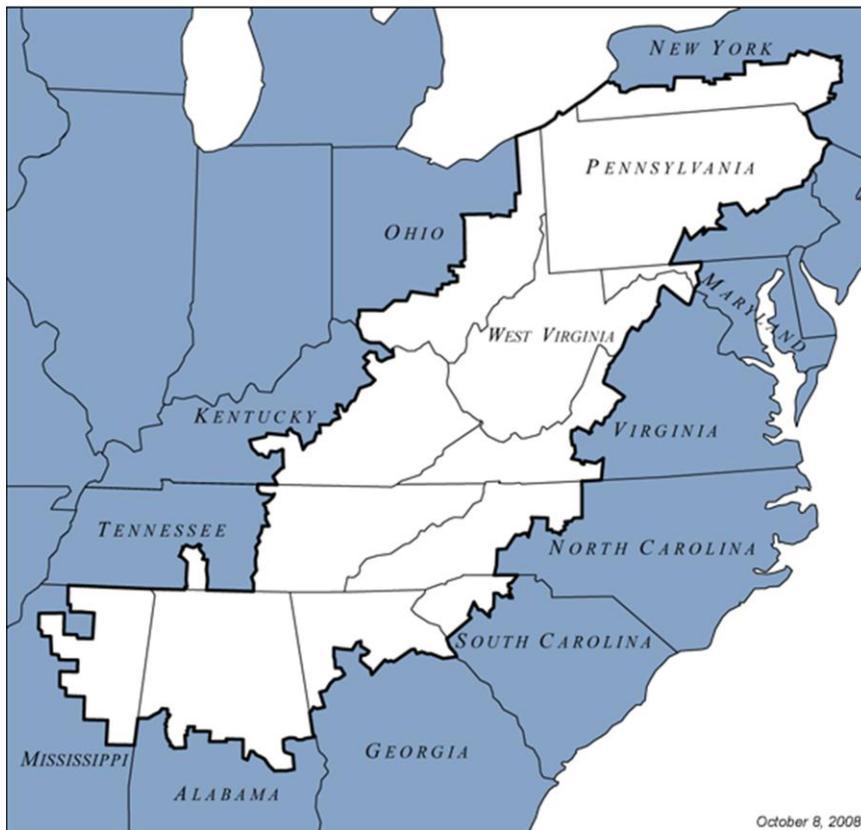




## Program Evaluation of the Appalachian Regional Commission's Infrastructure & Public Works Projects

August 2013



Source: Appalachian Regional Commission

October 8, 2008

### DEVELOPED FOR THE

Appalachian Regional Commission  
1666 Connecticut Avenue  
Washington, DC 20009-1068

### BY

HDR Decision Economics  
695 Atlantic Avenue, 2<sup>nd</sup> Floor  
Boston, MA 02111-2626

with

Cambridge Systematics  
Economic Development Research  
Group  
and  
Mt. Auburn Associates



## FINAL REPORT

### TABLE OF CONTENTS

1	Executive Summary .....	5
1.1	Program Evaluation Review .....	7
1.2	Performance Measure Database .....	8
1.3	Case Studies of Best Practices for Infrastructure .....	10
1.4	Study Findings and Recommendations .....	12
2	Introduction .....	15
3	Definition of Evaluation Criteria and Review of Past Program Evaluations.....	16
3.1	Program Evaluation Methods.....	17
3.2	Comparison to Current Program Evaluation Approaches Used by ARC.....	24
3.3	Summary and Conclusions .....	26
4	Review of Past Reports and Program Evaluations.....	31
4.1	“Evaluation of the Appalachian Regional Commission’s Infrastructure and Public Works Program Projects”.....	31
4.2	“Program Evaluation of the Appalachian Regional Commission’s Infrastructure and Public Works Projects” .....	32
4.3	“Handbook: Assessing Local Economic Development Opportunities with ARC-LEAP (Appalachian Regional Commission Local Economic Assessment Package)”.....	34
4.4	“Understanding Water and Sewer Reporting Issues” .....	36
4.5	“Drinking Water and Wastewater Infrastructure in Appalachia: An Analysis of Capital Funding and Funding Gaps”.....	37
4.6	“Government Performance and Results Act of 1993” .....	38
4.7	OMB Circular A-11, “Preparation, Submission, and Execution of the Budget Applicable to Federal Agencies” .....	39
4.8	“Moving Appalachia Forward: Appalachian Regional Commission Strategic Plan 2011-2016” .	41
4.9	“The Magenta Book: Guidance for Evaluation; United Kingdom Cross-Government Evaluation Group” .....	43
4.10	“Program Evaluation Methods: Measurement and Attribution of Program Results, Third Edition” .....	45
4.11	“Designing Evaluations” .....	48
4.12	“Public Works Program Performance Evaluation” .....	50
5	Performance Measure Database .....	52
5.1	Discussion of Performance Measure Database.....	52
5.2	Analysis and Summary of Project Performance Measure Database.....	54
5.3	Performance Measure Conclusions .....	78
6	Case Studies of Best Practices for Infrastructure.....	80
6.1	Barton Business Park Sewage Treatment Plant – Cumberland, MD .....	82



6.2	Big Caney Water Project Phase II – Dickenson County, VA .....	85
6.3	Burson Center for Business Development – Carrollton, GA.....	89
6.4	Canaseraga Wastewater Collection and Treatment System – Canaseraga, NY .....	94
6.5	Canton Water Improvement Project - Canton Borough, PA .....	97
6.6	Clinton I-75 Industrial Park Sewer Line – Clinton, TN.....	100
6.7	Dobson I-77 Infrastructure Project – Dobson, NC .....	104
6.8	Muscle Shoals Industrial Infrastructure – Muscle Shoals, AL.....	110
6.9	Owingsville/Bath County Industrial Park Wastewater Treatment Plant – Owingsville, KY .....	114
6.10	Powdersville Water Storage Tank Project – Powdersville, SC .....	117
6.11	Racine Water Treatment Plant and Storage – Racine, OH .....	120
6.12	Wastewater Treatment Solutions for Small Communities – Canaan Valley Institute, WV .....	124
6.13	Water Valley Sewer and Water Improvements – Water Valley, MS .....	129
6.14	Case Study Summary Findings and Recommendations .....	132
7	Findings and Recommendations .....	143
7.1	Key Findings.....	143
7.2	Recommendations .....	144
	Appendix A: Appalachian Regional Commission Program Evaluation of Infrastructure and Public Works Questionnaire .....	145
	Appendix B: Sample Letter to Grant Recipients.....	145
	Appendix C: Full Database Distribution by Project Type and State.....	145
	Appendix D: Survey Response Project Types and Responses .....	145
	Appendix E: Outlier Detection and Removal .....	145
	Appendix F: Regression Analysis Predictive Ability .....	145

## TABLE OF FIGURES

Figure ES-1: ARC Region .....	5
Figure ES-2: Number of Projects by State and Infrastructure Type, 2004-2010 Survey Responses.....	8
Figure 1: Project Distribution by Self-Identified Infrastructure Type, Survey Responses (n=197) .....	56
Figure 2: ARC Investment (\$) by Year and Self-Identified Infrastructure Type, Survey Responses (n=197) .....	57
Figure 3: ARC Funding by State and Self-Identified Infrastructure Type, Survey Responses (n=197) .....	58
Figure 4: Number of Projects by State and Self-Identified Infrastructure Type, Survey Responses (n=197) .....	59
Figure 5: ARC Investments by Economic Status – Dollars of Investment, Survey Responses (n=197)....	60
Figure 6: ARC Investments by Economic Status – Number of Projects Invested, Survey Responses (n=197).....	60
Figure 7: Number of Jobs Created or Retained by State, Survey Responses Closed Projects (n=30) .....	62
Figure 8: Number of Jobs Created or Retained by Self-Identified Infrastructure Type, Survey Responses Closed Projects (n=30) .....	62
Figure 9: Jobs Created or Retained by Industry, Survey Responses Closed Projects (n=30).....	63
Figure 10: Number of Businesses Created or Retained by State, Survey Responses Closed Projects (n=30).....	64
Figure 11: Number of Businesses Created/Retained by Self-Identified Infrastructure Type, Survey Responses Closed Projects (n=30) .....	65
Figure 12: Qualitative Survey Responses Regarding Economic Impacts (n=197).....	67
Figure 13: Qualitative Survey Responses Regarding Competitiveness Measures (n=197).....	68
Figure 14: Qualitative Survey Responses Regarding Environmental Measures (n=197) .....	69
Figure 14: Access Road Projects: Difference between Estimated and Observed Job Creation .....	162
Figure 15: Water/Sewer Projects: Difference between Estimated and Observed Job Creation .....	163
Figure 16: Industrial Site Projects: Difference between Estimated and Observed Job Creation .....	163



## TABLE OF TABLES

Table ES-1: Rating of Approaches and Methods against Criteria.....	6
Table ES-2: Number of Projects by State and Infrastructure Type, 2004-2010 Survey Responses.....	9
Table ES-3: Case Study Overview.....	10
Table 1: Summary of Approaches and Methods.....	26
Table 2: Rating of Approaches and Methods against Criteria .....	28
Table 3: Lessons Learned from Tasks 1 & 2 and Recommendations .....	29
Table 4: Number and Share of Grants Received and Survey Responses by State .....	52
Table 5: Number and Share of Survey Responses by Project Sub-Type .....	53
Table 6: Survey Responses by Self-Identified Project Type and State .....	54
Table 7: Comparison of Predicted and Actual Household Served and Jobs Created and Retained .....	66
Table 8: Number of Projects and Projects with Jobs Data by Type for Full ARCnet and Survey Responses .....	71
Table 9: Comparison of Predicted and Actual Job Creation .....	72
Table 10: Average Job Creation by Project Type for Predicted and Actual Jobs.....	73
Table 11: Explanatory Variables Tested in Regression Analysis .....	74
Table 12: Regression Results: Predicted Job Creation (ARCnet Database) .....	75
Table 13: Regression Results: Actual Job Creation (Survey Results) .....	76
Table 14: Regression Results: Intermediate Outcomes as a Function of Total Spending (\$1 Million) (Survey Results).....	77
Table 15: Regression Results: Actual Jobs Created as a Function of Intermediate Outcome (Survey Results) .....	77
Table 16: Case Study Summary .....	80

## 1 EXECUTIVE SUMMARY

### Highlights

#### Methodology

- The 811 Infrastructure Grant recipients from 2004-2010 provided information on their initial application regarding various outcome measures, including job creation and retention potential, business creation and retention potential, and households served.
- Evaluation of program success was conducted using data obtained through a combination of surveys and case studies.
  - Survey responses were received from all Appalachian Regional Commission (ARC) states and all project types, though not all were equally represented. Grantees from Kentucky provided the most responses of any state, water and sewer projects the most responses of any type.
  - Thirteen case studies of exemplary projects – one for each state – were conducted for projects that met or exceeded expectations.

