational infrastructure at Frostburg State University, Allegany College of Maryland, and the Robert C. Byrd Institute for Advanced Manufacturing.[5]

Water/Wastewater System Facts

The city of Frostburg has two water supplies, a water treatment facility and a transmission and distribution facility that serves the city of Frostburg, Frostburg State University, and approximately nine small surrounding satellite communities. Frostburg's drinking water is sourced primarily from Piney Dam Reservoir and supplements from Savage Springs when needed. Drinking water is treated at a three-million-gallon per day capacity water treatment plant built in the 1990s with the help of ARC funds. Current demand is at one million gallons per day.

Frostburg bills quarterly, solely based on volume consumed. For water customers inside the city limits that use between 0 and 50,000 gallons per quarter, the charge is $4.50 per 1,000 gallons. For use above 50,000 gallons, customers inside the city limits pay $10.13 per 1,000 gallons. A customer in Frostburg using 5,000 gallons per month, or 15,000 gallons per quarter, would pay a quarterly bill of $67.50, or $22.50 per month.[6]

Specific Need/Driver for the Project

Frostburg is certified as a Maryland Smart Energy Community, which allows the city to receive additional funding from the state if they adopt energy policies that lead to sustained reduction in energy usage, cost savings, and renewable energy development. For Frostburg this meant increasing its renewable energy use to 20% of its electrical needs over a seven-year span starting in 2014. This project was part of an effort to meet this quota for renewable energy use. Because the reservoir and springs that provide drinking water to Frostburg are located on the other side of Savage Mountain, a great deal of energy was being used to pump water from the intakes to the treatment plant. To reduce energy use as

well as recoup some the energy expended, Frostburg carried out a two part project: 1) installing smoother, wider diameter pipes to reduce energy use and increase transport capacity, and 2) constructing a low-head hydroelectric plant to generate electricity from the potential energy created while pumping water up one side of the mountain.

PROJECT SPECIFIC INFO

Description of Project

This case study focuses on part one of Frostburg's project to reduce and recoup energy used to transport source water to the drinking water treatment plant. Unlike the first part, the second part of this project was not funded using an ARC grant. Part one of the project used ARC funds to renew two pieces of the water transmission main. One was a six-inch pipe from the Savage Springs area that was increased to an eight-inch pipe and placed in a more direct manner to a large holding tank on the top of the mountain. That same tank would eventually deliver water to the inline hydroelectric turbine below. The other piece was a new 12-inch pipe from Piney Reservoir to the top of the mountain.

Hydroelectric turbine in Frostburg, MD. Photo courtesy of the City of Frostburg.

Community Partners

Since the time of the Frostburg system extension to Mount Savage, at the request of the state of Maryland, the state has been a close and gracious partner with the city and supports many of their water/wastewater projects, including the water main replacements now in focus. Additionally, through contract, the Maryland environmental service manages the Frostburg water treatment plant. Other partnerships are put in place with local mechanical contractors when repairs are needed. USDA was also mentioned as a partner; however, their role was not discussed.

Funding Outside ARC

Other than the ARC, two sources of funding were mentioned regarding this project. One being the State of Maryland and the other a water surcharge imposed over several decades. Beginning at one dollar per month, the surcharge was incrementally increased to a current charge of $11.80 per month.

BENEFITS AND CHALLENGES

Challenges to the Project

A major challenge confronted by Frostburg involved legislation in the state of Maryland. At the time of the project current, laws in place didn't allow net metering with hydroelectric energy production. Therefore, the electricity generated by the hydroelectric turbine would not be subtracted from the electricity used by the pumping facility. However, Frostburg worked with local delegation to get the state of Maryland to change the law to enable net metering.

Positive Outcomes

As a result of the new pipes and the installation of the hydroelectric turbine, in 2017, an estimated 35% of the energy used to pump water over the mountain was recouped with renewable technology. All indications are that the electrical consumption costs associated with the treatment plant are now lower than before the project.

With the addition of the hydroelectric turbine and the pipes to supply it, the city and its community is proud to exclaim their use of renewable energy and the fact that it's still working and generating electricity five years later. The community also benefits from more affordable water rates resulting from the grant funding received and the reduction in costs from energy savings. Further signs of success are indicated by recently announced growth of Frostburg University to a Division II school that was made possible by the treatment plant's increased capacity.

Foreseeable Challenges to the Project

Funding is described as a sustained challenge for Frostburg as they continue to have a relatively low median income. Additionally, future maintenance is stated as a constant concern. Although Frostburg attests to using high-quality materials, they accept that environmental conditions often dictate the life span of infrastructure; sometimes breaks and malfunctions cannot be avoided. Further, it was expressed that with two different water sources and all the pumping that occurs, the potential for something to go wrong is high.

FUTURE COLLABORATION

Next Project/Area That ARC Funding Might Be Needed or Used

ARC is seen as an essential piece of the funding puzzle for Frostburg not only in this project, but many of those from the past. Frostburg appreciates their contributions and recognizes how transformational their support has been in allowing the community to grow and have a pristine, efficient, and reliable water source.

Not only was the outcome of working with the ARC successful but so was the relationship built between the two. This relationship existed mainly through a single point of contact, Bill Atkinson, an employee embedded with the Maryland department of planning, who focused primarily on ARC matters. He was an essential liaison to the ARC due to his residence in the local region and ability to figure out how to get projects funded and moving along.

Experience Working with ARC

Currently, two future projects are being pursued that may require ARC funding. One is the installation of a new pipe to connect the raw water reservoir to the treatment plant located downhill. The water that comes down over the mountain and goes through the inline hydroelectric turbine spills into a small reservoir that supplies the plant. Currently, only one pipe goes underground between the reservoir and the treatment plant and so the new pipe would run parallel, leaving the old line in place as a backup for emergency situations. The second project is exploring the possibility of installing a smaller inline hydroelectric turbine on the new line leading to the treatment plant.

Other plans include conducting a comprehensive water system study and generating a GIS mapping system. The study would focus on system conditions in terms of structural integrity and service needs as an effort to be proactive rather than reactive in system maintenance. The GIS mapping system aims to generate a computerized delineation of the water system to serve as a management tool.

Advice for Others Seeking ARC Funds

Frostburg recommends other establishments pursue a close relationship with a local liaison or administrator for the ARC, as it has helped them greatly. Additionally, they highlight the importance of staying tuned in to what kinds of projects are currently more favorable to receive funding when prioritizing what projects are put into motion. They also recommend staying well informed of what other funding sources are available and how they interact with the ARC, so that a project can become fully funded.

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Marshall County RockFon Infrastructure

UNC SCHOOL OF GOVERNMENT Environmental Finance Center

Chickasaw Trails Industrial Park in Marshall County, MS. Photo courtesy of Marshall County IDA.

Marshall County, MS
FY: 2016

Justin Hall
Marshall County Industrial Development Agency

Fiscal Year: 2016

Project Type: Water

Funds – ARC: $264,093

Project Close: 11/1/17

Benefits to Distress County and Area: Primary

Funds – Total: $330,116

Marshall County RockFon Infrastructure

BACKGROUND

Community Facts

In 2016, Marshall County, Mississippi, had a population of 36,196. The county, situated in the northern part of the state and within the Memphis metropolitan area, is adjacent to a major highway system. The median household income in the county in 2016 was $40,598 and the poverty rate was 18.2%. The unemployment rate was 4.9%. Industry has taken off in the area, providing a multitude of jobs and a shortage of qualified workforce. While not the major employer in the area, manufacturing provides the greatest earnings per worker and remains a stronghold in the community.

The county's industry increased just before the announcement of a RockWool plant in 2013. Industrial strongholds included Volvo, McCormick Seasonings, and Post Cereals, in addition to the RockWool facility. From there, industry and related jobs grew rapidly, including in 2016, when another industry was added to the mix: RockFon. The county utilized a mix of funding sources, including ARC funds, to provide water and wastewater infrastructure for another large industry.

Water/Wastewater System Facts

In Marshall County, the Marshall County Water Association (MCWA) is responsible for the provision of water to the site. According to EPA's Safe Drinking Water Information System (SDWIS), the water association provides groundwater-based service to 3847 people.[2] As of 2019, the base charge for water is $22.62 and includes up to 2600 gallons of water per month. The volumetric charge after that base charge is $8.12 per thousand gallons. For 5,000 gallons, the bill is $44.38.[3] The MCWA is governed by the state public service commission.

According to data from the United States Geological Survey, as of 2015, approximately 35% of the population in Marshall County receives water from a community water system. This value mirrors that of % of population served by community water systems from 2000.[4]

Specific Need/Driver for the Project

Increased industrial presence in the area drove the need for extension of utilities to the Chickasaw Trail industrial site. A new manufacturer, Rockfon, which produces acoustic ceiling tiles, had expressed interest in the site but needed electrical, gas, and water infrastructure extended to the area. The extension of infrastructure to support this industry also provides the opportunity for existing manufacturers to expand or for future economic growth at the industrial site. The industrial presence can put a lot of pressure on a community for water and wastewater expansions. In this case, the new industrial presence could use as much water as 500 residential customers and required additional infrastructure.

The Marshall County Industrial Development Agency (MCIDA) identified the industry as a potential candidate for the site and partnered with the MCWA to provide the water infrastructure. In order to meet growing industrial need for water in the county, the MCWA has independently committed $3 million to a new well. In addition, the MCWA is currently building a new well and treatment facility.

The Rockfon industry is a subsidiary of RockWool, which constructed a facility at the Chickasaw Trail Industrial Site in 2013 and laid the groundwork for significant growth over the next five years. RockWool is a Denmark-based producer of stone wool products. This group became one of the staple

industries at the site, along with Volvo, McCormick Seasonings, and Post Cereals, followed by Asics and DHL, amongst others.

The original RockWool site announced a nationwide site search of 20 states, eventually narrowing down to three specific sites: the Birmingham area, a site in North Carolina, and the Marshall County site. The Marshall County site was eventually selected, due to the proximity to the Memphis metro area and ease of access to a great portion of the U.S. population within a one to two-day trucking route.

Approximately three years after RockWool located to the Chickasaw Trail Industrial Site, the RockFon industry decided to construct the facility in the Marshall County area, necessitating infrastructure upgrades for the industrial processes.

PROJECT SPECIFIC INFO

Description of Project

The project included extension of water, gas, and electrical service to the industrial park for a new industrial facility, RockFon. The project included 960 linear feet of water line, 850 linear feet of gas line, and 2400 linear feet of electrical cable. The extensions allowed the new industry to locate to the area, which provided $42 million in leveraged private investment and created 90 new jobs—an economic boon for the county.

As of July 2019, RockFon had fulfilled their 90-job quota with potential to extend it to 100 jobs. The extension of infrastructure, in addition to providing necessary services to RockFon, provided service to another 240-acre site that has not yet been developed. The line extension provides redundancy to the edge of the Chickasaw Trail Industrial Park and allows for continued growth and line extensions should more industries decide to locate to the area.

Community Partners

The Marshall County IDA collaborated with a few groups on this project, most of whom are regular partners in bringing new industries to the Marshall County Chickasaw Industrial Site. For the Rockfon project, Marshall County IDA teamed up with the Mississippi Development Authority (MDA), by way of the Northeast Mississippi Planning and Development District, to find the right funding partners for this project. Given previous successes working with ARC funding, particularly on other infrastructure improvements for economic development, ARC was highlighted as a funding partner, with the rest of the funds provided by the county and MDA.

The Marshall County IDA works with the Mississippi Development Agency regularly to recruit new industries to the area, as well as the Marshall County Board of Supervisors, the MCWA, TVA, and other, more project-specific partners. For this project, the community buy-in was particularly strong and building off a string of large industries locating to the industrial site. Marshall County is becoming an established industrial hub and the establishment of the site, the proximity to the Memphis metro area, and the attempt to think holistically about industry and workforce development has put Marshall County in a unique position where it is becoming a hub for commuters from the surrounding counties.

Funding Outside ARC

ARC funding covered most of the project costs, negating the need for an extensive funding package with multiple funders. The additional $66,000 necessary to complete the project was provided locally.

BENEFITS AND CHALLENGES

Challenges to the Project

Due to the experience working with ARC funds for infrastructure and the previous work at the site, the project experienced very few challenges. Challenges related to finding the right contractor, weather, and general delays characterized the project, but most were not notable or outside the usual challenges of construction-based projects.

One notable issue surrounding not only this project but the explosive industrial growth in the area are issues with workforce development and skilled labor shortages. It is estimated that there will be some 2000 jobs available in the industrial sector in Marshall County in the next six months. These jobs will range in the skills and education needed, ranging from chemical engineers to forklift operators, but nearly all will reflect the "new age" of industry: clean, climate-controlled environments.

The county is working to address these issues by promoting growth in training facilities for robotics and other skills necessary for large industries. This includes a workforce training center and partnerships with local high schools to best prepare students for the types of jobs they may find after graduating. This "gateway program" that prepares students for non-traditional career paths is a partnership with two school districts to meet this growing demand for skilled workers.

The project, in addition to providing jobs to the community, also provided infrastructure for a few additional connections outside of RockFon. The extension of services passed a few parcels that have not yet been developed but could be added to the service population in the future if growth continues. This puts additional pressure on the Marshall County Water Association to meet rising demands for capacity and continue to expand its infrastructure while maintaining the existing infrastructure. This challenge is not unlike utilities in other areas that are experiencing growth.

Positive Outcomes

The continued industrial growth in the area has greatly increased the revenue base for the MCWA and provided the necessary revenue for improvements across the county, benefitting not only industrial customers but residential customers as well.

This project provided 90 jobs and additional tax base for the county, while also continuing the chain of industrial presence in the area. Recently, Amazon announced it is constructing a facility at the same site, and RockFon has been joined by industries like Kellogg's and Corelle (manufacturer of Pyrex). In sum, the project is just part of a major economic boom in the area. In total, the Chickasaw industrial site provides some 7,000 jobs and has created a hub in a state that otherwise does not have a major metropolitan area.

Foreseeable Challenges to the Project

As of now, there are no future challenges anticipated. The project was completed successfully, and the economic impact has been realized.

FUTURE COLLABORATION

Next Project/Area That ARC Funding Might Be Needed or Used

The Marshall County IDA and the Mississippi Development Authority are constantly working to improve the lives of individuals in Marshall County through economic development. Currently, the wastewater treatment plant is undergoing an upgrade with some ARC funds, there is a workforce

development center under construction using ARC funds, and those are only some of the projects. It is clear that ARC is an important player in the Marshall County area and will continue to be a resource in navigating infrastructure, planning, or workforce challenges going forward.

Experience Working with ARC

Overall, the Marshall County IDA has had a great experience working with ARC. The funds are relatively easy to apply for, the guidelines for application and reporting are relatively straightforward, and ARC is willing to work with communities that have shovel-ready sites for economic development. The collaboration seems ongoing, and without an end in sight.