#### Findings

- Overall, survey response demographics were consistent with the full dataset demographics. The largest share of funding went to West Virginia, and among infrastructure types to water and sewer projects. Transitional counties had the greatest number of projects funded and the largest share of investment was in distressed counties.
- ARC funding supported projects that created and retained jobs and businesses and showed a positive impact on both intermediate measures and long-term outcomes:
  - The 21 projects with sufficient information to facilitate a comparison showed actual job creation of 5,051 new jobs, exceeding predictions of 4,181 jobs, despite the recession.
  - Job retention of 1,379 jobs fell short of predictions (2,354 jobs) for the eight projects with both predicted and actual values.
- Survey responses indicated a total of 27,488 households were served by 37 projects, more than double the projections provided in the original applications.
- Predicted job creation rises with project expenditure: \$1 million in spending results in 151 access road jobs, 52 water/sewer jobs, and 129 industrial site development jobs.

#### Lessons Learned

- Consider the project in the context of broader strategic vision.
- Think and plan ahead.
- Tap into outside expertise and resources.
- Consider how to fully leverage investment and develop strong relationships with funders.

#### Recommendations for Future Programs

- ARC Infrastructure Grant program has shown success in terms of economic development but data collection and record keeping for evaluation could use improvement.
  - Require tracking of outputs and outcomes as a stipulation of grant receipt.
  - Clarify project categories in the application.
  - Collect additional information related to funding sources.
- Consider new types of infrastructure investment to increase competitiveness.

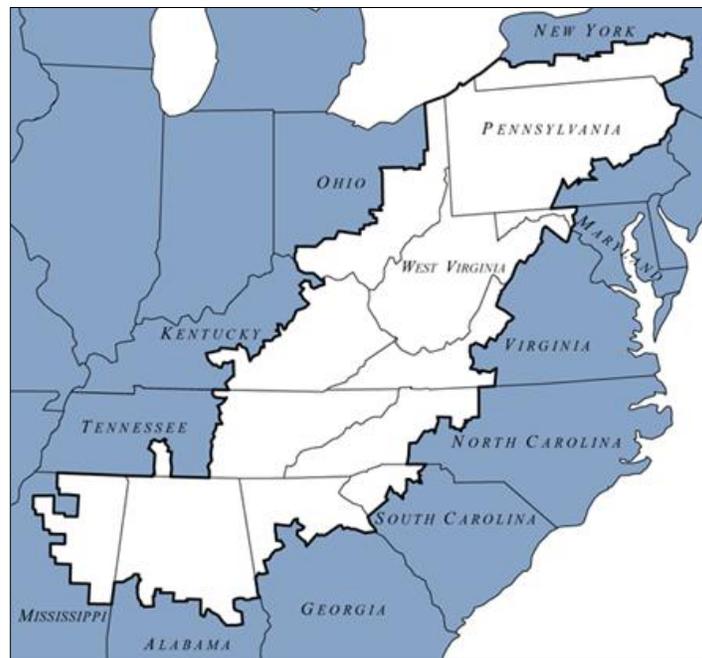
ARC investments fund locally developed public works infrastructure projects to assist localities in establishing and supporting private-sector businesses. The purpose of these grants is to enhance economic development by attracting new industry, encouraging business expansion, diversifying local economies, and generating permanent, private-sector jobs.

The ARC has four main goals, as laid out in the 2011-2016 Strategic Plan:

1. Increase job opportunities and per capita income in Appalachia to reach parity with the nation.
2. Strengthen the capacity of the people of Appalachia to compete in the global economy.
3. Develop and improve Appalachia's infrastructure to make the region economically competitive.
4. Build the Appalachian Development Highway System to reduce Appalachia's isolation.

The performance of the ARC's infrastructure investment program is closely related to these goals, and the ARC has commissioned this program evaluation to estimate the effectiveness of regional infrastructure and public works investments. The study examines projects from all 13 ARC states. The ARC region is outlined in Figure ES-1 below.

**Figure ES-1: ARC Region**



Source: Appalachian Regional Commission

The purpose of this study is to determine the extent to which ARC allocated funding of infrastructure projects contributed to the attainment of the ARC's economic development objectives set forth in its strategic plan. The study searches for correlations between types of projects, levels of funding, and real project outcomes to assess the allocation, impact and cost effectiveness of these programs.

The findings of the study suggest that the grant program is successful in achieving many of ARC's economic development objectives, but could be improved from a data collection and program evaluation

perspective. The following provides a more complete overview of the study’s findings and offers some recommendations for enhancing the evaluation aspects of the grant program.

### 1.1 Program Evaluation Review

This project commenced with a review of prior ARC Program Evaluations and other agency measures to determine the evaluation methods best suited for use in this particular study. The review covered 12 studies from the ARC and other government agencies and included various evaluation approaches: surveys, observation/site visits, case studies, analysis of experimental data, and statistical analysis among others.

The strengths and weaknesses of each evaluation approach, as well as their applicability to the ARC infrastructure investment program evaluation, were summarized. The merits of each evaluation method were rated against criteria to determine which was best suited for this evaluation. The comparison is shown in Table ES-1 below. Based on the study reviews, and giving consideration to the time and resource constraints associated with the project, the team recommended using a combination of surveys and case studies for the evaluation.

**Table ES-1: Rating of Approaches and Methods against Criteria**

Approaches & Methods	Criteria						
	Ease of Use for ARC	Ease of Interpretation	Flexibility	Data Availability	Estimation of Counterfactual	Transparency	Acceptance & Credibility
Surveys	★★★★	★★★★	★★★	★★★	No	★★★★	★★★★
Observations or Site Visits	★★★	★★★	★★	★★	No	★★★★	★★★★
Analysis of Experimental Data	★	★★	★★	★	Yes	★★★★	★★★★
Before & After Comparisons	★★	★★	★★★★	★★	No	★★	★★
Theory Based Evaluation & Modeling	★★★	★★	★	★	Sometime	★★	★★★
Case Studies	★★★	★★★★	★★★ ★	★★★	Generally Not	★★	★★★
Application of Findings from Other Studies	★★	★★	★	★	No	★★	★
Use of Expert Opinion	★★	★★★★	★★★★	★★★★	Not Explicitly	★★	★★
Statistical Analysis and Use of Causal Models	★★	★★	★★	★	Sometime	★★★★	★★★
Input-Output Modeling	★★★	★★★★	★★★★	★★★★	No	★★	★★★★
Benefit-Cost Analysis	★★	★★★★	★★★★	★★	Yes, Needed	★★★★	★★★★
Sensitivity Analysis or Risk Analysis	★★★	★★	★★★★	★★	N/A	★★★★	★★★★



## 1.2 Performance Measure Database

Following the program evaluation review, detailed in the previous section, the HDR Team examined the ARCnet database of 811 infrastructure projects funded by the ARC between FY2004 and FY2010. Using information provided in the database, correspondence announcing an online-survey was distributed to all grantees, based on the database. A survey was then developed to obtain information related to the individual projects, as well as the outputs and outcomes generated by the ARC investment. The team received 211 responses to the survey, though only 197 of these responses contained enough information to analyze. Fourteen of the responses were either blank or duplicates of completed surveys.

The information gathered in the survey was compiled into a database to analyze the reported outputs and outcomes associated with the projects. Responses were received from all 13 states within the Appalachian Region. Mississippi had the highest response rate, with 28 responses accounting for 14 percent of the total. Ohio and Kentucky each had 26 responses.

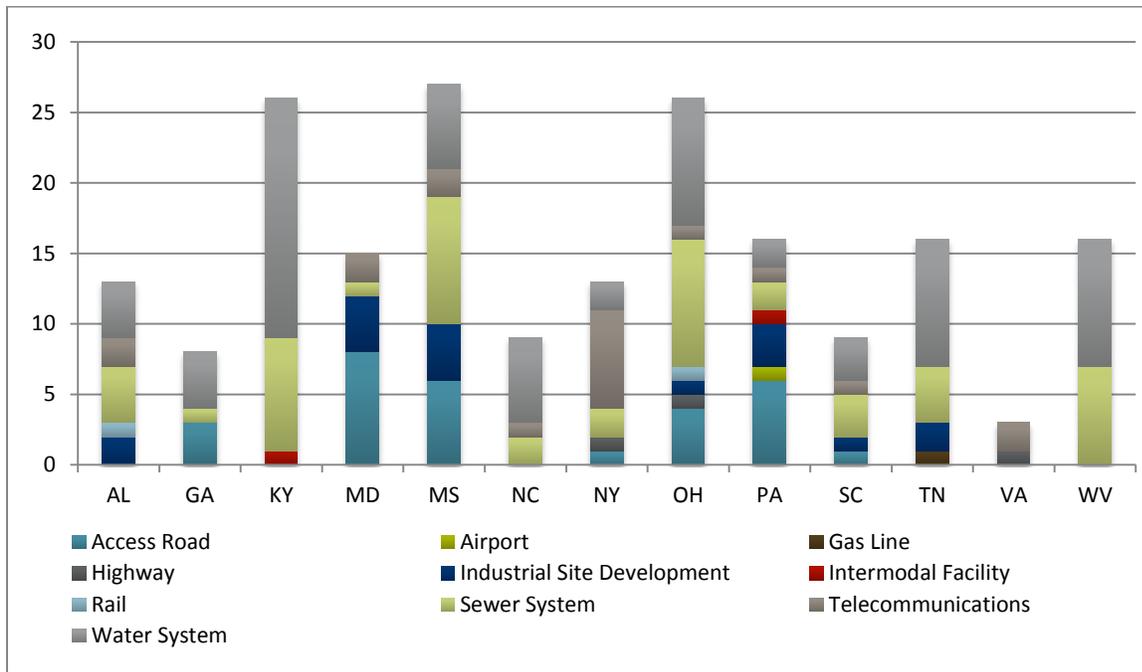
When evaluated from a project perspective, water and sewer systems had the largest number of responses by infrastructure type, 70 and 52 responses, respectively. This accounts for more than 60 percent of the total responses received. The share of responses is slightly less than the share of water and sewer projects in the full ARCnet database, which is 66 percent. Access roads, which account for approximately 15 percent of responses, represent 14 percent of all projects in the ARCnet data.

From 2004 to 2010, ARC contributed \$206.7 million in funding to 811 projects. The survey responses accounted for approximately one-quarter of this funding, or \$56 million. West Virginia received the largest amount of funding relative to both the total ARC contribution and among the survey responses, \$36 million and \$15.9 million, respectively. The largest share of the funding, based on survey responses, was spent on water system projects, \$28 million. This is very similar to the overall database, where water system or water tank projects account for \$105 million of the \$206.7 million, or approximately 50 percent, funded by ARC.

### 1.2.1 Descriptive Statistics

The performance measure database included information on 197 projects from all 13 Appalachian states across ten different infrastructure types. Approximately 77 percent of the survey responses were from water, sewer, or access road projects compared with 80 percent of all projects funded falling in these three categories. It should be noted that infrastructure type was identified by the ARC grant recipient. Figure ES-2 shows the number of projects funded in each ARC state, based on the survey responses. It also presents the types of infrastructure investments that were made. Overall, the bulk of ARC investment was in water and sewer infrastructure projects and the Commission sponsored many projects in both Kentucky and Mississippi, as presented below.

**Figure ES-2: Number of Projects by State and Self-Identified Infrastructure Type, 2004-2010 Survey Responses (n=197)**



In terms of total funding, the largest share of investment was spent in West Virginia. Most of the projects were in transitional counties, but the largest share of funding was spent in distressed counties.

ARC funding contributed to attracting new businesses and jobs to the communities, as well as improving the efficiency of business operations. Based on the survey results, water projects generated the most benefits in terms of jobs created or retained, businesses served, and households served. Additionally, projects in Kentucky seemed to have the highest benefit in terms of households and businesses improved. ARC funding of water system, industrial site development, sewer system and access road projects offered the highest return on investment, based on survey results. Of the studied cases, water systems projects have created or retained 6,005 jobs and 36 businesses. Industrial site development created or retained the second highest number of jobs with 1,045 and three businesses. Sewer systems created fewer jobs, 304, but the second highest number of businesses, 27. Access road projects created or retained 700 jobs and retained one business.

It is worth noting that expectations or anticipated outcomes of grant recipients were often lower than actual outcomes. For example, survey respondents expected to serve approximately 13,000 households but actually served nearly 27,500 – more than double the anticipated amount. Job creation was also greater than anticipated, with 5,051 jobs compared to 4,181 predicted. Job retention, however, fell short of predictions only keeping 1,370 jobs rather than the 2,354 jobs predicted.

ARC funds accounted for 20 percent of total project costs for those projects that responded to the survey and according to the grantees, ARC funding had a significant effect on the outcome of the projects. Without this funding, 35 percent of the projects for which responses were gathered would not have happened.



### 1.2.2 Econometric Analysis

As mentioned previously, the data collected through the survey process provided information on 197 projects funded between 2004 and 2010. The statistical analysis examined both the full universe of 811 cases in the ARCnet database and these survey responses. Statistical data was observed to be consistent between these two datasets; minimum, maximum, and average job creation were similar. The econometric analysis provided insight on both the actual job creation generated by the investments and the job creation anticipated by grant recipients at the time their application was submitted to ARC.

#### Statistical Analysis

Regression analysis, which is a statistical process for estimating the relationships between variables, showed that project size, density, and economic distress all affect job impacts. For example, water/sewer projects located in more urbanized areas (as indicated by higher population density) tended to have larger job impacts. Access road projects tended to have higher impacts in less dense areas.

The effect of economic distress was more complicated. In general, job impacts were greater in distressed areas, but as spending went up, the effect went down. This could reflect the fact that there is more opportunity for growth—or more capacity in the local economy—in distressed areas, but diminishing returns from large projects in those areas.

The study suggests that approximately 144 jobs are created for every mile of access road paved. It is also estimated that every 10,000 linear feet of water/sewer construction is associated with 10 new jobs.

Overall, the findings of both the descriptive and statistical analyses show that the ARC funding had a positive impact on both the intermediate measures – the construction of the infrastructure – and the long-term outcomes, such as job creation and business retention.

### 1.3 Case Studies of Best Practices for Infrastructure

In addition to the survey, the HDR Team conducted case studies of 13 projects, one in each ARC state. The case studies were intended to be exemplary in character in order to provide ARC and communities considering similar projects with insights into the ingredients of successful projects. Exemplary projects were identified through review of survey data and discussions with ARC program staff and state program managers. ARC defines exemplary projects as follows:

- Met or exceeded outcome projections
- Unexpected outcomes
- Consistency with ARC objectives and strategies
- Projects that achieved multiple objectives/strategies
- Particularly strong local commitment (e.g., financial contribution; participation of key actors)

The case studies focused on project planning and implementation, challenges encountered and how they were addressed, economic and community impacts, and “lessons learned” for communities undertaking similar projects. Information was obtained through review of ARC documents and interviews with key project participants, beneficiaries, and observers. Three of the case studies were conducted on-site and the remaining ten through telephone interviews. In addition to geographic diversity, the case studies were selected to obtain a mix of project types. Basic information on each of the case study projects is presented in the following table, with details provided in Section 6.

**Table ES-3: Case Study Overview**

Grantee	Project Title	Project Description	Project Category & Type	ARC Funding	Total Cost	Primary Outcomes
Allegheny County, MD	Barton Business Park Sewage Treatment Plant	Construction of a sewage treatment plant for 150-acre Business Park. Targeted users include advanced manufacturing and defense-related production facilities	Business Development/ Sewer System	\$371,000	\$1.94 million	364 jobs created; \$12 million Leveraged Private Investment (LPI)
Dickenson County, VA	Big Caney Water	Phase 2 of five-phase project to repair water infrastructure and extend water service to homes and businesses in unincorporated parts of the county	Community Development/ Water System	\$300,000	\$3.1 million	453 residences and 10+ businesses served
Carroll Tomorrow, Carroll County (GA)	Burson Center for Business Development	Development of small business incubator providing affordable space for small, early-stage businesses for periods ranging from one to five years.	Business Development/ Business Incubation	\$216,882	\$1.9 million	362 jobs created; \$42 million LPI
Village of Canaseraga, NY	Canaseraga Wastewater Collection and Treatment System	Construction of new wastewater treatment system to replace failing residential septic systems	Community Development/ Sewer System	\$150,000	\$4.59 million	215 residences and businesses served; 155 jobs retained
Borough of Canton, PA	Canton Water System Improvements	Replacement of 75-year old water mains and the construction of water storage tank	Community Development/ Water System	\$285,000	\$3.7 million	750 households and 70 businesses served; 200 jobs retained
City of Clinton, TN	Clinton I-75 Industrial Park Sewer Line	Improvements to wastewater collection and transmission system to support construction of auto parts production plant	Business Development/ Sewer System	\$450,000	\$1.26 million	560 jobs created; \$65+ million LPI
Town of Dobson, NC	Dobson I-77 Infrastructure	Extension of municipal water and wastewater service to a site of planned commercial development at interstate highway exit	Business Development/ Water and Sewer Systems	\$200,000	\$2.2 million	77 jobs created; \$18.25 million LPI
City of Muscle Shoals, AL	Muscle Shoals Industrial Infrastructure	Utilities and road improvements in a new industrial park to support construction of auto parts production facility	Business Development/ Industrial Site Development	\$500,000	\$2.73 million	800 jobs created; \$60 million LPI

Grantee	Project Title	Project Description	Project Category & Type	ARC Funding	Total Cost	Primary Outcomes
City of Owingsville, KY	Owingsville/Bath County Industrial Park Wastewater Treatment Plant	Installation of wastewater treatment plant to meet the expansion needs of food processing plant	Business Development/ Sewer System	\$500,000	\$3.04 million	222 jobs created and retained; \$26.2 million LPI
SC Budget & Control Board/Powdersville Water District	Powdersville Water District Water Storage Tank	Construction of water storage tank	Community Development/ Water System	\$500,000	\$1.69 million	410 jobs created
Village of Racine, OH	Racine Water Treatment Plant and Storage Facility	Replacement of deteriorating water facilities with new water treatment plant and ground water storage tank	Community Development/ Water System	\$457,000	\$1.96 million	315 households served; 55 jobs created and retained
Canaan Valley Institute, WV	Wastewater Solutions for Small Communities	Support for development of decentralized wastewater treatment facilities in small, unincorporated communities in southern WV's coal region through technical assistance to nonprofit organizations	Community Development/ Sewer System	\$96,811	\$176,865	77 residences and 1 business served; additional 900 residences projected
City of Water Valley, MS	Water Valley Sewer & Water Improvements	Repair of deteriorated sewer lines in residential area and a part of downtown, and extension of water and sewer service to another residential area	Community Development/ Sewer and Water Systems	\$152,547	\$602,547	354 residences and 15 businesses served; 100 jobs retained

#### 1.4 Study Findings and Recommendations

The HDR Team's infrastructure program evaluation work examined the impact of a particular investment on income, employment opportunities, job creation and retention, as well as the number of households and businesses served by the project. The evaluation considered both quantitative and qualitative outcomes of the investments in order to gauge the overall performance of the projects.

Water and sewer projects were the most frequent uses of grants, as well as the most heavily funded project types, based on survey results. These projects also generated the most benefit in terms of jobs created or retained, businesses served, and households served.