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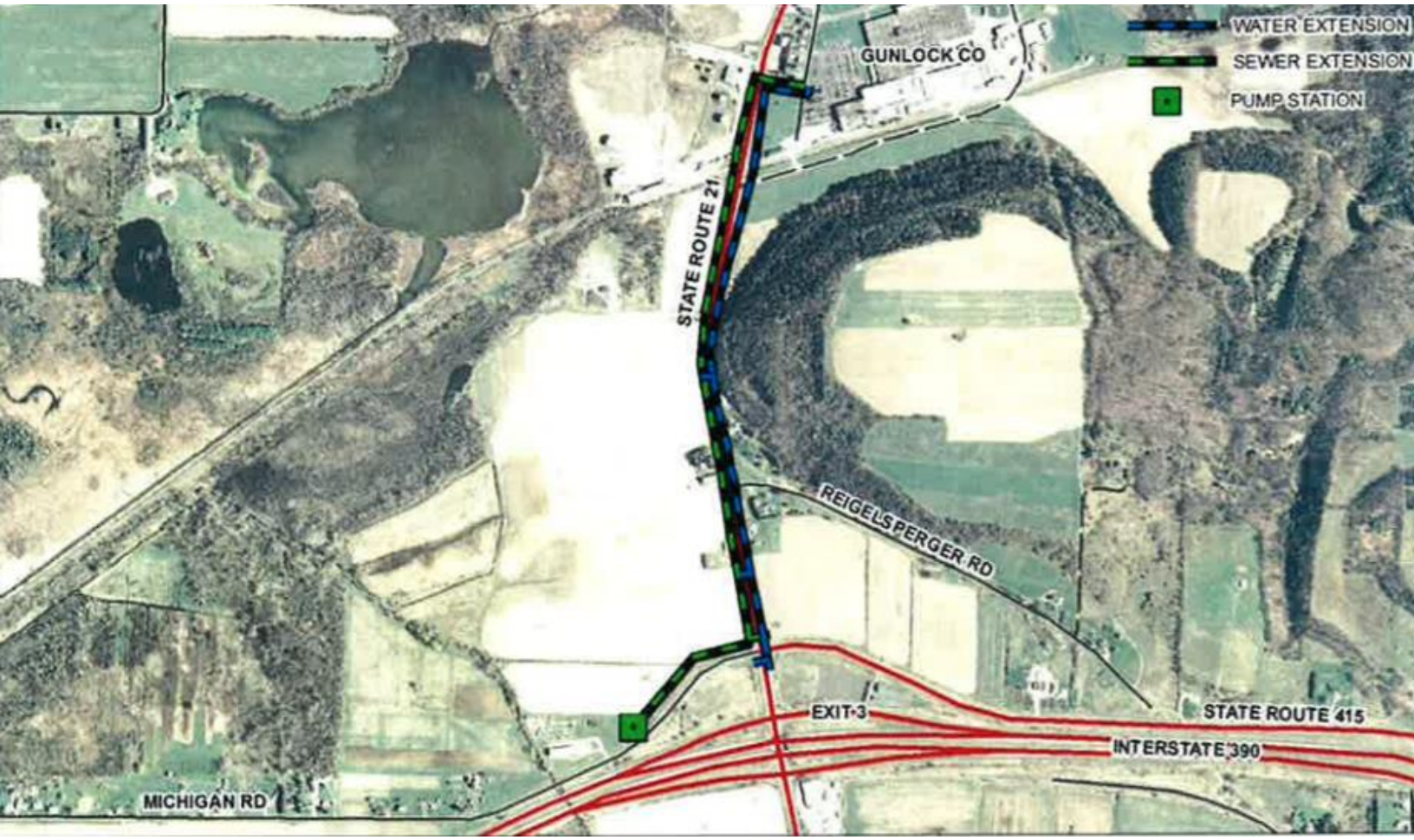
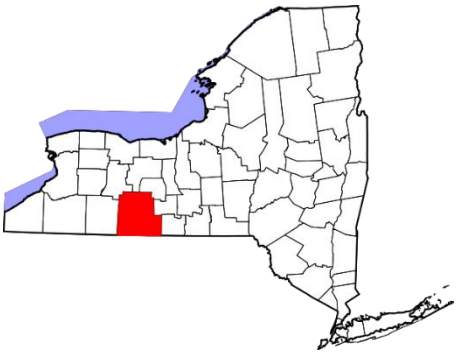
Wayland Business Park

UNC SCHOOL OF GOVERNMENT Environmental Finance Center



Outlined infrastructure expansions from the engineering report, prepared by Comprehensive Engineering Services.



Steuben County, NY
FY: 2014

Jamie Johnson
Steuben County Industrial Development Agency

Fiscal Year: 2014

Project Close: 8/3/2016

Project Type: Water and Wastewater

Benefits to Distress County and Area: None

Funds – ARC: $150,000

Funds – Total: $1,430,000

Wayland Business Park

BACKGROUND

Community Facts

Steuben County is located in the "Southern Tier" region of New York state. The population in 2013 was 98,951, and in 2017 the county population had declined slightly to 97,539. Unemployment was 5.5% in 2013 and has since declined to 4.1% in 2017.[1] Similarly, the Town of Wayland, within Steuben County, had a population of 4,070 in 2013 and 3,988 in 2017. The Town of Wayland is small and has a slightly declining population. The median household income (MHI) in 2013 was $41,168 and $51,029 in 2017. While the population is small and declining slightly, MHI grew significantly over these four years. Additionally, in 2013 the unemployment in the Town of Wayland was 7.4%, but had fallen to 4.2% by 2017.[2]

Steuben County's main industry is manufacturing. Corning, a Fortune 300 company, is headquartered in the area, just a half-hour drive from the Town of Wayland. Similarly, Alstom Manufacturing, which produces rail cars, is also a 30-minute drive from the site. Additionally, the Gunlocke Company is located in the area. Gunlocke produces high-end office furniture and employees about 600 people within the region.

Outside of manufacturing, Steuben County is quite rural and has a strong agricultural presence. The area has experienced growth in the dairy industry and the development of a few big dairy processors that produce cultured yogurts and cheeses. Industrial hemp is also beginning to take hold in the area.

Water/Wastewater System Facts

Village of Wayland Water & Sewer serves approximately 1900 residents in the Village of Wayland through 850 service connections and approximately 95 residents through 44 service connections in the Town Water District. The system's water source consists of two groundwater wells.[3] As of 2020, the Village of Wayland utilized a uniform block rate for both water and wastewater services. The Village bills quarterly. For water service, the Village has a base charge of $50.00 that includes a consumption allowance of 7,000 gallons. After that, customers are charged $3.51 per 1,000 gallons consumed. For wastewater, the Village's base rate is $63.75 and includes 9300 gallons. After that, customers can expect to spend $7.39 per 1000 gallons. Based on these rates, a household using 5,000 gallons per month, or 15,000 gallons per quarter, could expect to spend $26.02 per month on water and $35.29 on wastewater.[4]

Specific Need/Driver for the Project

Prior to the purchase and infrastructure extension to the Wayland site, Steuben County had experienced a significant uptick in the amount of retail distribution locating to the area. Best Buy had recently built a distribution center in the area, as well as Dollar General, Family Dollar, and Tractor Supply. In addition, the timing marked a strong era of Marcellus Shale gas, further driving fulfillment distribution centers for retailers and operations facilities for the shale gas industry.

Understanding the strong manufacturing industry in the area, the Steuben County Industrial Development Agency (IDA) began to examine available sites and industrial parks in the community to assess the capacity of the area for large industry. The county includes several smaller sites, ranging from 5 to 15 acres, but was lacking a large industrial site with access to necessary infrastructure that was

proximate to the interstate highways. Manufacturing and distribution facilities often have water and wastewater needs, and access to major highways provides an additional incentive for facilities to locate to a site.

The IDA identified a site spanning 150 acres directly off Interstate 390 and was provided a five-year option to purchase. Given the state of the real estate market at the time, the IDA did not have the resources to exercise the option to purchase. As year four of the five-year option passed, the owners expressed to the IDA that they would not renew the option to purchase, putting pressure on the IDA to act quickly. The offer at the time was priced at $5,000/acre, but the owners intended to raise the price substantially if the IDA did not act.

The site met all of the immediate needs for a large industrial presence. Most of the available land in the area was much more challenging to work with, either lying in a floodplain or on the side of a mountain, requiring additional internal infrastructure to prepare the site for development. This site was flat, right off of Exit 3 of Interstate Highway 390, and required little work outside of water and wastewater extensions.

The conclusion of this five-year period also marked the height of the Marcellus Shale gas development in the northeast, driving land prices to new heights. Understanding the community need for a large, contiguous site and the uncertainty around future land prices and availability, the IDA began to reach out to various development groups in hopes of partnering with a private developer to purchase and build infrastructure to the site.

PROJECT SPECIFIC INFO

Description of Project

The IDA eventually partnered with John Edmond, one of the founders of CREE Industries in the Research Triangle Park area of North Carolina. John Edmund was originally from the area and expressed interest in partnering. Once Edmond had purchased the property, the IDA began working to develop infrastructure at the site and prepare the site for development. The IDA sought out ARC funding as well as state funding to provide the necessary extensions.

ARC funding helped provide necessary water and wastewater extensions from the existing Village of Wayland municipal infrastructure to the site. The infrastructure was extended to the “curb” of the site, with the understanding that any internal infrastructure would be the responsibility of the industry in residence. The project included the construction of 4,720 linear feet of sewer line and a pump station and the construction of 4,090 linear feet of water main. With this infrastructure, the Steuben County IDA created a shovel-ready site with enough space to accommodate 1.1 million square feet of business development. In total, the infrastructure project cost $1.43 million, of which $1.2 million were direct construction costs.

The project led to a memorandum of understanding (MOU) between the Town of Wayland and the Village of Wayland to establish a Wayland Water District and a Wayland Sewer District. This MOU laid the groundwork for the Town of Wayland to purchase water and wastewater service from the Village to accommodate growth at the site.

The project is estimated to create 500 jobs and leverage $200 million in private investment within 10 years of completion.

Community Partners

The site purchase and public infrastructure project was born from an innovative public-private partnership to purchase the site. The site price, while outside of the budget of the IDA, was too desirable to give up, forcing the IDA to think outside of the box. This partnership allowed a private investor to exercise the right to purchase and the IDA to connect with the Village of Wayland and funding partners to provide the public infrastructure. The private investor is John Edmond of JMaC Properties of NY.

John Edmond, the private investor who purchased the property and partnered with the IDA, founded CREE in 1987 with five others. CREE developed blue LED lighting, a product that did not exist at the time, but provided a necessary product that allowed CREE to grow. CREE established their business by focusing on large, industrial LED lighting, but recently sold that division to focus on battery technologies for the automobile industry, amongst others. They employ approximately 5,000 people worldwide.

The project also created a partnership between the Town of Wayland, where the site is located, and the Village of Wayland, which provides water and wastewater service and owns the infrastructure. The partnership takes advantage of existing capacity at the Village system and provides opportunities for regional growth and collaboration that benefit the finances of both communities, through increased water/wastewater revenue and tax base.

Funding Outside ARC

In addition to the capital provided for the site purchase from Edmonds, the infrastructure extension also included funding partners outside of ARC. While ARC provided $150,000, the total project cost exceeded $1.4 million, requiring other funding partners. A contribution of $130,000 was made by JMaC Properties of NY, LLC, but the largest portion of the funding came from the state of New York, through the Regional Economic Development Council (REDC).

REDC provided $1.2 million of the funding in the form of a deferred loan. This loan was taken by John Edmonds, of JMaC Properties of NY, LLC, at a fixed 1% interest rate. This financing mechanism is based on 20-year terms, in which repayment begins upon development of the site, either through lease or sale of parcels, within the first 10 years. As of September of 2019, the site remained undeveloped.

BENEFITS AND CHALLENGES

Challenges to the Project

Once momentum towards purchasing the site began to build, the next steps were relatively smooth. The infrastructure costs were assessed, and potential funding and financing options were sought. Once construction began, the process moved relatively smoothly. The only challenge that arose during the project implementation process involved the construction window running through a particularly cold winter, which slowed things down.

The main challenges have been recruiting the right industry to fill the site. After purchasing and preparing the site, the nature of fulfillment operations has changed to a more polarized model. The sites either tend to be small or quite large, requiring more land and more employees. The area surrounding the site has very low unemployment and a small population, and thus a limited available workforce. While the site was also considered a desirable location for the shale gas industry, changes have hit the natural gas market, limiting the natural growth. Furthermore, New York state banned hydraulic fracturing.

As a result, the site remains undeveloped and without a committed future user. Over five years after site development and into the life of the infrastructure, JMaC Properties has not begun repaying the principal and interest on this sum. The terms of this loan, while providing an incentive to recruit the "right" industry and allowing for flexibility for the investor, could create a situation where the entire 10-year window for development passes and REDC has made a significant financial investment without return. This could mean that,if enough time passes, JMaC Properties is repaying a loan on infrastructure without selling or leasing the parcels.

Positive Outcomes

Despite the previously described challenges resulting from the project, there were also many successes. The project came in on time and on budget and allowed for some improvements to the municipal system along the corridor. Even though the site remains undeveloped, the extension of lines allowed homes and businesses along the path to tap into the system and provided benefit to approximately five households and two businesses outside of the original scope.

In addition, the extension of services to the site allows the Southern Tier, which includes Schuyler, Steuben, and Chemung counties, to have a large, shovel-ready industrial site that rivals any other site in the upstate of New York. Sites of flat terrain outside of a floodplain are challenging to find in upstate New York at this point, and the Wayland site is pre-permitted and has infrastructure available. While development of the site may take time, the area can accommodate a large industry immediately.

Foreseeable Challenges to the Project

Future challenges to the project stem from those that have arisen since the project was completed. Moving forward, challenges with a ready workforce to meet the needs of a large fulfillment center and changes to the market will continue to present challenges for attracting users to the site. The area remains rural, with unemployment falling from nearly 7% when the site was developed, to approximately 3.7% in 2019. New York state is a high cost-of-doing-business state, further limiting the desirability of the spot, especially considering the proximity to Pennsylvania.

Additionally, the IDA is continuing to feel pressure from project partners to fill the site. This includes the Town of Wayland, Village of Wayland, and JMaC Properties. While resources were generally not available within the IDA to purchase the site, in retrospect the Director of the Steuben County IDA says he could have pushed the board harder to exercise the option to purchase, rather than including a private investor. The investor needs a return on his investment, whereas the IDA is a non-profit and can plausibly lose money on the site. Because of the need to get a certain rate of return, it has, in a few instances, hampered the ability to market the site and recruit industries.

While the IDA could lose money to recruit an industry, it is impossible to say if the site would be developed under a different ownership model. The site, while shovel-ready, is pricey. Land can be purchased for $1,000/acre within proximity of the site, and while it wouldn't have municipal water or wastewater service, it could install a septic system to meet the needs. The question will remain if the site is "too rich" for the market.

FUTURE COLLABORATION

Next Project/Area That ARC Funding Might Be Needed or Used

The Steuben County IDA recently applied for a municipal infrastructure project in the Town of Prattsburgh. Similarly, a neighboring community, the Village of Hammondsport, just received ARC funding for a municipal sewer project.

The Hammondsport project is a wastewater treatment project to address issues related to water quality from failing septic systems. The community is on the southern tip of Keuka Lake and a tourist destination. Currently, all of the businesses are under consent decree due to their septic systems, and none of the businesses can expand due to the limitations associated with private septic and building capacity. The project will establish a municipal system in the downtown area that allows businesses to connect, addresses the water quality issues, and allows for downtown expansion.

Similarly, in Prattsburgh, a once-small telecommunications company has grown rapidly and needs additional sewer capacity, outside of what the current septic system can provide, to meet the growth. The company employs around 100 people in an otherwise very small town. To provide for an employee base of this size, the company has their septic system pumped twice a month and incurs the cost. Citing an inability to connect to municipal sewer, the company expressed a willingness to leave the area if the current situation was not addressed. This potential loss of industry drove the application for ARC funding, as the telecommunications company would be moving nearly 100 jobs from the area without the infrastructure upgrades.

In both cases, the design is essentially a large septic system, employing new technologies designed to work for small municipalities that may be growing but do not require a full, centralized treatment system. These communities are building a single-oversight septic system and treatment field where all the wastewater will be pumped and then managed on a municipal level. This technology allows for centralized management and oversight without all the infrastructure and costs associated with traditional centralized water/wastewater service.

Experience Working with ARC

Overall, ARC funding has been a great resource in the community to fill a gap. In general, the IDA has found ARC to be extremely useful, helpful, and willing to work together to make a project happen. The IDA has worked with ARC on many planning projects but has at times struggled to find a good basic agency for construction projects. Despite some challenges with larger projects, the IDA has used ARC funding for many smaller municipal projects and recommends ARC as a funding partner to any community than can utilize it.

At times, ARC funding has been challenging to apply to construction projects in New York state. Because there are only a handful of ARC counties in New York, the state does not prioritize ARC and thus few ARC projects are administered in the state. Finding the basic agency, outside of the state, to administer the funds has been an increasing challenge. Similarly, there is a maximum funding limit of $150,000 of ARC funding in New York, which is often only a fraction of an expensive infrastructure project. These challenges make ARC an imperfect funding source for construction projects and often better suited for engineering feasibility studies.

The IDA believes these challenges are more of a New York issue than an ARC issue, due to the lack of ARC counties in the state. The Wayland project was the only infrastructure project in the county that

did not have to go through the U.S. Department of Agriculture (USDA)-Rural Development (RD), and instead went through Empire State Development. In cases where USDA-RD is not a project funder, having them be the basic agency can present challenges. As such, on this project there were fewer reporting requirements and the ARC funding was more worthwhile.

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Universal Building Water Line Extension

UNC SCHOOL OF GOVERNMENT Environmental Finance Center

Universal Advanced Manufacturing Center. Photo courtesy of McDowell Economic Development Association, Inc.

McDowell County, NC
FY: 2016

Ashley Wooten
McDowell County

Fiscal Year: 2016

Project Close: 3/30/18

Project Type: Water

Benefits to Distress County and Area: Substantial

Funds – ARC: $140,500

Funds –Total: $311,000

Universal Building Water Line Extension

BACKGROUND

Community Facts

McDowell County is located in the mountains of Western North Carolina. Its population at the 2010 census was 44,996. In 2016, its per capita income was $31,479, its unemployment rate was 4.8%, and its 2012–2016 average poverty rate was 20%. From 2012–2016, 82.4% of the adult population had at least a high school diploma, while 14.6% had completed at least a bachelor's degree.[1] In 2016, its county economic status was designated "at-risk" by ARC.[2]

Water/Wastewater System Facts

The City of Marion's water department provides water and wastewater service and maintains and operates both treatment plants. The City draws from three creeks and can treat up to 4 million gallons per day (MGD), although current demand is only about 1.5 MGD.[3] The utility serves approximately 8668 individuals through 4440 service connections.[4] As of 2019, the City of Marion Water Department utilized a uniform rate, charging a $13.23 base charge for water service and a volumetric charge of $2.60 per thousand gallons. At 5,000 gallons of use per month, a residential household could expect to spend $23.23 on water.[4]

Specific Need/Driver for the Project

McDowell County purchased the Universal Building in 2012. It was formerly home to a furniture plant that had shut down over a decade before and was being used as a warehouse. The property was bought to become an expansion of McDowell Technical Community College (MTCC), which sat adjacent to it. However, one of the challenges was that the building was on city sewer, but not city water. Since the college is a part of the North Carolina Community College System, the state mandated that the building must be served by public water to be used for educational purposes.