Based on the questionnaire responses and case study findings, grant recipients seemed to underestimate the job and business impacts that the investment would have on their area. In many cases, the anticipated outcome per dollar spent was actually less than the actual outcome per dollar spent – a benefit to the Commission. Qualitatively, survey and case study respondents thought that the funding they received contributed to attracting new businesses and jobs to the community, as well as improving the efficiency of business operations. According to respondents, approximately 35 percent of the projects would not have occurred without the contributions from the ARC, indicating the importance of the program toward achieving the Commission's goals.

Overall, the evaluation found mixed results in terms of outcomes and outputs, though there are many factors contributing to these results. The varied feedback and success of the projects, as identified through the survey results and case study evaluations, has led the team to create a series of recommendations for future program funding prioritization. This list of recommendations is not meant to be a total assessment of the program or its priorities, but rather is intended to support future success while achieving the goals of the Commission.

The HDR team observed several important “lessons learned” through the questionnaire and case study process that may help the Commission and future grant recipients best leverage ARC funding to achieve maximum economic development outcomes:

- Consider the project in the context of a broader strategic vision.
- Think and plan ahead.
- Right-size your project, but know that sometimes a larger initial investment may save money in the long run.
- Consider how to fully leverage your investment and develop strong working relationships with funders.
- Develop strong collaborative relationships and effective communications among all key local actors.
- Tap into outside expertise and resources.
- Be prepared to meet business timelines and take a hands-on approach during the construction phase.
- Take a long-term view.

The recommendations provided below are intended to both improve the quality of the data utilized in ARC program evaluation and also the data collection process itself.

*Require tracking of outputs and outcomes as a stipulation of receiving the grant.* Several respondents noted that they were only required to keep records for five years and thus did not have any information on the project in question. Others simply did not have the information because they did not track the outputs or outcomes. This led to a lower than desirable response rate to the questionnaire and the possibility of skewed results. Given the high priority of tangible improvements to job opportunities and other competitiveness measures, it would be in the best interest of the Commission to require tracking simply for reporting and analysis purposes. This does not mean that a lack of the anticipated success in a particular case would be penalized, but would simply allow for better future prioritization of funding investments. One possible option would be to develop a letter directed to the local development districts highlighting the importance of collecting this information.

*Consider new types of infrastructure investment to increase competitiveness.* Water and sewer infrastructure projects accounted for the largest share of ARC spending during the evaluation period, and these projects are essential in providing basic services to underserved areas. As the region's most basic needs are met, it is important to invest in additional infrastructure. For example, a strong fiber optic and broadband infrastructure could help increase Appalachia's competitiveness with other regions of the country.

*Clarify Project Categories.* There may be some disconnect in the classification of projects for funding purposes and the project type as viewed by the grant recipient. When comparing the project type from the ARCnet database to the project type as identified by the survey respondent, there were multiple cases of discrepancies between the two. For example, in one case, a project was classified as an access road in the ARCnet database, though it is actually an airport runway. Clarity and consistency on project type will aid in tracking performance metrics in the future.



*Collect Additional Information Related to Funding Sources.* It is not always the case that ARC funds are the only sources of capital for specific infrastructure projects. Better understanding of all funding required to bring a project to fruition, as well as the sources of these funds, would provide useful insight to ARC. It would be interesting to know, for example, whether greater success in terms of job retention and creation occurs when there are many parties involved in funding the project. A better understanding of the leveraging power of ARC investments, as well as the non-ARC incentives that are being provided to support specific projects, may be informative to ARC as they consider future investment.

## 2 INTRODUCTION

Appalachian Regional Commission investments fund locally developed public works infrastructure projects to assist localities in establishing and supporting private-sector businesses. The purpose of these grants is to enhance economic development by attracting new industry, encouraging business expansion, diversifying local economies, and generating permanent, private-sector jobs. Business location decisions are heavily influenced by a number of factors in a geographic area. In addition to a skilled labor force and access to suppliers, adequate public facilities in the form of roads, water/sewer, telecommunications and utilities, and appropriately developable land in the form of industrial and commercial parks, are key factors to attract businesses to an area.

Performance management is a policy-directed, data-driven, performance-based business practice that links organizational goals and objectives to resources and results. The outcomes of performance-based management include a more efficient distribution of limited resources and a focus on accountability of decision-making. Performance management has been in use for over a decade in various public works fields, and over that time it has evolved from a focus on identifying measures and tracking performance to using performance measures in decision-making. This increased focus on managing with performance measures has enhanced the role of performance evaluation to address two important questions: 1) How are we doing? And 2) How can we do better?

This study aims to evaluate ARC funded infrastructure and public works projects to assess whether or not the projects have achieved their stated goals as well as these projects' contribution to the strategic objectives of the Commission. This study covers projects funded from 2004 to 2010 throughout the Appalachian Region, focusing on economic impacts including job creation and retention, business service, economic diversification and income growth.

The first section of this report provides detail on the various methods employed by the ARC and other organizations to evaluate program performance. This information is based on a review of ARC and other studies that focus on program evaluation reports, and guidance and related program evaluation studies from other government agencies. The second section of this report provides information on the development of the performance measure database as well as an analysis of the findings. The final section of the report details case studies of funded projects.



### 3 DEFINITION OF EVALUATION CRITERIA AND REVIEW OF PAST PROGRAM EVALUATIONS

Traditional evaluation methods and other approaches are described in the report, and studies that have relied on these methods to measure program performance are highlighted throughout. The report also compares ARC's existing approaches to measuring project performance with the methods used by other organizations or recommended by guidance documents that have been reviewed. The major evaluation approaches discussed in the report include:

- Surveys
- Observation or site visits
- Analysis of experimental data
- Before and after comparisons
- Theory-based evaluation and modeling
- Case studies
- Application of other studies
- Use of expert opinion
- Statistical analysis and causal models
- Input-output modeling
- Benefit-cost analysis
- Sensitivity analysis and risk analysis

A complete annotated bibliography that provides the name of the study, primary purpose, overall conclusions and other information is also provided in this report. Studies from both the Appalachian Regional Commission and other Government agencies were reviewed for depth of analysis of performance measures. The studies that were reviewed include:

- Program Evaluation of the Appalachian Regional Commission's Infrastructure and Public Works Projects (2007 and 2000)
- Assessing Local Economic Development Opportunities with ARC-LEAP (Appalachian Regional Commission Local Economic Assessment Package) (2004)
- Understanding Water and Sewer Reporting Issues: A Study of the Economic Development Infrastructure and Resources Survey Methodology (1999)
- Drinking Water and Wastewater Infrastructure in Appalachia, An Analysis of Capital Funding and Funding Gaps, UNC Environmental Finance Center (July 2005)
- Government Performance and Results Act of 1993, passed by the 103rd U.S. Congress
- Office of Management and Budget (OMB) Circular A-11, Preparation, Submission, and Execution of the Budget applicable to federal agencies (August 2011)
- Moving Appalachia Forward: Appalachian Regional Commission Strategic Plan 2011-2016
- The Magenta Book: Guidance for Evaluation, United Kingdom Cross-Government Evaluation Group (April 2011)
- Deputy Comptroller General, Treasury Board of Canada's Program Evaluation Methods: Measurement and Attribution of Program Results, Third Edition

- United States General Accounting Office's (GAO's) Designing Evaluations report (March 1991)
- Economic Development Administration's (EDA's) Public Works Program Performance Evaluation (May 1997)

The remainder of this section covers an overview description of different methods to conduct program evaluation, keeping in mind that it is common to apply two or more techniques to strengthen evaluation findings and examine causal relationships between a program and its desired outcomes. Section 3.2 provides a more detailed literature review of four studies specifically related to the ARC, while Section 3.3 details program evaluation guidance and reports from other government agencies in the U.S., Canada, and Europe.

### 3.1 Program Evaluation Methods

As discussed in the studies reviewed, there are a number of different approaches to measuring the performance of projects. A description of the method, its pros and cons, and its applicability to ARC public infrastructure project evaluation is provided. Where relevant, specific guidance or studies that discuss or utilize the approach are referenced.

#### 3.1.1 Surveys

A very common approach to assessing project performance by private and public entities is the implementation of a survey. There are three major survey types discussed in the literature: cross sectional, panel, and criteria referenced.

1. Cross Sectional: Measurements are made for multiple units at a single point in time.
2. Panel: Similar to a cross-sectional survey but has the added feature that the information is acquired from a given sample unit at two or more points in time.
3. Criteria Referenced: Enables evaluators to answer normative questions, which compare actual performance to an external standard of performance.

Surveys are versatile and, when properly done, produce reliable and valid information. They require expertise in their design, conduct and interpretation, however, and the results can be easily misused. The guidance offered in several of the studies reviewed, and in particular the Treasury Board of Canada's "Evaluation Methods: Measurement and Attribution of Program Results," recommends several basic steps before implementing a survey.

1. Other evaluation options: Evaluator should check to see if required data are available elsewhere and determine whether the survey is the most cost effective and efficient way to collect the data.
2. Good front end planning:
  - a. Identify what specific information will address a given evaluation issue;
  - b. Determine sources of information (e.g., types of respondents);
  - c. Choose methods to be used for sampling sources (e.g., random sampling) and collecting information (e.g., structured interviews and self-administered questionnaires);
  - d. Determine timing and frequency of information collection;
  - e. Decide on basis for comparing outcomes with and without a program; and
  - f. Develop the analysis plan.
3. Survey design: Avoid "nice to know" data collection and keep survey succinct and clear.



4. Survey pretest: Pretest on a representative sample of the survey population. Provides information on clarity of questions, response rate, time and length to complete, and the appropriateness of survey method. It also allows for adjustments to the survey approach as necessary.

### Applicability to ARC Program Evaluation

ARC utilizes cross-sectional surveys to collect data for program evaluation in a number of different areas and then uses this information to estimate the full impacts of a program. Previous ARC program evaluations have employed this approach, which is consistent with the guidance. The ARCnet database of projects includes a significant amount of data collected through the use of surveys (most recently conducted online). Additionally, the Local Development Districts (LDDs) conduct surveys every two years in an effort to obtain information related to water and sewer use in the Appalachian region. Historically, this has resulted in some information being collected that is useful in assessing the need for facilities, but some LDDs provide outdated or incomplete information because they do not have data available to them that would facilitate a more accurate completion of the survey. While surveys are applicable to ARC evaluations, the LDD water/sewer experience highlights the importance of pre-testing the survey instrument.