PROJECT SPECIFIC INFO

Description of Project

This project provided public water to the Universal Advanced Manufacturing Center, which is an extension of McDowell Technical Community College (MTCC), to be used as an industrial skills training center. Specifically, the project involved the installation of approximately 2,340 linear feet of 8-inch water line attached to the Universal Advanced Manufacturing Center that was connected to the city's 12-inch water line. The line was installed by the county but is operated and maintained by the City of Marion.

Community Partners

Many partners in the community have supported the county with encouraging support for the project, applying for grants, project administration, and maintenance. The county has a great relationship with MTCC and the college's administration was highly supportive of this expansion. The NC community college system also got on board with the project, even using this new skill center as a model for other state community colleges to emulate. Since the people of McDowell County are the ones that directly benefit from skills training centers such as this, the project also received great buy-in from the community.

Additionally, the county has a committee called the "workforce pipeline committee," which involves a partnership between local industries, the public school system, and MTCC. Some local employers even helped fund the project by paying for some of the industrial training equipment. The local council of government (COG), Isothermal Planning and Development, played an instrumental role in getting the ARC grant for the county and helping to administer the project.

Funding Outside ARC

Outside of ARC, a portion of the water line costs were funded by local dollars. The actual building renovations that created the Universal Advanced Manufacturing Center, however, were funded by a $2 million investment from the Golden Leaf Foundation, an organization that uses tobacco settlement agreement monies to fund projects in North Carolina's rural communities. Without this grant, the project never would have happened. Additionally, the county took out a loan to finance the original purchase of the property.

BENEFITS AND CHALLENGES

Challenges to the Project

Overall, the project went as well as it could have. However, one issue that occurred with the installation of the water line was the railroad. There is a CSX railway line that runs between the college campus and the Universal Advanced Manufacturing Center. They had to have an inspector from CSX onsite the entire time they were boring underneath the railroad, which added additional time and cost to the project.

Positive Outcomes

The state community college system has brought in representatives from other community colleges to see the new addition to MTCC, which they view as a model for future industrial skills training centers in North Carolina community colleges. The facility is also being used and has begun to send graduates into local industries, many of which have partnerships with the college. Local companies have worked with the college on expansion projects to help train new and prospective employees. Additionally, there is still much more land available for development on the college premises, which leaves open future opportunities for investment by the county, the college, and private industry.

Foreseeable Challenges to the Project

The major challenge that will face this project is maintenance. The Universal Advanced Manufacturing Center is 400,000 square foot building on a 300-acre property. They are looking to further develop the property, but without assistance from ARC or another grant agency, they will not be able to proceed very quickly due to lack of funds. They need to maintain the utilities and do some repairs to the roads around the property. With heavy rains, they have also had some flooding issues with the creek near the building, which will be an issue they have to monitor.

FUTURE COLLABORATION

Next Project/Area That ARC Funding Might Be Needed or Used

Currently, the land between the main campus of MTCC and the Universal Advanced Manufacturing Center is vacant. A portion of this land has been set aside by the county for future use by the college over the next 50 years. So, ARC funding may be sought for future development of this land for educational purposes. Additionally, other portions of the undeveloped land have been set aside for

business use. The area around Marion, the county seat and home of MTCC, has seen some growth in recent years, so this is another area where ARC funds could be used to fund public water or sewer service expansion.

Experience Working with ARC

The county's experience with ARC has overall been positive. The county always tries to get as much money in grants (rather than loans) as they can for project funding. The local COG, Isothermal Planning and Development, has a close relationship with ARC and have always focused on acquiring ARC funding for projects. ARC staff have worked with the COG and the county to help them put together the best possible applications for funds. The major downside that comes with ARC funding, in their experience, is that the grant application process is long. From submission to being awarded funds, the process can take 6–9 months or more, so when they are in a greater hurry to complete a project, they look elsewhere.

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[1] U.S. Census Bureau American Fact Finder: McDowell County, North Carolina. (2019). Retrieved from https://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml.

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Racine Water Line Replacement

UNC SCHOOL OF GOVERNMENT Environmental Finance Center

Village of Racine, OH Splash Park. Photo courtesy of Scott Hill and the Village of Racine.

Meigs County, OH
FY: 2009

Scott Hill
John Holman
Village of Racine

Fiscal Year: 2009

Project Type: Water

Funds – ARC: $250,000

Project Close: 4/30/14

Benefits to Distress County and Area: Primary

Funds – Total: $844,800

Racine Water Line Replacement

BACKGROUND

Community Facts

The Village of Racine is a small, residential community along the Ohio river in Southeastern Ohio. The Village is located in Meigs County, and most residents commute 45–50 minutes to neighboring cities, like Athens, for work. The Village is home to a public school, Southern High School, and a few small businesses. As of 2010, the population was estimated at 675 and the median household income was $30,774. The median age was 40 years, with 24% of the population ages 62 or older. As of 2017, the estimated population was 711 people.[1]

Water/Wastewater System Facts

The Village of Racine solely operates their water system. The Village serves 387 connections, most of which are residential. The Village houses a few apartment complexes and schools, providing a few larger customers for the revenue base. The groundwater system is fed by five wells, pumping approximately 100,000 gallons per day. The system is interconnected with Tuppers Plains-Chester Water District, but only exchanges with the neighboring district in times of emergency. According to the EPA Safe Drinking Water Information System, the Village serves approximately 652 people with water.[2] The Village has a built-in 3% rate increase every year to account for rising costs, and in 2020 the rate for 5,000 gallons of water is $56.00.

The Village is part of a regional entity, the Syracuse Racine Regional Sewer District, for the provision of wastewater and is not responsible for maintenance and replacement of the system, or rate setting.

Specific Need/Driver for the Project

The original Village of Racine water system was constructed in the early 1950s, and as of 2007, the system had not experienced any significant upgrades. The system was too small for the village's needs, the treatment plant wasn't up to compliance standards, and line breaks were common. The entire system was deemed as a problem area, and the community knew that failure was imminent. There were no meters within the town, making it hard to identify leaks or address overuse, and all customers paid a flat fee of $12/month.

Old Water Treatment Plant, Village of Racine. Photo courtesy of the Village of Racine.

Additionally, water loss was calculated at approximately 65%, causing significant revenue loss for the system and pushing the Village to address major infrastructure challenges. The treatment plant was pumping 23 hours a day to maintain pressure in elevated tanks due to the system losses. Understanding that the infrastructure needed to be addressed, the Village reached out to the Rural Community Assistance Project (RCAP) and hired an engineering firm to outline the needs and draft a plan for replacement.

The Village used this engineering assessment to piece together projects to replace the system, contingent on the funding available.

PROJECT SPECIFIC INFO

Description of Project

The Racine Water Line Replacement project was phase one of a two-phase project in the Village. This project replaced a major water line within the system, resulting in improved service for all customers and providing service to 20 new connections. The project involved replacement of failing water lines with new plastic lines, the addition of two new water meters, and valves and hydrants. Both Phase I, highlighted here, and Phase II, titled "Racine Water System Improvements Phase II," contributed to significant reductions in water loss and increased pressure within the system.

Community Partners

Many partners came together to push the project forward. RCAP provided assistance with rate setting, financial management, and understanding the path forward. The engineering firm provided the study without any upfront costs, allowing a small town with limited resources to understand their need and secure funding before paying for an engineering study. Buckeye Hills Regional Council facilitated piecing together the funding and assisted with the grant administration, specifically fund spend-downs and nuances of different funding agencies.

The project had two champions, Scott Hill, the Mayor of the Village, and John Holman, the water operator. These two individuals were with the Village at the time of the project and remain there today. At the time this project took place, each had been with the Village for at least 10 years. They utilized community meetings to communicate with ratepayers about the project and the need for an increase in rates. While rates are always a challenging topic, the trust that exists between the members of the small town and the decision makers, as well as the understanding on the part of the operator and mayor, facilitated community buy-in.

Funding Outside ARC

In addition to ARC funds, this project included funding from the Community Development Block Grant, the Ohio Public Works Commission, the Ohio Environmental Protection Agency, and a 30-year low interest loan from Ohio Water Development Authority.

The scope of each phase of the project was contingent on the amount of funds the town could secure. In this case, the total project cost for Phase I was $844,800, of which ARC provided $250,000. Phase II's total cost was $2,892,000 and ARC again contributed $250,000.

BENEFITS AND CHALLENGES

Challenges to the Project

The only challenge associated with the project was the environmental review process. Because the project involved multiple funders, there were multiple environmental reviews that needed to be conducted, which put a strain on the staff of a small community.

The project finished on time and on budget, thanks in part to the timing. The economy had not rebounded at the time of the project bids, making the bidding process particularly competitive and thus driving down the project costs.

Positive Outcomes

The project, while not particularly innovative or out of the ordinary, greatly reduced water loss. The 65% water loss prior to replacing the system is now down to approximately 3–5%; a significant improvement with a direct benefit to the utility's expenses, and thus, the ratepayers.

This reduction in water loss helped increase pressure within the system, and, as a result, the town could increase their fire flows, lowering their class rating according to the Insurance Service Office (ISO) and improving homeowner's insurance rates. The treatment plant no longer has to pump 23 hours a day to retain pressure within the system and, sometimes, only needs to pump every three days. This, too, provides a direct reduction to the utility expenses.

New Water Treatment Plant, Village of Racine. Photo courtesy of the Village of Racine.

Additionally, the reductions in water loss have freed up significant capacity within the system. Prior to the infrastructure replacements, the village could not take on any additional building because of the%loss. Since the replacements, the school within the village was able to build additional facilities and provide water service to those additions. Similarly, the Village was able to add a "splash park" facility for residents to play in and establish a bulk sale site at the treatment plant. Now, as a result of this additional capacity, folks outside of the service area can drive to the water treatment plant and purchase treated water on site for $0.50 per 100 gallons.

Foreseeable Challenges to the Project

Today, the system has been completely replaced and, for now, the Village believes the water system is in a good place. The infrastructure is new, and the utility is setting aside rate revenues for future replacement of meters and, eventually, infrastructure, and maintaining the system to the best of their abilities. The Village lies along the Ohio River, and to avoid challenges associated with floods and system interruptions, the wells and treatment plant are located outside of the 100-year flood plain. The system has invested in a generator to ensure provision of water in case of power loss. Similarly, the system has an emergency fund to cover any unexpected needs.

Despite these measures, the Village anticipates replacements down the line to again be an eventual challenge, but they aim to be more proactive this time, investing in necessary maintenance and putting aside funds, so the system does not again get to the point of near failure.

FUTURE COLLABORATION

Next Project/Area That ARC Funding Might Be Needed or Used

The Village does not have any current plans for utilizing ARC funding. Given the entire system has effectively been replaced as of 2017, water infrastructure needs are low. The Village did report that the regional sewer district is working through some significant upgrades, and while the Village is not

responsible for that system, ARC funding could play a role in the continued provision of wastewater service for residents.

Experience Working with ARC

The Village has successfully utilized ARC dollars for many projects during the course of replacing the water system. Overall, the experience was positive, and the Village has found that when piecing together a funding package, there normally needs to be one funder that commits early on before others get on board. In the case of the Racine Water Line Replacement project, ARC has been easier to commit to funding a project without other funding secured, allowing it to be the building block of the funding package.

References

[1] U.S. Census Bureau American Fact Finder: Racine village, Ohio. (2019). Retrieved from https://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml.

[2] United States Environmental Protection Agency (USEPA). (2019, December 2). Water Systems Search | SDWIS | US EPA. Retrieved from https://ofmpub.epa.gov/apex/sfdw/f?p=108:103:::NO:RP::.

Pendleton/Clemson Wastewater Treatment Plant Upgrade

UNC SCHOOL OF GOVERNMENT Environmental Finance Center

Pendleton-Clemson Wastewater Treatment Plant and Eighteenth Mile Creek from Google Maps

Anderson and Pickens County, SC
FY: 2015

Steve Pelissier
Arlene Young
Chip Bentley
South Carolina Appalachian Council of Governments

Fiscal Year: 2009

Project Type: Wastewater

Funds – ARC: $500,000

Project Close: 10/24/12

Benefits to Distress County and Area: None

Funds – Total: $3,447,000

Pendleton/Clemson Wastewater Treatment Plant Upgrade

BACKGROUND

Community Facts

As of the 2010 Census, the Town of Pendleton, South Carolina, had a population of 2,964 and a median household income of $25,669, with a median income of $41,818 for families. Its unemployment rate was 6.2% and 37.3% of the population lived below the poverty line. A total of 89.5% of the population over age 25 had at least a high school diploma, while 34.5% of the population had at least a bachelor's degree.[1] The City of Clemson, South Carolina, had a population of 13,905 and a median household income of $33,935, with a median income of $77,056 for families. Its unemployment rate was 6.2%. Of the population over age 25, 95.3% had at least a high school diploma, while 66.5% of the population had at least a bachelor's degree.[2] Anderson County and Pickens County, where these towns are located, were both designated as "transitional" by ARC.[3]

Clemson and Pendleton are suburban communities located west of Greenville, SC in the northwestern part of the state. At the heart of the economies of both towns is Clemson University, which is a major employer with a staff of 5,564 people and has served to bring businesses into the area along with a population of over 25,800 students. The local economy is also served by tourism from the university and the nearby Blue Ridge Mountains.[4]

The area has also been marked by a significant uptick in industrial growth over the last 10 years, including large manufacturing facilities for companies such as Michelin North America, BMW Group, General Electric Company, and distribution centers for companies such as Bi-Lo, LLC and Walgreens. The area is part of the I-85 "boom belt" that runs from Charlotte, North Carolina, nearly entirely through Atlanta, Georgia. Low property taxes and an available workforce have allowed Anderson and Pickens Counties to attract many large employers to the area, and thus facilitated significant economic and population growth.[5]

Water/Wastewater System Facts

The Pendleton/Clemson Regional Wastewater Treatment Plant serves residents of the neighboring towns of Pendleton (in Anderson County) and Clemson (in Anderson and Pickens counties), as well as some residents in surrounding unincorporated communities. The plant is located in and owned by the town of Pendleton, but it shares operation of the plant with the City of Clemson, to which 50% of its capacity is allocated. Anderson County also owns 5% of the treatment capacity at the system. As of 2019, the City of Clemson charged customers a uniform rate for wastewater service, with a base rate of $15.23 per month and a volumetric charge of $4.78 per thousand gallons. At 5,000 gallons per month, the monthly bill would be $39.13.[6]

The plant has been a jointly operated plant for several decades, with the operations controlled directly by the two towns, rather than operating as a separate utility. Given the hydrology of the area and the associated discharge limitations, the area has relied on partnerships for decades to facilitate economic growth. While created by environmental conditions, the early uptake of regional partnerships helped capitalize on economies of scale at a time when the region was much smaller.

The plant discharges its treated wastewater into Eighteen Mile Creek, and the biosolids removed from wastewater are used for application on local agricultural fields as fertilizer. As of 2015, 79% of Anderson County Residents and 85% of Pickens County residents are served by public water.

Specific Need/Driver for the Project

The main driver for the Pendleton/Clemson Wastewater Treatment Plant Upgrade project was to bring the plant into compliance with new environmental regulations. A new National Pollutant Discharge Elimination System (NPDES) permit set more stringent requirements on how much wastewater could be discharged by the plant and the quality of that effluent, specifically the amount of phosphorus. However, at its current state, the plant was unable to meet those requirements. Without improvements in the wastewater treatment process, the plant would have fallen out of compliance with the South Carolina Department of Health and Environmental Compliance (DHEC), which enforces NPDES permits in the state. The project was also needed to support future planned capacity expansions to accommodate a growing population in its service area.

The area is located at the headwaters for the state, meaning most of the streams for discharging are relatively small. The Pendleton/Clemson plant is no different, leading to relatively stringent permitting requirements given the low volume and flow. This more stringent discharge limit combined with increased development in the area, and thus additional wastewater to treat, did not provide a wealth of solutions to these challenges. The area has also experienced an increased industrial presence, putting specific pressure on system to address the constituents of this industrial influent. The only way to meet these competing demands was to increase the system reliability and performance through additional treatment technologies.

PROJECT SPECIFIC INFO

Description of Project

This project included a number of improvements to the wastewater treatment processes of the plant, involving the construction of new influent headworks facilities, including screening grit removal, a rapid mix tank, chemical feed improvements, and tertiary filters such as UV treatment to destroy disease-causing microbes. Additionally, a 4.5-million-gallon equalization basin was constructed to help regulate the flow of wastewater into the plant during especially rainy periods when influent is high. The equalization basin served to temporarily reduce the need for a capacity expansion by allowing this better regulation of treated rainwater. The project was approved in 2009 and closed on October 24, 2019.

As mentioned previously, this project was used to delay treatment plant expansion by increasing the level of treatment to meet permit requirements and reduce the amount of rain treated at the facility. In the long-term, however, these upgrades are phase one of a larger plan to improve the system and expand capacity. This expansion would take the plant from a 2MGD (millions of gallons per day) facility to a 3MGD facility, with the understanding that the area will continue to grow and have additional capacity needs.

Community Partners

The local council of governments (COG) partnered with the City of Clemson and the Town of Pendleton, who jointly operate the plant. DHEC delegates Clean Water Act Section 208 planning to local COGs, who work with local stakeholders for a body of water to decide how to most efficiently ensure

compliance with water pollution regulations. The towns and the local COG worked closely with DHEC to ensure all parts of the project were in compliance with state and federal environmental regulations. The construction was completed by a regional engineering firm, Design South. DHEC helped ensure that all plans and construction met their permitting standards.

The project was administered through the South Carolina Office of Budget and Control, in Columbia, South Carolina. While disconnected from the actual locality of the project, this plant upgrade included American Recovery and Reinvestment Act of 2009 (ARRA) monies, at a time when "shovel-ready" projects were funded relatively rapidly.

Funding Outside ARC

In addition to a $500,000 grant from ARC, this project received a $2.8 million loan from the South Carolina Pollution Control revolving loan fund, which is administered by DHEC. However, this loan had 45% forgiveness, which meant a net loan amount of $1.592 million. This remaining amount has a 20-year payback period and an interest rate of 3.5%. The project was also supplemented by federal stimulus money in 2009, bringing total funding to $3.447 million.

BENEFITS AND CHALLENGES

Challenges to the Project

There were no significant barriers to the completion of the project. Once underway, it was completed on time and with no major hurdles. The task of remaining in compliance was straightforward for the treatment plant, and given the project was driven by compliance, it was pushed forward quickly.

The biggest challenge to the project was the price tag, and making sure funding was available and could be pooled to meet the needs of the facility. Once this was secured, the project went smoothly.

Positive Outcomes

Currently, the improvements are serving their purpose and the plant is still in compliance with all relevant environmental regulations, seven years after the completion of the project. In addition, while this project was designed to serve as a stepping stone to a plant expansion, to date the expansion has not occurred. By addressing the high peaks in volume into the facility, the equalization basin has provided the necessary regulation of flow into the plant to allow for it to continue to operate at its current size.

Foreseeable Challenges to the Project

A major challenge for the plant will be continuing to meet the requirements for discharge into Eighteen Mile Creek. It is a small stream and, as a result, has stringent limits on how much and what may be discharged into it. EPA and DHEC are constantly monitoring changes in environmental conditions and adjusting regulations according. Because environmental regulations can be a moving target, maintaining compliance is always a primary concern for the treatment plant.

An additional challenge will be meeting the needs of a growing population, especially in Clemson, which has seen growth in its student population and greater water consumption as a result. Eventually, a capacity expansion will be necessary to serve growing needs, which will certainly come with a high price tag.

FUTURE COLLABORATION

Next Project/Area That ARC Funding Might Be Needed or Used

This project was in direct response to environmental regulations, but it also served as an intermediary step of a long-term plan to expand the plant's capacity from 2 MGD to 3 MGD. This expansion has not yet taken place but will sometime soon, and ARC funds may be needed to support this eventual expansion.

Surrounding towns, including Powdersville and Walhalla, are currently undergoing water infrastructure projects with ARC funding. Similarly, the Oconee Joint Regional Sewer Authority recently received funding from ARC and is waiting for the US Economic Development Administration (EDA) funding before moving forward. The area's rapid growth has created a significant amount of infrastructure need, much of which will include some ARC funding.

Experience Working with ARC

The experience of those working directly with ARC on this project was very positive. The Grant Services Director of the local COG remarked that she was impressed with the flexibility of ARC and the technical assistance provided to assist in grant-writing. ARC worked closely with the COG throughout the whole project development process to help them send in the most competitive grant application possible.

References

[1] U.S. Census Bureau American Fact Finder: Pendleton town, South Carolina. (2019). Retrieved from https://factfinder.census.gov/faces/nav/jsf/pages/community_facts.xhtml.

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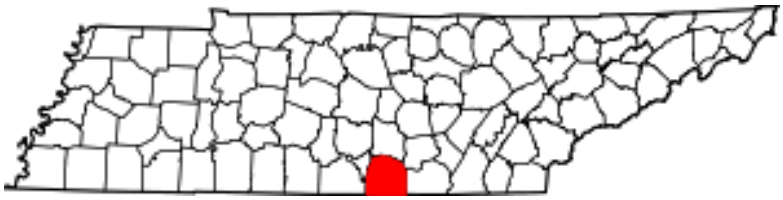
Decherd Water Transmission Line

UNC SCHOOL OF GOVERNMENT Environmental Finance Center

Nissan Plant in Decherd. Photo courtesy of Nissan USA.



Franklin County, TN
FY: 2015

Brooxie Carlton
Tennessee Department of Economic and Community Development

Lorie Fisher
Southwest Tennessee Development District

Start Date: 2015

End Date: 7/31/17

Project Type: Business Site Development

Benefits to Distress County and Area: None

Funds – ARC: $150,000

Funds – Total: $450,000

Decherd Water Transmission Line

BACKGROUND

Community Facts

Decherd is a small city within Franklin County, Tennessee, with a 2017 population of 2,361, representing a 6% increase from the 2010 population.[1] Franklin County is in the middle of the southernmost portion of Tennessee, sharing a border with Alabama. The 2018 population was 41,890, representing a 2.0% increase from the 2010 population, and the population density was 74 people per square mile.[2] As of 2015, 99.2% of the county's population was on public water.[3]

From 2013–2017, the county had a median household income of $46,882, a per capita income of $25,637, and a poverty percentage of 14.9%.[2] For context, the national average for per capita income and poverty percentage are $51,640 and 4.8%, respectively. The largest industries in Franklin County are manufacturing (4,371 people), educational services (2,523 people), and retail trade (2,230 people). The highest paying industries by median income are utilities ($80,875), information ($70,109), and professional, scientific, and technical services ($62,330).[4] Regarding education, a 2014–2018 average revealed 87.2% and 20.7% of the county had graduated high school and obtained a bachelor's degree or higher, respectively, compared to national statistics of 87.3 % and 30.9 %, respectively.[1]

Water/Wastewater System Facts

Decherd water department is a community water system owned and operated by local government. They serve an approximate population of 4,334 with drinking water sourced from groundwater that is influenced by surface water.[5] The water department charges a uniform rate and has specific rates for customers inside of city limits, or "inside" customers, and those outside of city limits, or "outside" customers. All inside customers pay a $10.00 base charge that includes 1,000 gallons of consumption. For all usage over 1,000 gallons, inside customers are charged $4.57 per 1,000 gallons. The outside rate is 1.5 times the inside rate.[6] At 5,000 gallons per month, a residential customer inside town limits in Decherd should expect to pay $28.28 per month.

Specific Need/Driver for the Project

This water line project was a reactive operation initiated by a line break in the water distribution system that supplied the local Nissan automotive plant. The break in the water line caused Nissan to run out of water and ultimately shut down for two shifts, which also caused the Canton, Mississippi plant to halt operation. Before this project, the water system supplying Nissan also supplied the rest of Decherd, and so any time there was a break in any of the distribution it would affect the water supply to the automotive plant. Nissan therefore needed a direct water supply as assurance the community could provide appropriate and adequate utilities to avoid future shutdowns and complications.

PROJECT SPECIFIC INFO

Description of Project

"One 95,000-gallon storage tank will be erected and fire hydrants located in the project area," was listed in the grant; however, Lorie Fisher stated that the tank was already there, and that the grant was just to build a water line to the tank. ARC reportedly provided $150,000, which was spent on construction and

construction-related expenses. In the end, Decherd, over a four-month period, built a dedicated line from the water treatment plant to the water storage tank at the Nissan plant.

Community Partners

Decherd has been a longtime partner with Nissan. The company is the city's main economic driver. Additionally, most of the water/wastewater infrastructure expansions in Decherd have been at the request of Nissan; therefore, the company agreed to a custom fee and payment schedule for utilities to help offset the cost of operating and maintaining the water/wastewater treatment plants. Another partner is the Tennessee Department of Economic and Community Development (ECD). The ECD is often a source of funding for projects.

Funding Outside ARC

Outside funding was provided by the ECD and the City of Decherd. ECD provided a $228,000 FastTrack infrastructure grant, while the city contributed $72,000. In order to secure FastTrack funding, and to secure ARC funding in a non-distressed county, Nissan had to commit to creating jobs as a result of this project. FastTrack is a funding source for economic development projects, and thus contingent on the commitment from Nissan.

BENEFITS AND CHALLENGES

Challenges to the Project

No major challenges were reported. The project went as planned; the contractor met the deadline and no obstacles were encountered. Yet, some local businesses were inconvenienced by the construction of the new water line; however, they were still in support of the project as it helped Nissan, the town's main source of employment. An additional minor challenge reported was figuring out the process of hiring a consultant. Tennessee had just become the registered basic agency, which complicated the hiring process.

Although not a challenge once the project began, acquiring the funding for the project was stated as a difficulty. There was a delay in the processing of the pay request because of an individual in the Appalachian Management Systems and the process of bidding through the ECD. Additionally, the inconsistency of the requirements for the various funding sources was reportedly difficult to navigate.

Positive Outcomes

Installation of this water line assured Nissan that Decherd was committed to providing reliable utilities, thus further solidifying the relationship between Nissan and the community. Additionally, this direct water supply became an essential step in a larger project to expand the automotive plant. Expansion resulting from the new water line accounted for 50–75 new jobs at the Nissan plant.

Foreseeable Challenges to the Project

Maintenance and depreciation are a future challenge for Decherd. As a small community, tackling these challenges is a large, long-term undertaking. While this project allowed for new infrastructure to go into the ground with a reasonable life span, the community must begin planning for the rehab and replacement of the line now, as the purchase cost of the asset is only a fraction of the total cost over the life of the asset.

FUTURE COLLABORATION

Next Project/Area That ARC Funding Might Be Needed or Used

Deckard is now working with Nissan to improve and expand the wastewater component at the automotive plant to allow for further expansion of the company.

Experience Working with ARC

The Decherd project presented some early challenges with state basic agencies; it was a learning process. There was some confusion regarding who administers construction projects. In addition, there were challenges understanding the requirements for ARC funding and coordinating these requirements with other federal funding sources. Despite these challenges, ARC was a critical funding partner for this project.

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Kingsport Sewer System Upgrade

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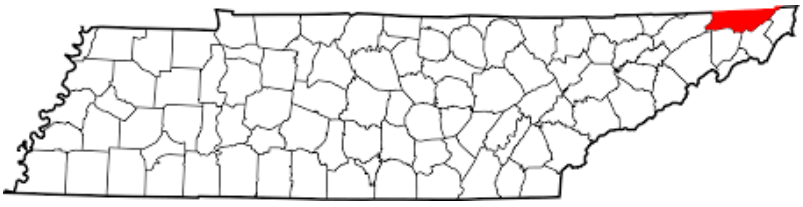
Eastman Chemical Company's corporate headquarters in Kingsport, TN. Photo courtesy of Eastman Chemical.



Sullivan County, TN
FY: 2015

Ken Rea
First Tennessee Development District

Fiscal Year: 2015

Project Close: 1/9/2018

Project Type: Wastewater

Benefits to Distress County and Area: Primary

Funds – ARC: $300,000

Funds – Total: $711,200

Kingsport Sewer System Upgrade

BACKGROUND

Community Facts

Kingsport, Tennessee, is a city in Sullivan County, in the northeastern part of the state on the border with Virginia. It is part of the "Tri-Cities," along with Bristol and Johnson City, Tennessee. The city was reestablished in 1917 and recently celebrated its centennial. Kingsport is known as a "garden city" as it was planned by a landscape architect and city planner upon being reestablished. The plan was called the "model city" and organized the town into areas designed for industry, faith-based institutions, residences, and downtown shops and businesses.[1]

As of the 2010 census, Sullivan County had a population of 156,823. In 2015, its per capita income was $38,799, unemployment rate was 5.8%, and 2011–2015 poverty rate was 17.5%. From 2011–2015, 85.5% of the adult population had at least a high school diploma. During the same period, just 21.9% had a bachelor's degree or higher.[2] Its economic status was listed as "transitional" in 2015 by ARC.[3]

The largest sector of the Sullivan County's economy is manufacturing. The single largest employer in Kingsport is Eastman Chemical Company, an international chemical company headquartered in Kingsport and employing approximately 7,000 people in the area. In general, unemployment is low and the community struggles to find skilled workers. The town has worked to build and develop continuing education opportunities in the downtown area that prepare individuals for the jobs present in the community. Many of these facilities have been built with ARC dollars in previous years.

Kingsport is an aging community. In addition to the older individuals aging in place, the city has become a desirable location for retired individuals seeking lower taxes and a reasonable climate. The city has a strong tourism presence, sitting just along the Appalachian Mountains and providing access to hiking, biking, kayaking, and other outdoor activities.[4]

Water/Wastewater System Facts

This project's infrastructure is part of the Kingsport sewer system, which is under the City of Kingsport Water Services Division. This division oversees everything related to water, sanitary sewer, and stormwater infrastructure in Kingsport.[5]

Kingsport owns a single wastewater treatment plant that discharges into the Reedy Creek, which meets the South Fork Holston River just past the plant. Currently, the plant treats approximately 9 million gallons of wastewater per day. The plant has served the town since 1955 and is currently undergoing significant upgrades and improvements to continue meeting the needs of customers and remain in compliance.[6]

As of January 1, 2019, the monthly "inside" residential bill for 5,000 gallons of wastewater service totaled $40.70. The utility has a uniform rate, with a base charge of $16.28, with 2,000 gallons included. Each addition 1,000 gallons is $8.14. For "outside" customers, this rate is multiplied by 1.5.[7]

Specific Need/Driver for the Project

The need for this project came from the Eastman Chemical Company's creation of a new 300,000-square-foot corporate business office in the city of Kingsport. At the time Eastman announced the new corporate office, the sewer infrastructure was undersized and inadequate to meet the needs of the new

facility. Eastman already had a large chemical manufacturing plant in Kingsport, where the company was founded in 1920. In addition to the new corporate office, Eastman was planning to upgrade several of its manufacturing facilities. This new expansion and the upgrades to existing facilities represented $1.6 billion in leveraged private investment and the creation of 300 jobs.

When Eastman made the announcement, the City looked at its infrastructure to see if it could meet the needs of the upgrades and the expansion. Since Eastman is one of the largest employers in the area and had plans to employ 300 more, the city recognized the importance of being able to provide adequate wastewater infrastructure to the new office. The city and the First Tennessee Development District (FTDD) worked together to secure the funding to get the project off the ground.

PROJECT SPECIFIC INFORMATION

Description of Project

This project involved the replacement of old, deteriorating sewer lines with new, larger lines to handle the additional capacity from the new building. First, the city put cameras in the sewer line to survey the extent of the damage. Once it was determined where the sewer lines needed to be replaced, the old sewer lines were replaced through a process of pipe bursting.

In addition, the project included laying a new pipe at the junction of the line from Eastman's new facility and an existing line along Wheatley Drive. The project also included grouting lines along Industry Drive, which runs along the river and provides passage for most of the flow to the wastewater treatment plant.

Community Partners

The FTDD and the City of Kingsport partnered with the Eastman Chemical Company, for whom the sewer lines were constructed to serve.

Funding Outside ARC

This project received a $300,000 grant from ARC, out of a total project budget of $782,000. The remaining $482,000 came from the City of Kingsport, with money raised from bonds that were issued for water and sewer improvements.