#### 3.1.2 Observation or Site Visits

This program evaluation technique involves on-site visits by an evaluator to locations where a program is operating to observe activities and to take notes. Program participants and leaders may or may not be aware that the program is being evaluated. When considering this evaluation approach, it is important to be aware that program staff may alter their behavior if they know they are being observed. The following recommendations were made in the reviewed guidance:

- a. U.S. General Accounting Office (GAO)<sup>1</sup> encourages an evaluator to consider social/cultural mores of the area where the evaluation is to be conducted. If the evaluation is in a rural area, for example, the evaluator must be sensitive to the difference in culture between a rural and urban environment.
- b. Consider whether the population being studied is stable. Are residents transient or do people live in the study area for decades? A neighborhood where residence is transient may require a different implementation strategy than one in which people do not move.
- c. Determine whether an on-site visit to evaluate a program is justifiable on a cost basis. On-site visits can be very useful but also very costly.
- d. Be aware that an evaluator may input some subjectivity in his or her assessment of a program.
- e. Keep in perspective that observation offers only anecdotal evidence unless it is combined with a planned program of data collection. By itself, it is not grounds for generalization about a program.

While this type of evaluation approach may be costly and may be subject to the perception of the evaluator, it does offer the opportunity to collect important qualitative information that may not be collected through other evaluation methods. The guidance offered by the Treasury Board of Canada points out that this approach may allow an evaluator to see things that may escape staff members or identify issues they are reluctant to raise in an interview. This is an important benefit of this evaluation approach.

---

<sup>1</sup> United States General Accounting Office, Program Evaluation and Methodology Division, *Designing Evaluations*, March 1991.

## Applicability to ARC Program Evaluation

Site visits have been a part of the previous infrastructure program evaluations conducted by ARC. In the past, these visits have been one of several approaches used in these evaluations. As another example, the EDA's "Public Works Program Performance Evaluation," conducted in May 1997, involved site visits. Specifically, EDA invited grantees to seminars at 13 locations across the country. At these seminars, they were instructed on technicalities of the team's information requests and the specific information that would be required as part of the program evaluation. One-day seminars were held in Atlanta, Austin, Chicago, Cincinnati, Denver, Hartford, Little Rock, Los Angeles, Myrtle Beach, Orlando, Philadelphia, San Francisco, and St. Louis. Research team members also physically visited 25 percent of the grantee locations for site inspections. Information from these visits, combined with survey data, was used in the evaluation performance metrics. Like ARC, EDA's performance measures include permanent jobs created and private and public funds leveraged. Information related to the diversification of the local economy and tax base added to the community was also assembled by EDA program evaluators.

### 3.1.3 Analysis of Experimental Data

Based on the guidance, program evaluation through experimental designs is the most rigorous approach available for establishing a causal relationship between programs and their outcomes. Unfortunately, this approach is impossible to implement for many programs, particularly when the program has been running for some time.

Experimental designs are characterized by a random assignment of participants to a "treatment" or separate "control" group. This process ensures that the groups being evaluated are equivalent (other than treatment), and the randomized assignment of participants to different groups prior to a program being implemented helps create an even playing field from which to draw comparisons, once the program is operational. Other related designs include:

1. Quasi-experimental design
  - a. Do not use randomization to create treatment and control groups. The treatment group is usually already given and one or more comparison groups are selected to match the treatment group as closely as possible.
  - b. Implementation takes creativity and skill to design.
  - c. Can provide highly accurate findings.
2. Implicit design
  - a. Typical evaluation design, but least rigorous.
  - b. Post-program evaluation with no control group – make a measurement after exposure to the program and then make assumptions about conditions prior to the program.
  - c. Flexible, versatile and practical to implement.
  - d. Offers little objective evidence of the results caused by the program.

## Applicability to ARC Program Evaluation

ARC empirically analyzed the extent to which it has stimulated the Appalachian economy in a quasi-experimental study conducted by Andrew Isserman & Terance Rephann. The study measures the effects of ARC programs on 391 counties within the region using this evaluation approach.<sup>2</sup> This approach could

<sup>2</sup> "The Economic Effects of the Appalachian Regional Commission: An Empirical Assessment of 26 Years of Regional Development Planning," prepared by Andrew Isserman and Terance Rephann, *Journal of the American Planning Association*, Volume 61, Issue 3, 1995.



be useful to ARC in its infrastructure program evaluations as well, but it would be challenging because of the number and range of projects being evaluated, the cost to conduct this type of evaluation, and the need to determine a statistically valid “control” group for comparison purposes.

### 3.1.4 Before and After Comparisons

Before and after assessments<sup>3</sup> compare outcomes for the units of study before the units were exposed to a program to outcomes measured after they began to participate in it. Unlike experiments, there is no separate comparison group, which is a weakness of this approach. This can be mitigated somewhat by evaluating the program at many different points in time. With a sufficient number of evaluation points, an interrupted time series analysis can be applied to this design to help draw causal inferences. A rule-of-thumb is a minimum of 50 before/after observations, based on the evaluation guidance reviewed. Data consistency is also an important element to before and after comparisons. The time series developed needs to be free of definitional and measurement changes, because these can be mistaken for program effects.

#### Applicability to ARC Program Evaluation

This comparison approach has been utilized by ARC in its prior program evaluations, including past studies to estimate the impacts of ADHS highway investments. Specifically, ARC developed profiles of counties prior to infrastructure program implementation and compared this baseline to the counties after the program was put in place. The study was strengthened by comparing the results to counties with no investment.

### 3.1.5 Theory Based Evaluation and Modeling

According to The HM Treasury's “The Magenta Book, Guidance for Evaluation,” theory-based evaluation approaches can offer an overarching conceptual framework within which specific evaluation studies can be designed. This approach is complementary, and not an alternative, to other evaluation approaches. The use of a theory-based evaluation can provide new data and evidence that can be incorporated into the evaluation framework as appropriate. One practical way to do this is through a simulation model.

Simulation models can be used to combine existing and new evidence to answer evaluation questions. These models can be subject to some uncertainty, however, due to the need to make assumptions about how different pieces of evidence are related. Simulation models do allow an evaluator to estimate the incremental effects of a program in complex and uncertain situations, which is not the case with some other evaluation approaches. For very complex programs, evaluation may only be possible through theory-based evaluation or simulation modeling.

Generally, a simulation has three main components based on evaluation guidance:

1. Input data
2. Mathematical model
  - a. Stochastic – incorporates a random data generator
  - b. Deterministic – does not incorporate a random data generator
3. Output data

---

<sup>3</sup> Implicit Designs and Before/After Comparisons are similar evaluation approaches, but the former makes assumptions about conditions before the program was put in place, and the latter uses observations both before and after the program was implemented.

Simulation resembles other statistical techniques, such as regression analysis, and these techniques may actually be used to build a simulation model. Once the model is constructed, however, the inputs provided are actually used by the model to generate outputs. The output generated by the simulation model can be checked against actual real world outcomes.

The guidance suggests that some form of simulation modeling is likely to play a role in a large proportion of program evaluations. Where outcomes are expected to occur over a number of years, some simulation of these effects might be necessary to ensure that evaluation evidence is obtained in a timely fashion. The primary benefit of simulation modeling is that an evaluator can estimate incremental effects of a program in a complex and uncertain situation. The primary con to this approach is that a sophisticated understanding of the dynamics of the program is required, as is some skill in building quantitative models (or the cost of obtaining models, such as the Regional Economic Models, Inc. [REMI] dynamic, time-series based economic forecasting and simulation model).

### Applicability to ARC Program Evaluation

ARC has utilized simulation models when it conducts its economic impact assessments of programs, including IMPLAN, ARC-LEAP, REMI, and TREDIS. These models are primarily used to estimate indirect and induced effects based on direct effects elicited through surveys. EDA also included the use of simulation models in some of its program evaluations. For example, EDA conducted input-output analysis to estimate indirect employment and investment impacts (multiplier effects) of EDA investments. They also conducted regression analysis to estimate the impact of the EDA investments on countywide employment and wages.

#### 3.1.6 Case Studies

Case studies usually involve a variety of data collection methods, including surveys and interviews. While it is tempting to do more case studies than fewer, guidance suggests that the study of a critical case may be more defensible than the case study of a representative sample. Unfortunately, using one case study in an evaluation does not enable the evaluator to make generalizations about the overall program. Case studies:

1. Enable an in-depth analysis that would not be possible with more general approaches;
2. Are typically expensive and time consuming;
3. Usually lack a statistical basis from which to generalize conclusions – difficult to do enough case studies to provide an adequate sample from which to draw conclusions; and
4. Provide broad insights on the program and the real world context of impacts.

The guidance recommends that case studies be carried out before, or in tandem with, other data collection efforts. According to studies offering guidance on program evaluation, there are generally three types of case studies:

1. Single case study
  - a. Information is acquired about a single individual project, process, or entity.
  - b. Qualitative information that describes events and conditions from various points of view can be collected.
  - c. Selection of a single case and the data collection may be challenging.
  - d. Analyzing and reporting qualitative data can be difficult, and the evaluation design must have explicit plans for these tasks. There are several different types of single case studies based on the literature:
    - Illustrative – Describes event or condition.

- Exploratory – May serve as a precursor to a larger evaluation or provide preliminary information.
  - Critical instance – Investigates one problem or event.
2. Multiple case studies
    - a. Likely to produce stronger conclusions than a single case study.
    - b. May be appropriate for evaluating either program operations or results.
    - c. Selecting variety among cases is important to avoid bias, as is uniform information collection.
  3. Criteria-referenced
    - a. Can be adapted to answer normative questions about how well program operations or outcomes meet certain performance criteria.
    - b. Carefully choosing the sample of cases to evaluate is critical.

### Applicability to ARC Program Evaluation

A case study can help develop a clear, well-reasoned and comprehensive understanding of the situation, project or people affected by a program. Case studies often are used to supplement or complement a more quantitative evaluation approach, helping evaluators better understand the causal logic.