BENEFITS AND CHALLENGES

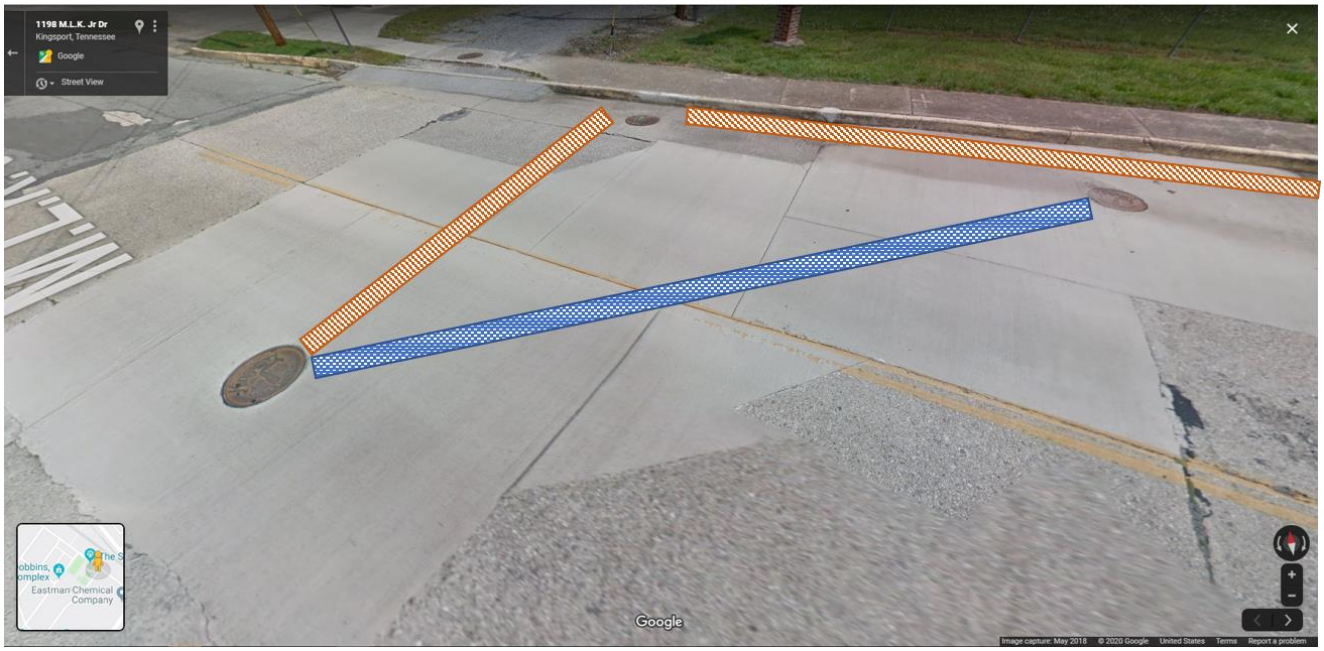
Challenges to the Project

Overall, the project went according to plan. When going to bid, the costs came in a bit higher than anticipated, so the city was responsible for some additional costs. The bids, despite higher than expected, were still within reason and did not require any additional outside funding sources.

The project included grouting some old lines that have experienced significant cracks due to tree growth along a forested corridor. The grouting process, while about 80% effective at reducing inflow and infiltration on the targeted lines, did not address the entire problem; it likely will have to be addressed again. In addition to the grouting process, the project also required some unanticipated ingenuity.

The line from the new Eastman Chemical plant comes down Martin Luther King Boulevard to meet Wheatley Street. The flow then comes down Wheatley Street to meet a main line that feeds to the wastewater treatment plant on Industry Drive. The location where these two lines met, originally designed to be a 90-degree angle, presented serious backflow up Wheatley Street, and created

significant problems for the utility. In an effort to prevent future problems, the utility diverted the angle of the volume from the Eastman Line to meet the main transmission line on Industry Drive at an angle that could handle the combination of flows. A mock-up of the design can be seen in the figure below.



In the image, the orange lines represent the original 90-degree angle design of where the lines would meet. The blue line represents the angle of the new line that resulted from the challenges encountered.

Positive Outcomes

As described above, the new corporate office building was a $1.6 billion investment that created 300 jobs, an obvious economic boon for the area. Eastman was already one of the largest employers in Kingsport with its 4,400-acre campus employing roughly 7,000 people.

Foreseeable Challenges to the Project

The foreseeable challenge to this project is what tends to be a challenge with any water or sewer project: maintenance. Previously, some of Kingsport's water and sewer infrastructure were put into the ground and maintenance needs were largely ignored, leading to a deteriorating system and resulting in costly repairs and replacement. Now, with this project and the system in general, the City of Kingsport is being more proactive with maintenance, resulting in upkeep costs being the only real issue with the project in coming years.

FUTURE COLLABORATION

Next Project/Area That ARC Funding Might Be Needed or Used

Given the age and size of the system in Kingsport, including over 1,000 miles of water lines, the city expects to be constantly working to rehabilitate and replace the system. In cases where ARC funding can be used, like the case with Eastman Chemical's expansion, Kingsport envisions continuing to work with the FTDD to find funding partners that suit the needs of the community. Every dollar that can be sourced from outside funding is another dollar to put towards additional infrastructure upgrade and repair.

Experience Working with ARC

The FTDD, which administered the project, has had many positive experiences working with the ARC to fund development projects. They work with a wide range of different funding organizations, but ARC has stood out as one of the best to partner with. The deputy director specifically cited that they appreciate a lot of the opportunities ARC provides to learn more about project funding and administration, such as conferences and trainings. ARC provides more of these opportunities to learn about best practices and better ways to do things compared to many other funding organizations. One benefit of accessing ARC funds is that it allows the FTDD to do more projects per year than would otherwise be possible.

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Big Caney Phase V

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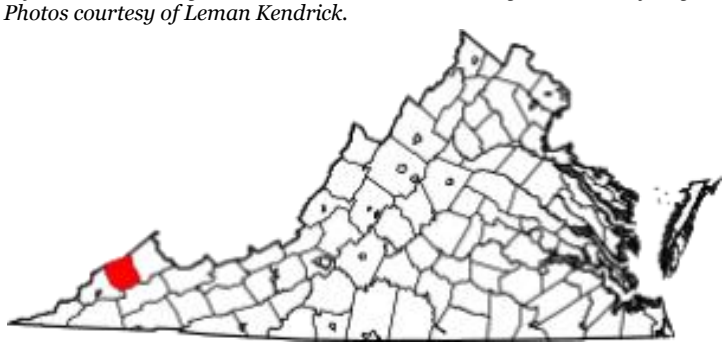
Left: New Rose Ridge water tower with the old storage tank in the foreground. Right: New 200,000-gallon Rose Ridge water tower. Photos courtesy of Leman Kendrick.



Dickenson County, VA
FY: 2011

Leman Kendrick
Dickenson County Engineering Department

Fiscal Year: 2011

Close Date: 5/8/14

Project Type: Water

Benefits to Distress County and Area: Primary

Funds – ARC: $500,000

Funds – Total: $1,527,228

Big Caney Phase V

BACKGROUND

Community Facts

Dickenson County is in southwestern Virginia, bordering Kentucky. It is rural, with a population of 15,903 and population density of 48.1 persons per square mile at the 2010 census. However, the Census Bureau estimates that as of 2018 the population had decreased to 14,523. Dickenson County is economically distressed, with a 2017 per capita income of $30,687, compared to the national per capita income of $51,640. Its three-year average unemployment rate from 2015–2017 is 9.2%, compared to the national average of 4.8%.[1] The county's 2013–2017 poverty rate is 23%, compared to a national average of 14.6%. The average percentage of residents from 2013–2017 with at least a high school diploma is 74.5%, while 9.3% have obtained a bachelor's degree or higher, compared to national statistics of 87.3% and 30.9%, respectively.[2]

Historically, Dickenson County's economy has been supported by the coal mining industry. In the heyday of the local coal mining industry in the 1950s, Dickenson County had a population of over 23,000 and 56.2% of the employed labor force was engaged in mining.[3,4] However, its population has drastically shrunk. As of 2017, only 4,580 people were employed in Dickenson County, and although construction and extraction occupations remain the most common job type, only 11.0% of the employed work force fill this category.[5] Other common employment types in the county include sales and related occupations (10.4% of employed labor force) and office and administrative support occupations (10.3% of employed labor force).[5]

Water/Wastewater System Facts

In the absence of a public service authority in Dickenson County in the 1960s, a private water corporation under the name Big Caney was formed to distribute water to many ridgetop areas in need of a reliable water source. However, belonging to the private sector prevented the corporation from applying for grants and similar support, causing Big Caney to struggle financially and ultimately, in the early 90s, to be taken over by Dickenson County Public Service Authority (DCPSA). DCPSA was founded in 1985 and before the adoption of Big Caney's 1,700 customers, served a mere population of 45.

After decades of improvements and expansions, DCPSA now serves 94% of Dickenson County (4,500 customers). In consequence of the high costs associated with extending public water to rural communities, Dickenson County now charges some of the highest water rates in Virginia. Contributing to these costs is the fact the DCPSA purchases all its water. However, thanks to funding from the ARC for Big Caney Phases III and IV, DCPSA is now able to purchase water directly from the John Flannagan treatment plant versus paying higher rates to go through either Buchanan County or the Town of Clintwood.

Specific Need/Driver for the Project

Big Caney Phase V was the fifth step in a six-phase project focused primarily on replacing the infrastructure for the Big Caney water system. As mentioned, the water infrastructure for Big Caney was installed in the 1960s, so after 30 years of use, the system required repairs and replacements to sustain the needs of its customers. Therefore, over the last two decades, DCPSA has undertaken this six-phase project to address these issues.

PROJECT SPECIFIC INFO

Description of Project

Big Caney Phase V consisted of the replacement of 28,528 linear feet of pipe. This venture had a budget of $1,019,610 with $500,000 sourced from the ARC.

Community Partners

DCPSA worked very closely with the Virginia Department of Health (VDH) on this project. Construction plans associated with public water must be approved by VDH prior to implementation. Additionally, DCPSA has a close relationship with Wise County PSA, Town of Clintwood, and Buchanan County as they all work together to supply Dickenson County with drinking water.

Funding Outside ARC

Another major source of funding DCPSA received for this phase was a $519,610 grant from USDA-Rural Development. Additional funding was acquired from Virginia Block Grant program and Virginia Water Projects. Lastly, DCPSA pulled on resources set aside from coal severance tax. They claim to be one of the first counties to allocate 25% of coal severance money to water and sewer.

BENEFITS AND CHALLENGES

Challenges to the Project

One of the largest challenges facing the project was working around the difficult geology and topography of this region. The subsurface in this county has a high percentage of rock, which complicates construction paths. Additionally, replacing system sections where there is more than 1,000 feet of vertical relief complicates construction.

Furthermore, when the original Big Caney systems were built, many pipes didn't follow along the roadways. Those sections extended across land that was often difficult to access with the equipment needed to apply maintenance. DCPSA had to move nearly all of its lines back onto the state route where equipment access was possible.

Positive Outcomes

This phase of the project as well as the others has made a very positive impact on the Dickinson County community. In Leman Kendrick's eyes these improvements in infrastructure have not only improved many residents' lives, but through mitigation of the recent population loss, also stabilized the community.

A quantitative sign of success resulting from these water infrastructure projects and others is the increase in the number of Dickenson County households on public water. In 1992, it was somewhere between 35 and 40%; now it is up to nearly 95% of the households. Additionally, the customer retention rate is near 100% (almost every person that initially signed up ended up being water customers).

Foreseeable Challenges to the Project

A future challenge facing the Big Caney system is continuing to keep up with maintenance needs. From DCPSA's point of view, staying on top of maintenance is the best way to sustain accountability, and accountability is key, especially when it comes to efficiently operating on a low budget. Maintenance can be a challenge in Dickenson County; DCPSA's systems cover the largest part of the county, and so the travel times between pump stations and tanks can be quite prolonged.

FUTURE COLLABORATION

Next Project/Area That ARC Funding Might Be Needed or Used

Now that DCPSA has made gains in the drinking water sector, they are turning their attention to sewer expansion. One line had just recently been installed for a developing industrial park, which had the added benefit of serving slightly over 100 homes. Partial funding for this project came from an ARC grant, and further sewer expansion there may lead to a request for more funding as development continues.

At the same time, DCPSA is continuing to perform water line replacements for aged systems. They are seeking any grant money they can pick up alongside the coal severance money to perform these smaller infrastructure projects; additional request for ARC funding for these efforts is likely.

Experience Working with ARC

DCPSA appreciates the ARC's generosity and looks to them every time they can for project support. Many projects would not have been possible without the ARC. On most projects, they can apply for the Community Development Block Grant (CDBG) and ARC, and it works out very well. When they went through USDA-RD or "rural development," ARC operated like a liaison.

DCPSA always tries to be responsive and upfront with project details and expectations when applying for ARC grants and has found success in this approach. To be successful when formulating a project that needs funding, DSPCA recommends trying to anticipate how much money can be put together and then coming up with an economically realistic goal, even if that means splitting a project up into many smaller parts.

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Haysi to Big A Mountain Water, Phase III

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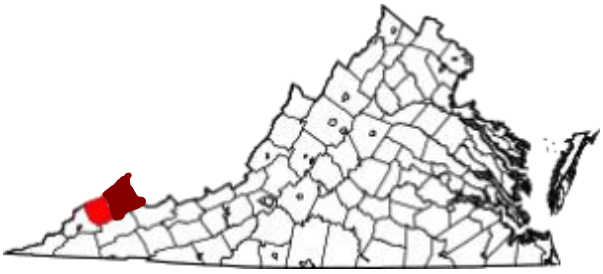
New White Ridge pump station in Dickenson County, VA. Photo courtesy of Leman Kendrick.



Dickenson and Buchanan County, VA
FY: 2009

Leman Kendrick
Dickenson County Engineering Department

Fiscal Year: 2009

Project Close: 3/29/11

Project Type: Water

Benefits to Distress County and Area: Primary

Funds – ARC: $500,000

Funds – Total: $4,359,770

Haysi to Big A Mountain Water, Phase III

BACKGROUND

Community Facts

Dickenson and Buchanan Counties are in southwestern Virginia, bordering Kentucky. Dickenson County, the primary county benefitting from this project, is a rural county with a population of 15,903 and population density of 48.1 persons per square mile at the 2010 Census. However, the Census Bureau estimates that as of 2018 the population has decreased to 14,523. Dickenson County is economically distressed, with a 2017 per capita income of $30,687, compared to the national per capita income of $51,640. Its three-year average unemployment rate from 2015–2017 is 9.2%, compared to the national average of 4.8%, and its 2013–2017 poverty rate was 23%, compared to a national average of 14.6%. The average percentage of residents from 2013–2017 with at least a high school diploma is 74.5%, while 9.3% have obtained a bachelor's degree or higher, compared to national rates of 87.3% and 30.9%, respectively.[1]

Historically, Dickenson County's economy has been supported by the coal mining industry. At the height of the local coal mining industry in the 1950s, Dickenson County had a population of over 23,000. However, its population has declined since. This can be attributed to the decreased demand for laborers in coal mines as the mining process has become increasingly mechanized, and the total share of coal as a power source in the United States dropping from 44% in 1950 to 27% in 2018.[2]

Today coal mining remains relevant in Dickenson County, though to a much lesser extent. Dickenson County has increasingly shifted its focus to tourism, as it is home to a part of Jefferson National Forest, many scenic hiking and biking paths, rivers for kayaking and canoeing, and a lively bluegrass music industry.[3]

Water/Wastewater System Facts

The Dickenson County Public Service Authority (PSA) is the provider of public water services in Dickenson County. It was founded in 1985, at a time when there was very little water infrastructure in the county. However, even by the early 1990s, just 30% of residents were served by public water. Starting in the early 1990s and continuing to and past the Haysi to Big A Mountain Water project, the PSA has ramped up its efforts to provide near county-wide access to public water. Today, 94% of Dickenson County residents are served by the PSA. EPA's Safe Drinking Water Information System (SDWIS) reports that the PSA has 16 water systems, serving a total of about 4,500 connections.[4]

The PSA utilizes a uniform rate for residential water customers. In 2019, customers payed a base charge of $19.66 that included 1500 gallons of consumption. Each additional 1,000 gallons was $9.85. At 5,000 gallons of consumption, a residential customer could expect to spend about $54.14 per month. Dickenson County PSA has a schedule of rates increases from 2018–2020, outlining increases in base charges and volumetric charges annually.[5]

Specific Need/Driver for the Project

Haysi to Big A Mountain Water Phase III was one part of a larger, four-phase effort to extend public water to areas of Dickenson County that were previously not served by public water. Before the water line extension, many residents either had private wells or cisterns, or got water from springs. Some residents even put 250-gallon water tanks in their trucks and filled them up at the treatment plant of

Big Caney Water Corporation, a private water company, which sold water for $0.01 per gallon. For residents using on-site wells or cisterns, there was a study done in Dickenson County where researchers took water samples and found residents using water with high iron quantities and fecal contamination. Ultimately, the main driver for the project was the need to ensure that rural Dickenson County residents had access to safe, clean drinking water.

PROJECT SPECIFIC INFO

Description of Project

This project involved the extension of water lines along and nearby State Route 80, as well as a water tank and a water pump station. Route 80 is one of the main routes in Dickenson County, and extending service alongside it picked up 177 new customers. New customers were primarily residential, with a few non-residential connections such as small businesses and churches. Due to mountainous terrain and the low population density (about 10 new customers per mile of water line), this project had a cost per connection of $20,000. This system also tied into the existing system of the neighboring Buchanan County, which saved Buchanan County from needing to bring water into that area from another direction.

Community Partners

Dickenson County partnered with Buchanan County by linking their local water systems together, as a means of supplying water more efficiently at areas near the border of the two counties.

Funding Outside ARC

In addition to $500,000 of ARC grant-funding, the project included a local contribution of $144,030 and a state contribution of $3,715,740, which can be broken down into several funders:

- Abandoned Mine Land (AML): $2,359,770
- Virginia Department of Housing and Community Development (DHCD): $1,000,000
- Coalfield Water Development Fund (CWDF): $185,000
- Southwest Virginia Water and Wastewater (SWVA W/WW): $170,970

BENEFITS AND CHALLENGES

Challenges to the Project

A major challenge for this project was the terrain. Dickenson County is in the heart of the Cumberland Mountains, which makes water line hydraulics a challenge, since issues of frequent and sharp elevation changes must be considered. Additionally, the low density of homes and the fact that residences tend to occur in clusters often means that water lines can stretch half a mile or more without any connections. This low number of connections per square mile of water line combined with mountainous terrain is what led to the $20,000 per connection cost of the project. High costs meant that Dickenson County had to acquire more funding from varied sources than might otherwise be the case. Additionally, at one point they struggled with a contractor who was very behind schedule, and as a result there was some pressure from community members to quicken the pace of the project.

Positive Outcomes

This project achieved its target of 177 new connections, contributing to increasing the PSA's public water service rate to about 94% of the population. Additionally, it encouraged some modest growth in the newly served area, as people tend to move from areas without water to areas with water.

Foreseeable Challenges to the Project

Dickenson County has seen a downturn in its economy due to a declining coal market. This has resulted in many leaving the county, thereby reducing water utility and tax receipts, which has been a challenge for the financial viability of the PSA. The county engineer for Dickenson County remarked that he is not sure if the PSA is putting back enough money for line replacement and maintenance. Another challenge Dickenson County has is a lack of a four-lane road, which makes it difficult for them to diversify economically, which compounded with the downturn of the coal industry is not good for the PSA's ability to finance water-related expenses.

FUTURE COLLABORATION

Next Project/Area That ARC Funding Might Be Needed or Used

Dickenson County is currently working on developing an industrial park. They have already installed a sewer line for the industrial park, which had the additional benefit of about 100 residential and five nonresidential connections. An ARC grant was used in funding that project, and more funding may be needed for future water and sewer expansions as the park continues to develop.

Experience Working with ARC

Dickenson County has had a longstanding positive relationship with ARC. Since the county PSA's inception over 30 years ago, ARC has provided grants for 14 water or wastewater infrastructure projects and has been vital in the expansion of residences served by public water and/or sewer in the past three decades in Dickenson County. In this time, ARC has provided a total of $6,008,690.08 in grants, for projects which have resulted in 2,648 water connections and 421 sewer connections. ARC is looked favorably upon in Dickenson County because it is grant money and has a fairly easy process of applying for and being awarded funds, compared to other funders they have worked with.

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Mercer/Summers Regional Water Project Phase IV-A

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Oakvale Volunteer Fire Department. Photo courtesy of Grant McMillan.

Mercer County, WV
FY: 2011

Jason Roberts
Region 1 Planning and Development Council

Fiscal Year: 2011

Project Close: 4/10/13

Project Type: Water

Benefits to Distress County and Area: None

Funds – ARC: $1,388,000

Funds – Total: $7,862,000

Mercer/Summers Regional Water Project Phase IV-A

BACKGROUND

Community Facts

Mercer is a rural county in the southernmost part of West Virginia with a population density of 148.6 persons per square mile. In 2018, they had a population of 59,131, representing a 5.0% decrease from the 2010 population.[1] In 2015, 79.8% of the population was served by public water.[2]

The 2013 to 2017 median household income was $37,763 and the per capita income was $21,698.[1] In 2017, 37.1% of the population was employed and 21.4% was in poverty.[3] The largest employment fields in the county are health care and social assistance (4,720 people), retail trade (3,471 people), and educational services (2,386 people), while the highest paying fields based on median annual income are resource extraction ($74,858), agriculture, forestry, fishing and hunting ($73,366), and transportation and warehousing ($51,558).[3] Regarding education, in 2017, 83.5% of persons over 25 had graduated high school and 19.9% had obtained a bachelor's degree or higher.[1]

Water/Wastewater System Facts

The Green Valley Glenwood Public Service Department (PSD) is a community water system owned and operated by the local government. Located in Princeton, WV, this system serves drinking water sourced from surface water to a population of 5,775.[4] As of 2020, the PSD customers were charged based on a uniform block rate structure. The base charge of $20.52 includes 2,000 gallons of consumption per month, after which customers are charged $0.82 per 100 gallons. Based on these rates, a residential household using 5,000 gallons per month would spend approximately $45.12 per month on water.[5]

Specific Need/Driver for the Project

This project is the fourth phase of a broader effort to increase access to in-home water of reliable quantity and quality in Mercer County. Discussion with key stakeholders during a site visit in October 2019 emphasized the necessity of long-term planning; the beginning stages of Phase 1 of this project began in the late 1990s as a response to aging water treatment plants in Hinton and Princeton that struggled to provide water that met relevant Safe Drinking Water Act guidelines. Each extension and subsequent phase have extended water service and consolidated or improved the distribution network. Through working together, the two counties have been able to leverage assets and expertise. In addition, they were able to secure funds and develop a public/private partnership with American Water to build a treatment plant large enough to account for projected future growth and addition of new customers as the distribution system expanded.

The Phase IV-A Water Line Extension specifically reviewed in this funding cycle arose directly from an inventory of community needs. Local individual homeowners and businesses were reliant on private wells, which were unreliable and subject to surface water contamination. In 2006, local testing revealed that 48 of 73 wells (66%) were positive for fecal coliform and 15 of 73 (20%) were positive for *E. coli*, which presents an immediate health risk. Discussion with local residents suggested that the lack of reliable water of certain quality was limiting development, particularly for those businesses that aimed to provide food services (for example, cafes, restaurants).

Project partners and grant application was organized by Region One WV Planning and Development Council (WV PDC), which is one of eleven public agencies established across WV to provide assistance

with infrastructure development and planning in designated service areas. They hold monthly public meetings throughout each of the six counties they serve to gauge interest in potential projects as well as gather insight into current infrastructure needs in the community. Consistent emphasis by meeting participants on the need for improved water access in Oakvale, West Virginia, motivated the decision to apply for funds to continue this broader effort by extending service in southeastern Mercer County (Phase IV).

PROJECT SPECIFIC INFO

Description of Project

Drinking water service was extended from the Green Valley Glenwood PSD in Princeton, West Virginia, southeast along US-460 through to the town of Oakvale, West Virginia. Construction consisted of over 25 miles of 2" through 12" water lines, a 100,000-gallon water storage tank, 100 kW mobile generator, fire hydrants, and two dual-zone pressure reducing stations. $1.388 million was granted from the ARC, while total project cost was $7.866 million.

Community Partners

Beyond the considerable grassroots support by local citizens and business owners, formal partners on this project included Mercer County Commission, Oakvale Road Public Service District, the West Virginia American Water Company, and the town of Oakvale. County officials continually stressed the importance of their longstanding partnership with West Virginia American Water, which maintains and operates the water facility lines. Through partnering with WV American Water beginning in the 1990s, Mercer and Summers counties were able to develop a more comprehensive water infrastructure plan that could develop beyond immediate critical needs and plan for economic growth. Working with American Water also allowed the more rural Mercer and Summers county service districts to benefit from the company's statewide customer base; water rates are fixed throughout the state.

Funding Outside ARC

Additional grant funding included a HUD Community Development Block Grant ($1.5 million; basic agency), a WV Bureau for Public Health Design Grant ($200k), a U.S. Army Corps of Engineers Reimbursable Grant ($705,000), and a WV Governor's Contingency Grant ($341,000). Supplementary contributions were secured from the WV American Water Company ($325,000) and the Oakvale Road Public Service District ($8,000). To account for remaining funds needed, the council received a $3.4 million WV Infrastructure and Jobs Development Council Loan. In person discussion with the county commissioner indicated that as part of the public-private partnership, WV American Water pays the annual debt service on this loan.

BENEFITS AND CHALLENGES

Challenges to the Project

While the partnership with WV American Water was essential to success, it did present some challenges in coordination, budgeting, and grant applications. Because ARC and USDA do not fund private companies, the local service district had to take control of the distribution systems entirely (for example, the portion of the project funded) and create a new county public service authority, and American Water was required to construct the direct connections to their plant. The steep slopes in

Mercer County presented some technical challenges and required creative design of two pressure-reducing stations.

Positive Outcomes

As a direct result of this project, 410 new customers received water service (391 individual homeowners, 6 commercial enterprises, and one school). In addition to the immediate health and convenience of reliable, high quality water, this provided more fire protection to key areas of the county. In particular, a fire hydrant was installed on the Oakvale Elementary School (~150 students) property, which greatly lowered their insurance premiums (prior to this, fire protection was only afforded by the local fire department's tanker truck). Provision of water service also opens the door for future installation of sanitary sewer systems. In West Virginia, when sanitary systems are offered, residents are required to accept, and therefore, no enforcement mechanisms are in place for obtaining service payment. However, with water service present, service shutoff can be used as an incentive to pay the sewer bills. Consequently, sewer service is typically not extended to areas that don't first have a water service.

Foreseeable Challenges to the Project

Challenges include supporting future population growth, such as maintaining population to support continued operation and maintenance costs. This project is part of a much larger comprehensive plan for water infrastructure in Mercer and Summers counties and there is some concern that those communities still "waiting" for water service in subsequent phases may be particularly difficult to access due to the terrain; for example, pipes would need to be laid directly in bedrock due to the shallow mountain soils.

FUTURE COLLABORATION

Next Project/Area That ARC Funding Might Be Needed or Used

Nearly a dozen ARC applications have been submitted for the current funding cycle. There are additional water line extensions planned for the two counties, and current work is ongoing completing Phase IV-B (the completed project under review is IV-A). At present, roughly 90% of Mercer County is served by public water, and the local planning commission would like that number to be near 100%.

Experience Working with ARC

Attendees at the on-site visit indicated that while ARC is often the "last in" (meaning the majority of funds had to be secured prior to ARC investment), they are a "big player" who "stepped up" to make this project possible. While the grants process does take time, this latest phase was developed and submitted by a new county employee, who was still able to successfully navigate the process, even for a very large and detailed project. There were no problems working with the basic agency (USDA).

The main takeaways for success include long-term strategic planning; openness to public-private partnerships; and ongoing opportunities for community planning. As discussed previously, the decision to plan beyond immediate crises in the 1990s enabled the counties to engage WV American Water in constructing a plant big enough to plan beyond the existing distribution system. Once the large plant was available, the counties have continually been applying funds to extend service while assured of sufficient capacity. Community engagement was essential both for the identification of strategic or critical areas in need of service, and in securing general goodwill and willingness to pay. Notably, though over 180 easements were required during Phase IV-A, there were only two disputes or requests for appraisal, which is far lower than for most local infrastructure projects.

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Appendix I: Open-Ended Survey Response and Feedback Session Summary

As part of the evaluation, the project team utilized qualitative research methods to supplement the quantitative data, and address questions that could not be answered with simple numeric data points. The qualitative data, in addition to the case studies, included feedback sessions and open-ended survey responses. These two data collection processes involved two distinct groups; the survey provided insights from grantees, while the feedback sessions included representatives from Local Development Districts (LDDs) within the Region.

To provide confidentiality for participants, the results of this data collection will be summarized in the following paragraphs without any identifying information. The results will be summarized as they relate to three main topic areas: 1) Project Administration, 2) Challenges Associated with ARC Funding, and 3) Benefits of ARC Funding, and in the case of feedback sessions, 4) Recommendations for ARC.

Project Administration

Survey Responses

Survey respondents overwhelmingly agreed that the ARC partnership with Local Development Districts was helpful, specifically as it pertained to any rules regarding use of funds, grant-writing, or documentation. Respondents noted that the personal relationship between grantees and the LDDs often helped identify and address needs. In addition, the survey respondents spoke highly of the established partners on their projects, often naming multiple groups that worked in tandem to secure the funding and administer the project. Of note, many survey respondents stated that a key to the successful administration of a project was accessibility of partners and good communication.

Conversely, some survey respondents cited challenges with project administration, many of which ran counter to the benefits reported above. A few common themes emerged, largely related to delays in approval through basic agencies, challenges with securing funding or staying within budget, and lack of reliable communication.

Many respondents used the survey question about project administration to express obstacles outside of the administration process, including high bids for projects, low availability of contractors, challenges with weather during the construction, and permits. While these obstacles were noteworthy to respondents, they largely outlined things out of the control of the LDDs and basic agencies.

Feedback Sessions

The feedback sessions highlighted similar comments to those from grantees. In general, respondents acknowledged the transition to more state basic agencies from federal basic agencies for construction projects. In general, participants stated that the transition caused some complication initially, as LDDs had to adapt to a different administration and set of rules, specifically in cases where the state basic agency administered Community Development Block Grant (CDBG) funds and enforced similar rules and regulations for ARC grants. Other participants stated that, in cases where CDBG funds were also involved in projects, the state basic agency was a benefit as the regulations overlapped. For projects that

were solely ARC funding or did not involve other federal or state funders, sometimes the process was a bit more complicated than under the federal basic agency process.

Multiple participants mentioned the "hoops" associated with using multiple funders. Coordinating the timing of applications, announcement times, and regulations is often a challenge and differs based on the funders involved. In some cases, the participants noted that the state has worked to address those challenges and reduce the number of "hoops."

Only one participant explicitly expressed challenges with project administration. Given the challenges of working with a basic agency for construction projects, the state has instead shifted away from using ARC funds for construction projects, including water and sewer infrastructure, and instead uses the funds for planning and feasibility projects.

Selected Quotes

- "It would be good if **ARC adopted, very clearly adopted their own requirements** or, I mean, use those [a specific funder's] requirements. But then, be very clear about if they're doing all of them or some of them or what part."
- "[T]hey're a flexible partner that, you know, it's **not a mystery how to get an ARC project**. The **criteria is pretty clear**, you know, the track record of what types of projects are competitive is well known…"
- "**Good communication** among the Owner, Consultant, Contractor, Regulatory Agencies, and Funding Agencies **leads to successful project administration**."
- "The only obstacle encountered with this project was that it **was the first standalone ARC project using [state agency] as the Basic Agency** and required **learning some new processes** that would be required by them."

Challenges or Obstacles Reported

Survey Responses

Survey respondents largely focused on challenges associated with the projects, rather than challenges of working with ARC. While only a few respondents reported any significant challenge or unintended consequence of the infrastructure project, one key theme emerged: fewer connections to the new service than anticipated. In one reported case, this presented challenges for the utility, as the projected revenue generation from the infrastructure was much higher than actualized. Similarly, another project detailed building infrastructure for an industry that did not come to the area. Both cases can present financial challenges for the utility in anticipation of maintenance and replacement of the new assets.

Feedback Sessions

Outside of challenges with reporting and regulations for basic agencies, participants reported very few challenges of working with ARC funding. A couple of participants noted that, recently, there have been a larger number of denials for funding, or challenges associated with applying that maybe did not exist historically. Notably, the emphasis on economic development for funding in a few states was brought up. In some cases, participants found it challenging to apply ARC funding to a water or wastewater project if it did not have a direct economic development impact.

Conversely, at least one participant stated that they did not have that challenge, given the priorities outlined by their state. In general, this seemed to be an issue that differed based on the state.

Selected Quotes

- "The number of customers on the line was less than expected. While residents wanted water service, **they did not want to switch over until they had a problem with a well or spring**. Thus, the number of customers was less than expected."
- "The number of customers on the line was lower than expected. This made the cashflow from the water line being less than expected and was difficult on the utility."
- "The project was designed in part for the new plant but **unfortunately it was not built**."

Benefits Reported

Survey Responses

Survey respondents largely reported that ARC funds were addressing problems with failed infrastructure, meeting a community need with new infrastructure, leveraging a new industry or industrial park in the area, or keeping rates affordable by providing outside resources to meet capital needs. Many respondents agreed that ARC funding helped provide affordable water and wastewater rates for community members, and allowed the communities to address public health concerns and meet environmental needs. Several respondents cited providing water service to sparsely populated areas with financial challenges as a main driver, in addition to providing potable water to community members. Similarly, the environmental needs included keeping rivers and waterways clean, addressing failing septic systems, separating combined sewer systems and addressing overflows, and addressing concerns with failing wastewater systems.

Survey respondents included many different project types that benefitted from ARC funding. In most cases, survey respondents had a dire need and ARC funding helped fill the gap. In some cases, ARC funding was solely used to attract an industry or meet the needs of a staple industry in an area. Respondents reported positive economic growth and development in the area as a result of the project.

Feedback Sessions

Participants had many positive examples of impacts from ARC in their communities. Whether it be to provide water and wastewater service to distressed communities or promote economic development, participants had extensive experience working with ARC and found the funding to be a critical part of piecing together a funding package. Most participants described ARC funding as easy to understand and predictable. This was compared, in contrast, to other funders that may fund one type of project at one time and may not fund the same project two months later.

Additionally, two participants acknowledged that ARC dollars were instrumental to expanding public water service. One noted that 40 years ago only 20% of the district had public water and now over 90% of the population is served. Another commented that in the area they serve, any resident that flushes the toilet or runs the tap has benefitted from an ARC grant for infrastructure. Several participants reported that ARC funds have kept down loan costs in the community and reduce the burden of infrastructure on the ratepayers.