The ARC's "Drinking Water and Wastewater Infrastructure in Appalachia: An Analysis of Capital Funding and Funding Gaps" utilized case studies, as well as a survey and information obtained from other reports, in its evaluation. Specifically, ARC examined particular towns, regions, and states to ascertain specific needs for drinking and wastewater and compared these needs to the available data and funds. For the infrastructure and public works program evaluation, case studies of 13 projects will highlight best practices and provide context for the data analysis components of the evaluation.

#### 3.1.7 Application of Other Studies

A literature review of other studies, or a file review of data and information, enables an evaluator to make the best use of previous work in the field under investigation. Application of other studies can help: a) to determine the best analytical methods and performance measures to use; and b) use assumptions and data findings to help compare and estimate program impacts. In addition, the evaluator may learn from the experiences, findings, and mistakes of other entities that have conducted program evaluations. Past research can suggest hypotheses to be tested or evaluation issues that should be examined in the current study, and specific methodological difficulties can be identified and mitigated. In some cases, evaluation questions may be directly answered on the basis of past work or redundant data collection.

Another advantage to reviewing other studies is that sources of secondary data, such as previous surveys or organizational records, may be uncovered, which may lessen the need to collect primary data. While this evaluation approach is economical, it is not always appropriate for a particular program evaluation. Another limitation to using other studies to evaluate a particular program is that it can sometimes be difficult to determine the accuracy of the data gathered through a previous study.

Many project evaluations utilize a review of other studies as a first step in a larger evaluation of a program. ARC has employed this approach in its work, and other organizations have incorporated the same sort of preliminary review of studies prior to embarking upon a larger program evaluation.

## Applicability to ARC Program Evaluation

Reviews of other studies are primarily applicable in terms of determining methodology and performance measures for the infrastructure and public works evaluation. The team cross-checked results from the new program evaluation with the results from previous efforts that attempted to measure the same kinds of ARC infrastructure and public works programs.

### 3.1.8 Other Potentially Applicable Evaluation Approaches

Other applicable approaches to program evaluation were discussed in the studies reviewed by the team. These methods are generally sub-sets of or related to the over-arching methods described above and are described below.

#### Use of Expert Opinion

Collecting data from experts is a method best suited to supplementing other measures of program outcomes. An advantage to this approach is that data can be collected and summarized systematically. In addition, the opinions of experts may vary and experts may not be equally knowledgeable about a program or issue. While this approach should not be used as a sole source of data for an evaluation, it can help fill in the gaps or offer detail on a particular program. For ARC program evaluations, this approach could be part of a case study or survey effort.

#### Statistical Analysis and Causal Models

Statistical analysis and development of a causal model requires expertise, and not all programs can be analyzed using these approaches. A causal model is based on an equation that describes the marginal impact of a set of selected independent variables on a dependent variable. This approach focuses on variables to be included in the model (endogenous and exogenous) and their postulated relationships. Regression analysis is a technique employed to measure the impact of one variable or variables on another, the causal relationship. With respect to program evaluation, the program is only one of several independent variables that are expected to affect the dependent variable. Determining when it is appropriate and how to apply statistical analysis to measure causality is the focus of "Impact Analysis for Program Evaluation."<sup>4</sup> The author also discusses the use of experiments and quasi-experiments as part of an overall evaluation that includes statistical analysis.

#### Input-Output (I-O) Modeling

A variation of theory-based evaluation and modeling, this type of approach consists of using a model designed to depict the mutual interdependence among different parts of an economy. It describes how one industry uses the outputs of other industries as inputs, and how its own outputs are used by other industries as inputs. ARC uses I-O models to measure the total economic impacts (including multiplier effects on indirect and induced demand) of direct project impacts, which are often obtained through interviews with grantees. While useful for better understanding the impact of a program, these types of models and their results can be misused in evaluations. For example, offsetting negative effects generated by taxes and borrowing necessary to support a program need to be factored into an I-O model. Otherwise, the impacts of the program on the economy may be overstated. Other challenges include

<sup>4</sup> Impact Analysis for Program Evaluation, Second Edition, by Lawrence B. Mohr, 1995.



measuring the direct impacts of a program in terms of factors such as additional spending or employment, or controlling for potential displacement of activity from other sectors of the economy (e.g., new retail activity that displaces or impacts existing retail establishments).

The Economic Development Administration and ARC have utilized I-O models in their program evaluations to estimate total job impacts, business sales, and other economic variables.

### Benefit-Cost Analysis (BCA)

Benefit-cost analysis looks at a program's net worth and assesses and compares program alternatives. The issue of attribution and incrementality of effects over a "base case" must be addressed prior to doing this type of analysis. Benefit-cost analysis is more a comprehensive approach to assessing the effects of a program or project than an approach to measuring its performance. It uses the results of interviews, experiments, case studies, and so forth, as inputs and produces summary measures of monetary value. Most typically, benefit-cost analysis is used to assess the future impacts of proposed investments, although it can be used for program evaluation if benefits can be measured and isolated. Regardless of the timing of this analysis, the guidance recommends that a sensitivity analysis of key assumptions be conducted if this analytical approach is employed. Details related to sensitivity analyses are provided below.

### Sensitivity Analysis and Risk Analysis

Analytical work is often directed toward a single "expected outcome," supplemented with alternative scenarios. The limitation of this approach is clear – while it may provide the single best statistical estimate, it offers no information about the range of other possible outcomes and their associated probabilities.

There are two ways to mitigate this issue. One common approach to providing added perspective on reality is "sensitivity analysis." Key assumptions are varied one at a time in order to assess their relative impact on the expected outcome. The problem here is that the assumptions are often varied by arbitrary amounts. A more serious concern with this approach is that, in the real world, assumptions do not veer from actual outcomes one at a time. It is the impact of simultaneous differences between assumptions and actual outcomes that is needed to provide a realistic perspective on the riskiness of a forecast.

Risk Analysis avoids the problems outlined above by measuring the probability or "odds" that an outcome will actually materialize. This is accomplished by attaching ranges (probability distributions) to the forecasts of each input variable. The approach allows all inputs to be varied simultaneously within their distributions, thus avoiding the problems inherent in conventional sensitivity analysis. The approach also recognizes interrelationships between variables and their associated probability distributions. Sensitivity and risk analyses can be useful as part of an overall program evaluation.<sup>5</sup>

## 3.2 Comparison to Current Program Evaluation Approaches Used by ARC

Generally, the ARC has evaluated its infrastructure investments using a combination of approaches applied to a sample of ARC projects. The sample is selected to be representative of the mix of project types and area characteristics within the region. The first step in the evaluation has been a review of ARC records and classification of the programs into a database. A phone survey of several local or regional

---

<sup>5</sup> As an example, see the Federal Highway Administration (FHWA) Economic Analysis Primer, August 2003.

development staff, local government and civic leadership, and/or private sector representatives was then conducted. Information collected through the survey and other secondary data sources were used to construct project profiles. Site visits were then made to validate project results and to develop more detailed case studies. Site selection has historically been based on project type, geography, and area demographics.

For past studies, the projects were evaluated by comparing the anticipated and actual project outcomes in terms of key performance measures. In the initial project applications for ARC funding, local applicants are required to estimate the number of jobs to be created or retained, the number of businesses to be served or retained, and the number of new or existing households to be served directly by the project. This information is considered the “anticipated” outcomes. For the ARC program evaluation of infrastructure conducted in both 2000 and 2007, surveys conducted by phone and site visits were performed to gather information and validate project results. In 2000, eight site visits were made to validate project results and develop case studies. Information related to several different categories was collected and examined during these visits and interviews:

- Project area distress based on the poverty rate, three-year average unemployment rate, and per capita market income as compared to the national averages
- Project data and budget information (cost, sources of funding)
- Project fiscal and economic impact analyses
- Economic trend and vitality analyses of primary impact counties to understand the economic context of impacts
- Interviewee information
- Qualitative project objectives and outcomes
- Impact comments and discussion

ARC interviews and site visits helped to determine the total number of jobs created and retained whenever possible. Other information collected included estimates of retained wages and new income. ARC supplemented this primary data with average wage data from the U.S. Bureau of Labor Statistics. The interviews also helped determine whether ARC's investments broadened the type of jobs available and the desirability of available jobs, as well as the importance of ARC investment and the role that the projects played.

For the ARC evaluations, estimated economic development impacts were compared with the actual results for each project in which an investment was made. This before and after approach enabled a variety of ratios to be constructed, including an investment ratio that compares ARC and total public funding with private investment results. Other ratios constructed in these studies included taxes per dollar of public investment, total public investment per job, and the private sector leverage that resulted from the program investment by ARC. Private sector leverage was based on the total private investment that was spurred (and reported) as a result of the ARC program investment. Economic impacts were also estimated using IMPLAN and the ARC-LEAP model.

The evaluation guidance that was reviewed suggests that utilizing multiple evaluation approaches is useful in that each approach may help fill in the gaps that may occur when using only a single approach. ARC's decision to utilize surveys, on-site visits and case studies, as well as before and after comparisons aided by an input-output model, is consistent with the program evaluation guidance reviewed by the team and similar to how some other agencies assess their program's impacts.

Ideally, ARC would utilize an experimental design approach to measure its program outcomes. The guidance indicates that this evaluation approach is the most rigorous. As is the case with many program investments, however, it would be very difficult and very costly to implement this type of approach. The



ARC funds numerous programs across the Appalachian Region and establishing a control and treatment group for each program would be time- and cost-prohibitive.

### 3.3 Summary and Conclusions

The approaches and methods described in this section are summarized in Table 1 below. The table includes a brief description of the methods, identifies the specific questions being addressed, and assesses the extent to which the methods have been used in the evaluation of ARC programs.