Selected Quotes

- "…if you can turn on the water or flush a toilet in these communities, **you've absolutely had an ARC project** at some point, from 1965 until now."
- "…when we began, working hard to acquire funds for water projects, this was in the early to mid-70s, only 20% of our district had public water, and now it's probably 92%, and ARC's been involved in literally, it's probably in the hundreds of projects, that has made that possible."
- "…that grant funding has been really crucial to help them avoid having to do **rate increases that their customer base can't really afford**."
- "Even though they are the last money in many times, they're **often the central, the nucleus** of some of these projects…"
- "[Town's] water meters were up to 40 years old and many did not work at all, or functioned incorrectly. This resulted in an **inability to bill many customers properly**. Additionally, there was no impetus to conserve water. The system had **often run out of water** with the need to bring it in on trucks (water buffalos). By installing the new meters, customers could see how much water they were using and wasting. **Consumption dropped, preserving the water supply**."
- "A manufacturer, which had to truck a portion of its wastewater for lack of sewer capacity, was at risk of leaving [town]. This **project helped retain jobs** and improved sewer services for residents."
- "Prior to the implementation of this project application it was determined 80% of the household water supplies in this community were contaminated and over 21% of homes in this community had experienced water supply shortages during the summer months…the provision of public water service to a previously unserved areas was the challenge this project addressed."

Recommendations for ARC

Feedback Sessions

The recommendations from the feedback sessions followed closely with the comments related to project administration and challenges of ARC funding. Some participants expressed that making the state basic agency process a bit easier and aiding in the transition process would be helpful. One mentioned having a little more structure and guidelines for the transition, to provide the states with a framework.

Additionally, many participants expressed a similar sentiment regarding ARC's role in funding water and wastewater projects. One participant stated that water and wastewater projects are critical to improving quality of life in rural areas, and while there are new, interesting entrepreneurial projects rising to the surface, water and wastewater is a fundamental part of any other project. Therefore, water and wastewater funding should remain at the center of what ARC funds. Another participant expressed that economic development outcomes, like job creation or retention, is not the only way to gauge community success and, thus, there should continue to be a focus on quality of life outcomes in project prioritization. That participant also explained that water and sewer projects can still be funded in cases where the project benefits a distressed area, so this is more specific to projects outside of distressed counties and areas.

Selected Quotes

- "I think **water and sewer has to stay at the heart of what ARC is willing to do**. I think it's important not only for economic development, but also **a quality of life issue** I think in these rural communities. …I know it's not exciting in the new world of trying to do more entrepreneurship…but it's **just so critical to all those things** and I would hate for that to go **away from the center part of what they're trying to do**."
- "I would have to say that if there's something ARC could do to make life better it would be **progress in the area of basic federal agenc**y issues."
- "I think **job creation is always something we're striving for**, but not necessarily what's going to help the communities succeed; **it's not the ultimate thing to measure community success on**. So, if they're thinking about how they do measurement, that's the main piece."

Conclusion

Open-ended survey responses and feedback sessions provided insights and recommendations for ARC from different perspectives in the project implementation process. Overall, most respondents and participants seemed to be very satisfied with their experiences working with ARC and consider ARC a critical part of funding water and wastewater infrastructure. Most considered ARC easy to work with and easy to understand.

In general, most of the reported challenges and recommendations for ARC align with the project administration and basic agency process, namely, navigating transitions to state basic agencies and challenges with communication and implementation when the basic agency does not have any funds in the funding package. Additionally, feedback session participants stressed the importance of ARC funds for water and wastewater infrastructure in Appalachia, regardless of economic development outcomes associated with projects.

Appendix J: Literature and Practice Review

The challenges in meeting community water and sanitation needs in rural regions of the United States are increasingly recognized as an area of acute technical need by various academic and agency groups. Analysis of the most recent long-form census data by the Rural Community Assistance Project (RCAP) indicates that occupied homes without complete indoor plumbing are most often located in rural communities (Gasteyer and Vaswani, 2004). Targeted analysis of specific regions facing gaps in the provision of safe drinking water and appropriate sanitation have reported on issues in Appalachian communities, such as the continued prevalence of straight-piped wastewater discharges in the coalfields region of West Virginia, Virginia, and Kentucky (Cantor et al., 2017) and the household drinking water quality and health impacts of reliance on cesspools for wastewater disposal in Alabama (Wedgworth et al., 2014).

It is important to note that the provision of piped in-home drinking water and centralized sewage, while meeting an immediate need upon initial installation, will only continue to serve and benefit the surrounding community if there is effective and sustainable system management, maintenance, and financing. A recent national analysis of Safe Drinking Water Act (SDWA) violations since 1982 demonstrated that small rural drinking water systems reliant on surface waters were most likely to report violations of health-based water quality regulations (for example, exceedances of maximum contaminant levels). The statistically significant difference in violation rates between urban and rural areas has increased notably since the 2000s with the advent of the Disinfection Byproduct Rule, which has placed more stringent requirements on finished water (Allaire et al., 2018). National trends are echoed in specific examinations within Appalachian states. In Wyoming County, West Virginia, 15 drinking water systems have faced years of boil water advisories and health violations after the mining companies that built them left the area and turned over control of the services to volunteers (EPA, 2006). An analysis of trends in SDWA violations across Virginia by Marcillo and Krometis (2019) determined that very small rural systems (those serving fewer than 500 homes) in USDA-designated isolated rural areas had much higher rates of monitoring and reporting violations, which can obscure health-based risks and erode public trust.

Local hydrogeology, economic markets, and history often define the specific infrastructure and management challenges for drinking water and wastewater in these areas. Common types of challenges often include:

- **Low population densities** make it difficult to achieve economies of scale, secure a sustainable tax base, and efficiently respond to problems, which may explain why very small systems struggle to meet SDWA requirements.
- **Aging infrastructure** can result in insufficient disinfection, line breaks, and corrosion issues, which can lead to lead contamination (EPA, 2006, 2016).
- **Challenging terrain**, including steep mountains, narrow valleys, and thin or poor soils may preclude reliance on traditional wastewater disposal systems such as septic drainfields and require extensive distribution and/or collection systems. (Arcipowski et al., 2017; D'Amato et al., 2012; EPA, 2012; U.S. Water Alliance, 2019).
- **Securing capital funds for major system repairs or improvements** may be difficult for small systems with lower credit ratings. Allaire et al. (2018) noted that this may make difficult

the purchase, installation, and maintenance of more advanced treatment systems to meet disinfection byproduct rule requirements.

- **Unsustainable rate structures** are often difficult to change due to fears that raising rates to levels sufficient to maintain service may be unaffordable for some customers. A national analysis of water affordability by Mack and Wrase (2017) identified West Virginia as the state with the highest percentage of "at-risk" citizens who may be unable to pay water bills given rate projections. Unfortunately, increased failures to pay can further drive up utility rates for paying customers to ensure continued basic service. This situation can reach a crisis point when there is a significant infrastructure failure. In Martin County, Kentucky, rates rose more than 60% in 2018 in order to address serious water leakage and treatment issues (Food and Water Watch, 2018).

The goal of this document is to briefly describe and review emerging innovations in water infrastructure development, financing, and design. When available, an emphasis is placed on examples from states under the purview of the Appalachian Regional Commission (ARC). Ideally, these examples will also serve as points of contact for neighboring states interested in implementing similar programs. Examples are divided into the following categories:

- Partnerships and financial innovations
- Design and technology
  - Wastewater (decentralized systems; ecological engineering)
  - Drinking water (kiosks; point-of-use technology)

Partnerships and Financial Innovations

Consolidation—when multiple legal entities unify "under the same governance, management, and financial functions"—can be a successful strategy when smaller systems are failing to deliver water at the proper quality and quantity (U.S. Water Alliance, 2019). When executed properly, consolidation can increase efficiency, lower rates, and ensure stable water services for the thousands of households currently served by smaller water systems. In the case of Wyoming County, mentioned above, all 15 systems were eventually consolidated under the newly formed Eastern Wyoming Public Service District, which was more viable than the individual systems and allowed for extending services to unincorporated areas (EPA, 2006). Even in areas where services are functioning properly, consolidation can help improve efficiency and reduce rates for consumers (U.S. Water Alliance, 2019).

While physically interconnecting but historically separate systems can be costly, communities across Appalachia have been able to secure external funding in many cases through strategic partnerships with local and federal agencies, private businesses, and/or nonprofit organizations. For example, the consolidation of 12 systems from Logan, Todd, and Christian County, Kentucky into a Joint Powers Agency (JPA) was funded in large part by a nearly $50 million USDA loan (U.S Water Alliance, 2019). This partnership was partly responsible for making the region a more attractive site for two aluminum smelters, bringing $800 million of economic growth to the area. Multiple consolidation efforts have also received significant funding from their state's revolving water fund (EPA, 2006, 2009; U.S. Water Alliance, 2019). Additionally, transferring assets to a nonprofit utility can make even more funding options available (Delmarva Community Wellnet, 2017). In Sussex County, Delaware, three nonprofit groups (EDEN Delmarva, Diamond State Sustainability Corporation [DSSC], and Southeast Rural

Community Assistance Project [SERCAP]) came together to form Clean Water Solutions (CWS), which was able to finance the transfer of assets through various grants and private, low-cost loans (Delmarva Community Wellnet, 2017). CWS was able to access funding options that would not be available to a for-profit utility, which made the project more feasible for the low- and middle-income communities involved. Even when a significant portion of consolidation efforts are funded by taxpayers and customers through temporarily raising rates, consolidation can eventually lead to lower rates for all involved (U.S. Water Alliance, 2019; Westbrook et al., 2010).

Design and Technology: Drinking Water

It is generally accepted that piped in-home water access should remain the ultimate goal for communities to maximize health benefits. However, observational studies in Pennsylvania, Kentucky, West Virginia, and Virginia report that some Appalachian households supplement or meet household needs through "hauling water" from roadside "spout" springs (Krometis et al. 2017; Swistock et al., 2015). As these sources of water are not monitored, maintained, or regulated by the county or state, water quality is often dubious, but spring users express a strong distrust of in-home municipal water. In addition, water collection may serve social or community needs and be preferred by community members. In an innovative and unique program in southeast Kentucky, an interdisciplinary team of professionals including nurses, engineers, and architects came together to construct a community water kiosk that provides chlorinated, fluoridated water in a central location (Arcipowski et al., 2017; personal communication with Dr. Lisa Davenport, University of Tennessee). Water is sourced directly from the Leslie County Water District distribution system, so water quality oversight and compliance with relevant SDWA guidelines is conducted by the adjoining county's PSA. Through intentionally planned educational and community events developed collaboratively with the community, the technical team and the non-profit Red Bird Mission have been able to establish the kiosk as a gathering place and site of a local farmer's market. This unique yet simple design appears to be growing in popularity, as the number of gallons dispensed has continued to grow since installation (Table 6).

Table 7: Annual Water Dispensed from Community Kiosk in Beverly, Kentucky[12]

Year	Amount of Water Dispensed
2015	2,622 gallons
2016	5,260 gallons
2017	10,263 gallons
2018	11,215 gallons

The experience of the interdisciplinary team in Kentucky parallels studies of water kiosks in developing countries, which emphasize that regular kiosk usage is the result of community involvement in the decision-making process and physiological ownership (Contzen and Marks, 2018). More simply, kiosks can offer a safe, reliable source of water as well as a space for communal gathering, but an existing trusted partnership between the professionals and the community is essential for its success

[12] Via personal communication with Dr. Lisa Davenport (ldavenp1@utk.edu) of the University of Tennessee, Knoxville.

(Arcipowski et al., 2017; Contzen and Marks, 2018). In a similar strategy, a private company, Zero Mass Water, recently established a partnership with a local food bank in Kimball, WV (McDowell County).[13] The company uses solar energy to harvest water from latent moisture from the air. On-site bottled water from this technology is available to food bank visitors. At present, only a relatively small quantity of water can be provided (maximum of 950 gallons/month for all food bank visitors), which may be insufficient to meet all local potable needs. As this intervention has only been installed very recently (November 2019), there is no formal evaluation of its impacts, though further testing is planned.[14] Given the length of time required for major infrastructure projects, the water kiosk model may prove a means to minimize adverse household exposures when in-home piped water does not meet acceptable standards.

Point of use (POU) water treatment has been championed as a strategy to reduce the burden of disease associated with the consumption of contaminated water in developing countries for the past several decades (Sobey et al. 2008). POU technology traditionally primarily targets the removal and/or inactivation of pathogens through filtration, sedimentation, and disinfection. Common types of POU include ceramic filters, biosand filters, and household UV disinfection. In order to be successful, POU treatment requires continual proper use and maintenance by the user, which can be challenging to secure (Sobsey et al. 2008; Brown and Clasen, 2012).

Until recently, POU treatment has generally not been promoted as an acceptable strategy to secure safe drinking water in the United States, particularly if the primary source of water to the home is from a centralized source; in other words, POU has been viewed as an insufficient stopgap in comparison to fixing the treatment or distribution system failures resulting in poor water quality at the tap. However, during the recent Flint water crisis, commercially available water filters (Figure 21) were successfully deployed to reduce lead exposure in individual homes. Notably, faucet-mounted filters were able to remove lead at levels up to 420 µg/L, though the filters were only NSF certified for waters with concentrations less than 150 µg/L (EPA, 2016). Given that many aging systems are struggling to reduce contamination sourced from distribution systems and household plumbing, the implementation of POU treatment may prove a useful stage in larger system development efforts and/or a more cost-effective means to reduce household exposure. A recent meta-analysis concluded that POU treatment can be effective, and encourage its use following contamination events or prophylactically during system upgrades (Brown et al., 2017). Educational programs accompanying POU distribution and installation may assist in creating a sense of partnership and trust between clients and their local water authority during system upgrades. In some cases, investment in POU may prove more financially accessible than complete service line replacement, depending on the long-term economic and population profile.

[13] https://www.wvnstv.com/news/new-hydropanels-to-help-create-clean-drinking-water-in-mcdowell-county/

[14] Based on personal communication with Mr. Colin Goddard, Director, USA, at Zero Mass Water (colin@zeromasswater.com)

Figure 21: Commercially Available Faucet-Mounted Water Filters Used to Reduce Lead Contamination in Flint, MI

These filters (brands: Pur, left and Brita, right) were paired with an extensive educational campaign, including videos and websites to encourage proper installation and maintenance. Source: www.flintcares.com

Design and Technology: Wastewater

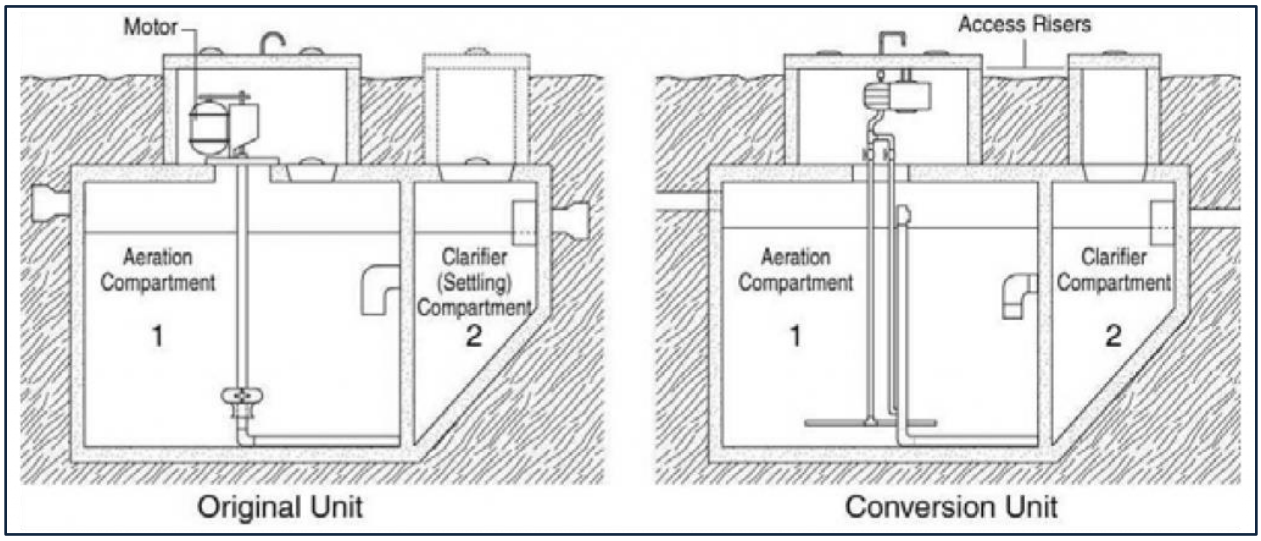
When centralized wastewater infrastructure proves too costly or logistically challenging for a region, decentralized systems may be a viable alternative. Decentralized systems can take many forms and often combine the technology and strategies of traditional onsite wastewater treatment systems (for example, septics) with modern centralized systems. For example, a decentralized system might consist of individual household septic tanks that provide primary treatment (settling) for household wastewater, with the resulting primary effluent piped through small-bore sewer lines to a centralized secondary treatment location. These systems may provide more flexibility in growth and planning, as fewer investments in common infrastructure are needed: for example, smaller pipes and less maintenance are required for primary effluent following solids removal (WERF, 2019).