**Table 1: Summary of Approaches and Methods**

Approaches & Methods	Brief Description	Principal Strengths & Weaknesses	Use in ARC Evaluations
Surveys	Collecting data or information directly from those affected by a program or action, typically through a mail or online questionnaire, or through phone interviews. May be cross-sectional, panel, or criteria referenced.	Allows gathering large amounts of performance data at a relatively low cost. Accuracy of data depends on survey and questionnaire design, as well as quality of information available to interviewees. Can only be used to evaluate the direct effects of a program or action.	Yes, extensive
Observations or Site Visits	Visits by an evaluator to locations where a program is operating, to observe activities, assess changes, and take notes.	Allow gathering detailed, qualitative information on the effects of a program at a specific location, or set of locations. Is often costly to implement and findings may be biased by evaluators’ perception.	Yes
Analysis of Experimental Data	Comparison of performance between a treatment group and a control group. Design may be experimental (with random assignment of participants), quasi-experimental (without randomization), or implicit (without control group).	Considered most rigorous approach to establishing cause-and-effect relationships between programs and observed changes. But is generally difficult and costly to implement, and may not be suited to all programs and actions.	Limited
Before & After Comparisons	Comparison of performance before and after implementation of a program, for a single group of units or participants.	Effective in measuring changes over time, but causal relationships between programs and outcomes may not be formally established.	Yes
Theory Based Evaluation & Modeling	Use of a conceptual framework and/or model to develop assumptions about, or simulate the impacts of a program.	Must be used in conjunction with other approaches and methods. Particularly effective in estimating the impacts of complex programs. If not properly documented, simulation models may be viewed as “black boxes,” limiting the applicability of their output.	Yes, in the estimation of indirect and induced economic impacts

Approaches & Methods	Brief Description	Principal Strengths & Weaknesses	Use in ARC Evaluations
Case Studies	Detailed analysis of a critical case or a limited set of cases, involving a variety of information gathering techniques (including interviews, site visits, etc.).	Provide in-depth information and analysis of effects, but can only be applied to a limited number of units or locations. Results can rarely be generalized. Particularly useful in validating or augmenting the findings of a broader data collection effort (e.g., survey).	Yes
Application of Findings from Other Studies	Use of methods, data sources, assumptions and/ or estimates from existing studies.	Useful in methodology development stages. “Transfer” of impact estimates and other quantitative or qualitative findings are generally low-cost, but not considered best-practice.	Only to inform selection of methods and performance measures
Use of Expert Opinion	Eliciting information directly from Subject Matter Experts, to supplement other data sources and collection efforts.	Particularly useful when observation and traditional data collection techniques fail to produce adequate results. May also be used for review and validation. Requires use of formal elicitation techniques to limit potential for bias.	No
Statistical Analysis and Use of Causal Models	Use of statistical methods, including regression analysis, to estimate “causal” relationships between program attributes and performance. Often used for the analysis of experimental or quasi-experimental data.	Allows formal hypothesis testing, but robustness of results depends on quality of data and survey design (see Analysis of Experimental Data). Is not applicable to all types of programs.	Limited
Input-Output Modeling	Use of accounting tables tracing linkages of inter-industry purchases and sales to estimate the indirect and induced economic impacts of a program or action.	A sub-set of Theory Based Evaluation & Modeling. Economic impacts estimated with off-the-shelf I/O models are typically gross impacts, ignoring many further possible interactions and responses.	Yes, in the estimation of total economic impacts
Benefit-Cost Analysis	Estimation of the costs and benefits of a program, defined in terms of well-being (welfare) with a view to providing an overall assessment of value-for-money. Is not a performance-measurement approach per se.	Primarily used for program assessment, ex-ante; but may be used ex-post to estimate the return on investment of existing programs (based on performance measures developed through other means).	No
Sensitivity Analysis or Risk Analysis	General approaches to incorporating uncertainty into performance measurement and program evaluations. Can be applied in conjunction with any of the above quantitative methods.	Assists decision-makers in assessing the degree of confidence they should place in the outcomes of an evaluation.	No



Table 2 evaluates each approach or method against a set of criteria, defined as follows:

- **Ease of use in ARC evaluations:** whether, once developed, the method and associated tools can be used by local, regional and ARC staff with a range of technical expertise;
- **Ease of interpretation:** whether the resulting performance measures can be easily understood and interpreted;
- **Flexibility:** whether the method can be applied to a wide range of conditions and projects;
- **Data availability:** whether the data required to apply the method are readily available and/or accessible at a reasonable cost;
- **Ability to “attribute” impacts:** whether the contribution of the program to observed outcomes can be formally tested;
- **Estimation of counterfactual:** whether the method requires use of a control group and/or estimation of a counterfactual;
- **Transparency:** whether all steps of the method can be described clearly, including where applicable the “logic” used to derive outcomes from output measures; and
- **Acceptance and credibility:** whether the method is widely accepted and/or conforms to industry standards.

The ratings shown in the table were developed, somewhat subjectively, by the Project Team. The criteria are rated on a scale of one to four (stars), four representing the easiest or most flexible method, and one the least.

**Table 2: Rating of Approaches and Methods against Criteria**

Approaches & Methods	Criteria						
	Ease of Use for ARC	Ease of Interpretation	Flexibility	Data Availability	Estimation of Counterfactual	Transparency	Acceptance & Credibility
Surveys	★★★★	★★★★	★★★★	★★★★	No	★★★★	★★★★
Observations or Site Visits	★★★	★★★	★★	★★	No	★★★★	★★★★
Analysis of Experimental Data	★	★★	★★	★	Yes	★★★★	★★★★★
Before & After Comparisons	★★	★★	★★★★	★★	No	★★	★★
Theory Based Evaluation & Modeling	★★★	★★	★	★	Sometimes	★★	★★★★
Case Studies	★★★★	★★★★★	★★★★★	★★★★	Generally Not	★★	★★★★
Application of Findings from Other Studies	★★	★★	★	★	No	★★	★
Use of Expert Opinion	★★	★★★★	★★★★	★★★★	Not Explicitly	★★	★★
Statistical Analysis and Use of Causal Models	★★	★★	★★	★	Sometimes	★★★★	★★★★

Criteria	Ease of Use for ARC	Ease of Interpretation	Flexibility	Data Availability	Estimation of Counterfactual	Transparency	Acceptance & Credibility
Approaches & Methods							
Input-Output Modeling	★★★	★★★	★★★	★★★★★	No	★★	★★★★★
Benefit-Cost Analysis	★★	★★★	★★★	★★	Yes, Needed	★★★	★★★
Sensitivity Analysis or Risk Analysis	★★★	★★	★★★	★★	N/A	★★★	★★★

Lessons learned from the literature review and selected recommendations for subsequent tasks and future ARC evaluation efforts are summarized in Table 3 below. In drafting these recommendations, the Project Team recognizes ARC’s time and resource constraints, and considers the specific focus of its ongoing evaluation and research efforts.

**Table 3: Lessons Learned from Tasks 1 & 2 and Recommendations**

Approach or Method	Lessons Learned	Selected Recommendations	Main Sources
Surveys	<ul style="list-style-type: none"> <li>Response rates may be lower than expected.</li> <li>The information collected through surveys may be incomplete, imprecise or outdated.</li> <li>Survey respondents may have difficulties thinking in terms of “counterfactual” and assessing the true contribution of a program.</li> </ul>	<ul style="list-style-type: none"> <li>Avoid “nice to know” data collection, and keep survey succinct and clear.</li> <li>Pretest the survey instrument on a representative sample of the population. Provides information on clarity of questions, response rate, time and length to complete.</li> <li>Review the appropriateness of the survey method for collecting the information needed for an evaluation.</li> <li>Focus on direct effects and provide guidance with respect to assessing attribution and cause-and-effect.</li> <li>Offer interviewees the opportunity to rate the strength of their claims of new jobs and other effects.</li> </ul>	<ul style="list-style-type: none"> <li>Treasury Board of Canada</li> <li>UK Cross Government Evaluation Group</li> </ul>
Observation or Site Visits	<ul style="list-style-type: none"> <li>Approach may allow evaluators to see things that may escape staff members or identify issues they are reluctant to raise in an interview.</li> <li>Findings may be biased by evaluators’ subjectivity and/or changes in the behavior of those being observed.</li> </ul>	<ul style="list-style-type: none"> <li>To the extent possible, systematically include site visits in program evaluations.</li> <li>Use observation results to augment and validate survey findings, or (in survey design stage) to assist with questionnaire development.</li> <li>Instruct evaluators to conduct extensive background research on site or unit prior to visit.</li> </ul>	<ul style="list-style-type: none"> <li>Treasury Board of Canada</li> </ul>



Approach or Method	Lessons Learned	Selected Recommendations	Main Sources
Analysis of Experimental Data	<ul style="list-style-type: none"> <li>Use of experimental or quasi-experimental data is considered the most rigorous approach to assessing the effects of a program.</li> </ul>	<ul style="list-style-type: none"> <li>Consider supplementing ongoing evaluation efforts with occasional statistical analyses, in the spirit of Isserman &amp; Rephann (1995).</li> <li>Explore possibility of hypotheses testing using information from the ARCnet database.</li> </ul>	<ul style="list-style-type: none"> <li>Treasury Board of Canada</li> <li>Isserman &amp; Rephann (1995)</li> </ul>
Before & After Comparisons	<ul style="list-style-type: none"> <li>Approach is commonly used in program evaluation, but must be carefully designed and/or supplemented with other methods to establish causality.</li> <li>Comparisons across many different time periods, as recommended in the literature, may be costly or impractical – if the program was recently implemented.</li> <li>Results may be tainted by definitional and measurement changes.</li> </ul>	<ul style="list-style-type: none"> <li>To the extent possible, before and after comparisons should be supplemented with cross-sectional analyses and comparisons to a control group (e.g., counties without investment).</li> <li>Through desktop research and interviews, evaluators should identify all potential factors, other than the program, that may have impacted the performance of the unit.</li> </ul>	<ul style="list-style-type: none"> <li>ARC</li> <li>Treasury Board of Canada</li> </ul>
Theory Based Evaluation & Modeling	<ul style="list-style-type: none"> <li>Generally used as a complement to other methods.</li> <li>Often the only way to estimate certain effects (e.g., indirect and induced economic impacts).</li> <li>Results may be difficult to interpret or may be misused (e.g., estimation of gross vs. net job creation).</li> </ul>	<ul style="list-style-type: none"> <li>Provide detailed guidance for the interpretation of model output.</li> <li>Highlight the limitations of off-the-shelf I/O models with respect to estimating the net effects of programs.</li> <li>In reporting evaluation results, clearly separate what is measured from what is estimated with the model.</li> </ul>	<ul style="list-style-type: none"> <li>ARC</li> <li>Treasury Board of Canada</li> <li>UK Cross Government Evaluation Group</li> </ul>
Case Studies	<ul style="list-style-type: none"> <li>Often used in combination with a more quantitative approach, helping evaluators better understand causality.</li> <li>Selection of cases is critical to generating informative value.</li> </ul>	<ul style="list-style-type: none"> <li>Encourage evaluators to justify and document the selection of case studies, ex-ante.</li> <li>Make sure that the content of the case studies is aligned with the purpose of the evaluation and other data collection efforts.</li> <li>Use case study results to illustrate the impacts of a program, and possibly comment on the validity of findings developed through other means.</li> </ul>	<ul style="list-style-type: none"> <li>Treasury Board of Canada</li> <li>UK Cross Government Evaluation Group</li> </ul>
Application of Findings from Other Studies	<ul style="list-style-type: none"> <li>Generally not recommended, unless it is used in the development of methods and metrics, or the identification of data sources.</li> </ul>	<ul style="list-style-type: none"> <li>N/A</li> </ul>	<ul style="list-style-type: none"> <li>Treasury Board of Canada</li> </ul>

## 4 REVIEW OF PAST REPORTS AND PROGRAM EVALUATIONS

### 4.1 "Evaluation of the Appalachian Regional Commission's Infrastructure and Public Works Program Projects"

This report was prepared for the Appalachian Regional Commission by The Brandow Company and Economic Development Research Group in 2000.