Available case studies do emphasize that it is important to combine effective initial designs with strategies to ensure homeowners maintain the portion of the system on their property (for example, pump septic tanks periodically, etc.). This is particularly true when the system is wholly decentralized and homeowners are essentially operating individual-scale onsite systems. Hamilton County, Ohio, installed 20,000 individual wastewater treatment systems to treat septic tank effluent (for example, pre-settled waste) (Figure 22). This system was designed to aerate waste, much like activated sludge or a trickling filter, to treat waste so that large septic drainfields would not be needed in areas with poor soils and/or limited land area. However, the rate of mechanical system malfunctions reached 44% at one point and threatened the quality of surface water and groundwater (EPA, 2012). In order to overcome this issue, Hamilton County developed a GIS-integrated database in order to keep track of individual and clustered systems (for example, multiple homes sharing a single unit), which dropped the failure rate to 18%.

The Albemarle Sound and surrounding region of North Carolina has also developed household-scale decentralized systems that were not reliant on native soils for secondary waste treatment. Instead, sand-lined filter trenches were used to treat the effluent of single-home septic tanks, but in 1991, 30% of

these systems were identified as malfunctioning and leaching insufficiently treated waste to groundwater (EPA, 2012). In order to ensure proper maintenance, local governments implemented inspect and contract requirements and recommended installation of new pressure-dosed treatment systems to supplement the sand trenches. Recent inspections in 2007–2008 identified fewer than five malfunctioning systems (EPA, 2012).

Figure 22: Household Aeration Units Used in Unsewered Areas of Hamilton County[15]



Communities can also choose to cluster individual systems. This can allow for dense development without the need to construct or expand a central wastewater system, which can be quite costly. In 2001, Piperton, Tennessee, installed six cluster systems (combined capacity of 280,000 gpd) in order to meet demand without having to forecast future growth (D'Amato et al., 2012). Effluent from individual septic tanks is piped to one of the six distributed treatment. At present, the Piperton systems rely on fairly familiar technology, including trickling filters for secondary treatment and UV disinfection prior to discharge; however, the small-scale nature of these distributed systems makes them ideal for the implementation and trial of new technologies, such as super-critical water oxidation (SCWO) (Duke University, 2017).

In order to reduce cost and operation and maintenance requirements, "ecological engineering" approaches are often implemented in developing countries to treat community wastewater. Rather than typical modern secondary treatment (such as trickling filters or activated sludge basins), following initial sedimentation, primary effluent is biologically treated passively through a constructed wetland. In addition to treating wastewater to levels compatible with safe discharge, a properly constructed wetland can also protect open space and provide habitat for local species. The success of constructed wetlands for wastewater treatment has been reported on extensively in the international literature (Wu et al., 2015; Li et al., 2018); regulatory requirements such as NPDES permits for wetland discharges have made them more unusual, but not wholly uncommon, in the United States. In the town of Walnut Cove, North Carolina, a constructed wetland was installed to replace an aging treatment facility that

[15] Hamilton County Public Health: www.hamiltoncountyhealth.org/resources/fact-sheets/cavitette-2/

required major renovations that would have cost $2 million. Instead, initial construction cost only $600,000, a little more than a quarter of the projected cost of repairs to the traditional facility (Seyfried et al., 2016).

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Appendix K: Sample Survey

Note that the survey included unique project-specific fields from ARCnet. The code for these fields is shown in the survey below, in the format: `${e://Field/"Imported Field Name"}`

Evaluation of Water and Wastewater Funding from the Appalachian Regional Commission

The Appalachian Regional Commission (ARC) is conducting a program evaluation of ARC-funded water and wastewater projects in order to guide future grant offerings benefiting communities across Appalachia. The University of North Carolina at Chapel Hill's School of Government and Virginia Tech are conducting this survey as a part of that evaluation.

The ARC has identified that your organization received an ARC water/wastewater grant for `${e://Field/Title}` that was approved on `${e://Field/approval}` and administered by `${e://Field/Admin%20Agency}`. We would like to verify information about the project that currently exists in ARC records, with an opportunity for you to edit incorrect or complete missing information. Your project's data from the ARC database have already been uploaded to the survey. We would like to ask for your assistance by verifying the data we include, correcting the values if they are wrong, or filling in values that may be missing.

We anticipate the survey will take approximately 15 minutes to complete. The appropriate person to complete this survey is someone with access to files about `${e://Field/Title}` or who is familiar with this project. If you are not that person, *please do not go any further in the survey, and instead, forward the original survey link to the appropriate person.*

If you believe you are the best person to complete the survey, click the "next" button to begin. If you have questions or concerns, please contact Austin Thompson by email at thompson@sog.unc.edu or by phone at 919-962-5795. Thank you in advance for your time and participation.

Basic Project Information

Q: The values shown below reflect the basic project information in ARC records. Please read over and verify that the values listed below reflect the details of the project. If the value is correct, please select the checkbox in column 1 that corresponds to the project information. For those values that are incorrect, please input the correct value in column 2.

	This is correct	This is incorrect
	Select if value is correct	Input the correct value if ARC records are incorrect
Project Type: `${e://Field/System_type}`	☐	
Project Close Date: `${e://Field/close}`	☐	
ARC Funding: `$${e://Field/ARC_Total}`	☐	
Total Funding (Including ARC Funds): `$${e://Field/Overall_total}`	☐	
Basic Agency: `${e://Field/Admin%20Agency}`	☐	

Q: Contact information is collected in case there is any need to follow up with grantees after the survey is completed. Please input the appropriate contact information in the spaces provided.

- ○ Name: _____
- ○ Organization: _____
- ○ Phone number: _____
- ○ Email address: _____

Economic Development and Quality of Life Project Outcomes

Q: What are the economic development outcomes as of today?

When you submitted your application, ARC projected benefits to be provided by the project. When the project closed, ARC recorded benefits. Please read over and verify the data at close. If values today match close, then check the box for "correct." If values today differ from close, then type the current value in the right-most box.

Leveraged private investment is defined as private sector financial commitments as a result of the project. For example, a manufacturer commits to a $3 million plant expansion after a project supplies more reliable water service.

	Project outcomes as of today	Project outcomes as of today	Values projected at approval	Values recorded at close
	Select if the value at close is still CORRECT	If the value at close is NO LONGER CORRECT, please input the correct value.	This is what ARC expected project outcomes to be	This is what ARC recorded at the end of the project
Businesses created:	☐			
Jobs created:	☐			
Jobs retained:	☐			
Leveraged private investment:	☐			

Q: (*For projects closed at least 3 years)* Please provide the approximate date *(mm/dd/yyyy)* you verified these economic development outcomes.

_____

Q: Were these economic development outcomes met?

- ○ Yes
- ○ Partially
- ○ No

Q: What are the quality of life project outcomes as of today?

When you submitted your application, ARC projected benefits to be provided by the project. When the project closed, ARC recorded benefits. Please read over and verify the data at close. If values today match close, then check the box for "correct." If values today differ from close, then type the current value in the right-most box.

	Project outcomes as of today	Project outcomes as of today	Values projected at approval	Values recorded at close
	Select if the value at close is still CORRECT	If the value at close is NOT CORRECT AS OF TODAY, please input the correct value.	This is what ARC expected project outcomes to be	This is what ARC recorded at the end of the project
Number of **residential connections** benefiting from the project	☐			
Number of **business/non-residential connections** benefiting from the project:	☐			

Q: (*For projects closed for at least 3 years)* Please provide the approximate date *(mm/dd/yyyy)* you verified these quality-of-life project outcomes. _____

Q: Were these quality-of-life project outcomes met?

- ○ Yes
- ○ Partially
- ○ No

Q: (*For projects with non-zero households benefitting)* Which of the following best describes these residential connections?

- ○ All homes had public `${e://Field/System_type}` service prior to the project
- ○ Most homes had public `${e://Field/System_type}` service prior to the project
- ○ About half of homes had public `${e://Field/System_type}` service prior to the project
- ○ Few homes had public `${e://Field/System_type}` service prior to the project
- ○ None of the homes had public `${e://Field/System_type}` service prior to the project
- ○ I don't know.

(For projects with non-zero businesses benefitting) Which of the following best describes these business/non-residential connections?

- ○ All businesses had public `${e://Field/System_type}` service prior to the project
- ○ Most businesses had public `${e://Field/System_type}` service prior to the project
- ○ About half of the businesses had public `${e://Field/System_type}` service prior to the project
- ○ Few businesses had public `${e://Field/System_type}` service prior to the project
- ○ None of the businesses had public `${e://Field/System_type}` service prior to the project
- ○ I don't know.

Q: Please describe any other positive outcomes from this project that were not captured in previous questions.

_____
_____
_____

Q: ARC records show that the project primarily served people in `${e://Field/County%20formatted}` county(/ies).

Is this correct?

- ○ Yes
- ○ No
- ○ Don't know

Q: *(Displayed when respondents selected "no" to the previous question)* Please list the counties that would better represent your service population in the provided text box.

_____

Project Administration

Q: All projects include an anticipated completion date at application. Was your project completed by that anticipated completion date?

- ○ Yes
- ○ No
- ○ Don't know
- ○ I want to explain in more detail _____

Q: Was the project completed on budget?

- ○ Yes
- ○ No
- ○ Don't know
- ○ I want to explain in more detail _____

Q: In your opinion, would this project have taken place without ARC funding?

- ○ Yes
- ○ No
- ○ Don't know
- ○ I want to explain in more detail _____

Q: Which of the following best describes the project funding?

- ○ This project was planned or on-going prior to applying for funding. The project **did not rely** on receiving ARC-funding.
- ○ This project was planned prior to applying for funding, but the project **would not have started** without receiving ARC-funding.
- ○ The availability of ARC-funding allowed us to plan and create this project.
- ○ Other (please explain) _____

Q: In addition to `${e://Field/Admin%20Agency}` and ARC, what other agencies or organizations were critical to the success of this project?

_____
_____
_____

Q: What worked well with the project administration?

_____
_____
_____

Q: What obstacles did you encounter with the project administration?

_____
_____
_____

General Project Feedback

Q: What was the main challenge or opportunity the project aimed to address?

_____
_____
_____

Q: (*Displayed if text response was not null)* To what degree did this project solve this challenge or opportunity?

- ○ Completely solved it
- ○ Somewhat solved it
- ○ Did not solve it
- ○ Don't know
- ○ Too early to tell

Q: Did this project result in any unintended consequences or new challenges?

- ○ Yes
- ○ No
- ○ Don't know

Q: *(Displayed if previous question was answered with "Yes')* Please describe the unintended consequence or new challenge that arose as a result of this project.

_____
_____
_____

Q: What words of advice would you give a community carrying out a project that is funded by ARC?

_____
_____
_____

Q: If there is anything else you would like to share, please detail it in the text box below.

_____
_____
_____

Please click the right arrow to submit the survey. The following page will show your responses to the survey. Click "download PDF" to save a copy.

Appendix L: ARC Evaluation Short Survey

Note that the survey included unique project-specific fields from ARCnet. The code for these fields is shown in the survey below, in the format: `${e://Field/"Imported Field Name"}`

The Appalachian Regional Commission (ARC) is conducting a program evaluation of ARC-funded water and wastewater projects in order to guide future grant offerings benefiting communities across Appalachia. The University of North Carolina at Chapel Hill's School of Government and Virginia Tech are conducting this survey as a part of that evaluation.

The ARC has identified that your organization received an ARC water/wastewater grant for `${e://Field/Title}` that was approved on `${e://Field/approval}` and administered by `${e://Field/Admin%20Agency}`. We would like to verify information about the project that currently exists in ARC records, with an opportunity for you to edit incorrect or complete missing information. Your project's data from the ARC database have already been uploaded to the survey. We would like to ask for your assistance by verifying the data we include, correcting the values if they are wrong, or filling in values that may be missing.

We anticipate the survey will take approximately 2–3 minutes to complete. The appropriate person to complete this survey is someone with access to files about `${e://Field/Title}` or who is familiar with this project. If you are not that person, *please do not go any further in the survey, and instead, forward the original survey link to the appropriate person.*

If you believe you are the best person to complete the survey, click the "next" button to begin. If you have questions or concerns, please contact Austin Thompson by email at thompson@sog.unc.edu or by phone at 919-962-5795. Thank you in advance for your time and participation.

Q: Contact information is collected in case there is any need to follow-up with grantees after the survey is completed. Please input the appropriate contact information in the spaces provided.

- ○ Name: (1) _____
- ○ Organization: (2) _____
- ○ Phone number: (3) _____
- ○ Email address: (4) _____

Economic Development and Quality of Life Project Outcomes

Q: What are the quality of life project outcomes as of today?

When you submitted your application, ARC projected benefits to be provided by the project. When the project closed, ARC recorded benefits. Please read over and verify the data at close. If, to the best of your knowledge, the values today match those recorded close, then check the box for "correct." If values today differ from those recorded at close, then type the current value in the right-most box.

	Project outcomes as of today	Project outcomes as of today	Values projected at approval	Values recorded at close
	Select if the value at close is still CORRECT	If the value at close is NOT CORRECT AS OF TODAY, please input the correct value.	This is what ARC expected project outcomes to be	This is what ARC recorded at the end of the project
Number of **residential connections** benefiting from the project:	☐			
Number of **business/non-residential connections** benefiting from the project:	☐			

Project Administration

Q: All projects include an anticipated completion date at application. Was your project completed by that anticipated completion date?

- ○ Yes
- ○ No
- ○ Don't know
- ○ I want to explain in more detail _____

Q: Was the project completed on budget?

- ○ Yes
- ○ No
- ○ Don't know
- ○ I want to explain in more detail

_____

Q: In your opinion, would this project have taken place without ARC funding?

- ○ Yes
- ○ No
- ○ Don't know
- ○ I want to explain in more detail

_____

General Project Feedback

Q: If there were any other project outcomes, project challenges, or any other comments you would like to share, please detail them in the text box below.

_____

_____

_____

_____

_____

Please click the right arrow to submit the survey. The following page will show your responses to the survey. Click "download PDF" to save a copy.

Appendix M: Data Challenges Encountered During Evaluation

During the evaluation, challenges related to reliability, consistency, and relevancy of data arose. The team worked with ARC to address some of the data challenges encountered, but in some cases, it required additional assumption to be made or limited the analysis.

Challenges with Relevancy and Reliability of ARCnet Data Fields

While ARCnet contains extensive fields for project outputs and outcomes, only some of those fields were relevant to water and wastewater infrastructure projects. Additionally, for some of the planning projects and feasibility studies within the portfolio, the data outputs and outcomes were not transferrable, making those projects harder to evaluate. The project fields, while built on outputs and outcomes defined by ARC's performance measures, did not allow the team to distinguish between new infrastructure and improvements to existing infrastructure, which could have provided an additional level of analysis to assess the impact of ARC funding.

To glean more project details, the team turned to the project descriptions from ARCnet. These descriptions often contained more data than was captured in performance metric fields and could build a fuller narrative of the project. The team cleaned extra characters out of project descriptions and compared project descriptions to measures captured for a subset of projects. Of the 58 projects examined, 20 (34%) were missing some or all performance measures describing the project impacts and 38 (66%) had the performance metrics that would be expected based on project descriptions. This suggests that there may be challenges associated with transferring information from the short project narrative into the by-outcome fields.

Challenges with Consistency of Data Fields

In addition to the challenges with the relevancy and reliability of the data, some challenges arose related to the consistency of the data. Most notably, there is no distinction between null values and zero values in ARCnet. This presented a challenge for the team in understanding the difference between cases where the value was not recorded and might be a nonzero value, and cases where the value was zero.

ARCnet performance metrics include metrics ending in "P" for proposed, "A" for at close, and "V" for validated. Given the nature of the "V" metrics, very few projects had non-zero values. Some projects had "A" metrics or "P" metrics but not both. For those projects which had a zero for either the "A" or "P" metric and a nonzero value for the "P" or "A" metric, it was challenging to know if one field was lacking, or if the value actually changed over the course of the project implementation.

Additionally, the project team examined missing data by basic agency. State agencies were typically the most reliable, with fewer than 4% of state administered projects missing data. Some other basic agencies had between one-third and two-thirds of projects they administered missing data.

Recommendations for Addressing Data Challenges

The team recommends that ARC examine project records to determine the reason for the differences between project descriptions and performance measures recorded. Were "P" metrics projected on original project records? Were the projected values not met, or were data collected that could not be entered because it did not meet ARC data quality standards? What about impacts that would be anticipated based on project descriptions? Are there cases where the project narrative suggests a potential impact but for which performance measures (either "A" or "P") were not recorded?