#### 4.1.1 Purpose and Goals

The purpose of the evaluation was to assess past program performance, identify opportunities for future improvement, and facilitate the public's understanding of the benefits of ARC's infrastructure investments. The study focused primarily on economic development impacts, with the exception of quality-of-life impacts due to water/sewer improvements.

#### 4.1.2 Key Issues Identified

1. **The report does not cover all of ARC public works investments through the program.** Projects included in the evaluation sample were limited to those funded from 1990 to 1997. Programs funded earlier were often lacking detail and more recently funded projects were in general not mature enough to be evaluated.
2. **The report is primarily concerned with economic development impacts.** Job creation, business service, income growth, economic diversification, tax revenues, and changes in total business output that can be attributed to ARC investments were the study's focus. While residential water and sewer projects receive some analysis and discussion of quality-of-life impacts, changes in public health that may have resulted from various projects are not quantified.
3. **Some indicators provide a context for local and project analysis but do not provide a basis for inferring project cause and effect.** The report provides a variety of traditional and innovative economic indicators for project impacts (e.g., growth trends, business retention, job replenishment, business vitality, industrial diversification). These indicators can provide a context for project analysis, facilitate a better understanding of project area economies/needs, and inform qualitative discussions of how some projects affected land use/development patterns or entrepreneurial vitality in the primary impact areas. The economic diversification and job growth analysis provides specific measures of how projects affected existing economic conditions.

#### 4.1.3 Key Performance Measures

The study used a variety of performance measures to gauge the extent to which projects achieved their projected outcomes and aligned with the strategic goals of the ARC:

1. Projected jobs and jobs created, jobs attributable to ARC investment
2. Leveraging rates for other project related funds
3. ARC's relative funding contribution
4. Diversification effects of investment on local economic base using location quotients at the national and county level
5. Indirect economic impacts
6. Local tax base impacts



7. Impact/cost analysis of projects
8. Quality-of-life improvements to residences (water/sewer projects)

#### 4.1.4 Analytical Approach

A selection of 99 projects initiated between 1990 and 1997 were analyzed: 2 industrial park projects; 11 business incubator projects; 15 access roads projects; 51 water/sewer projects. The sample includes projects in all states in ARC; reflects metro/non-metro mix in region; includes projects of all eligible economic designations; includes very small, very large and average scaled projects.

1. **Surveys:** One to four interviews with local/regional development staff, local government/civic leadership, private sector representatives for each project. Project profile developed:
  - a. Project area distress data
  - b. Project data and budget information
  - c. Project fiscal and economic analyses
  - d. Economic trend analyses of primary impact counties
  - e. Economic vitality analyses of primary impact counties:
    - i. Comparison of start-up rates nationally and in project area
    - ii. Percentage of surviving young firms against US
    - iii. Firm retention rate
    - iv. Number of jobs lost by failed firms in the firm retention analysis
  - f. Interviewee information
  - g. Qualitative project objectives and outcomes
  - h. Impact comments and discussion
2. **Observation/site visits:** Eight site visits to validate project results and develop case studies.
3. **Before/after comparisons and Input-Output Modeling:**
  - a. Anticipated versus actual project outcomes, in terms of performance measures. Share attributable to ARC based on ARC share of total investment
  - b. Jobs, personal income generated from business attraction/expansion/retention. Local tax revenue impacts
  - c. Impacts per dollar of total public investment
  - d. Impacts per dollar of ARC investment
  - e. Total public investment per job
  - f. Private sector leverage = (total dollars private investment/total dollars public investment)
  - g. County-level economic profiles developed as baseline. If applicable, local economic changes corresponding to project impacts measured and compared to the baseline.
  - h. Performance of project counties compared to national trends (i.e., economic diversification, entrepreneurial vitality, business growth).
  - i. Multiplier impacts using IMPLAN

## 4.2 “Program Evaluation of the Appalachian Regional Commission’s Infrastructure and Public Works Projects”

This report was prepared for the Appalachian Regional Commission by BizMiner/Brandow Company, Inc. and Economic Development Research Group in October of 2007.

#### 4.2.1 Purpose and Goals

The study sets out to examine infrastructure and public works projects from an economic development perspective, to evaluate whether or not the projects achieved their original objectives and how these project investments contributed to attaining the Appalachian Regional Commission's strategic goals. The evaluation looked at a representative sample of all infrastructure investments in six different categories – industrial parks and sites, water and sewer projects, access roads, business incubators, telecommunications and housing – from 1999 through 2005.

#### 4.2.2 Key Issues Identified

The study analyzed about 25 percent of ARC infrastructure and public works project investments from 1999 to 2005.

#### 4.2.3 Key Performance Measures

The evaluation considered a variety of performance measures to determine how closely the projects met the goals of the ARC strategic plan. These measures include the following:

1. Number of jobs projected and actually created or retained upon project completion
  - a. Anticipated impacts – applicants for funding are required to project impacts
  - b. Gathered data on the outcomes and showed the results
2. Leveraging rates for other project-related funds, including state, local, other federal, and private investments
3. Determination of the agency's relative funding contribution
4. Calculation of the job creation rate attributable to ARC's investment once the impact on other funds is considered
5. Diversification effects of the projects on the local economic base
6. Indirect and induced economic effects attributable to the project
7. Impacts on the local tax base resulting from the projects
8. An impact/cost analysis of the projects
9. Qualitative quality-of-life improvements provided to residential households served by the housing and water and sewer projects
10. Economic vitality measures such as diversification, mature firm growth, and entrepreneurial vitality (start-up growth)

#### 4.2.4 Analytical Approach

The evaluation reviewed 104 of the more than 400 investment projects between 1999 and 2005, ensuring the selection of a representative sample of all project types. The projects were categorized into three broad categories – economic development, community development, and housing development. Economic development projects promote business development by attracting new jobs and saving existing jobs that are in danger of being lost. Community development projects improve basic health and/or quality of life in a community; water/sewer and telecommunications projects generally fall into this category. Housing development projects involve the construction or rehabilitation of housing for low- and moderate-income residents; these projects do not generate jobs.

1. **Surveys:** ARC used interviews to assess the total number of jobs created and retained whenever possible and to gather information on estimates of retained wages and new income, supplemented with average wage data from the Bureau of Labor Statistics. They also helped determine whether the



investments broadened the type of jobs available and the desirability of available jobs. Finally, the interviews provided information related to the importance of ARC investment and the role that they played. For each project, a profile was developed similar to the 2000 study.

2. **Observation/site visits:** Used to validate project results.
3. **Before/after comparisons and Input-Output Model:** Measures of economic conditions in each of the project areas using indexes for comparison purposes. The indexes are designed to focus on strategic ARC objectives including area economic diversity, development of robust patterns of growth among area firms, and incubation of a strong entrepreneurial culture.
  - a. Economic development impacts were estimated and compared with the actual results for the entire project in which the investment was made using a ratio. This is accurate only if all of the project results depended exclusively on the ARC funding and none would have occurred without it.
  - b. Investment ratios were developed to compare the total public funding with actual results (private investment value compared to public or ARC funding).

#### 4.3 “Handbook: Assessing Local Economic Development Opportunities with ARC-LEAP (Appalachian Regional Commission Local Economic Assessment Package)”

This report was prepared for the Appalachian Regional Commission by Economic Development Research Group, Inc. in 2004.

##### 4.3.1 Purpose and Goals

The ARC-LEAP model is set to define key concepts involved in evaluating an area's economic performance, identifying targets for further economic development, and defining priorities for improving local economic competitiveness. ARC-LEAP is a tool developed specifically for the ARC and its Local Development Districts. The goal is to help practitioners identify target industries for economic development in three specific areas: economic assessment, targeting diagnostics, and policy analysis.

1. **Economic Assessment:** Evaluation tool for local practitioners to assess current economic conditions and likely future trends
2. **Targeting Diagnostics:** Diagnostic tool to provide data-based analysis for economic development strategies and industries to target for growth
3. **Policy Analysis:** An analysis tool for assessing potential economic development consequences of future policy initiatives, which can affect local costs, labor force skills and/or infrastructure characteristics

The tool is applicable to situations that include high unemployment and low wages, seasonal fluctuations in employment, isolation and lack of local opportunities, or over-dependence on a particular industry or a few large employers.

##### 4.3.2 Key Issues Identified

The analysis is limited by the fact that it is only a tool for analysis, and knowledge of the area is required to make correct decisions based on model output. It is important that the tool not be used blindly. It is necessary to use a proper basis for comparison, correct business classifications by industry, proper detail on area competitiveness, identify differences in business sales and employment trends, and to interpret industry targets correctly. The tool and its outputs require careful interpretation.

### 4.3.3 Key Performance Measures

The study does a base analysis of current conditions, measures performance gaps, and provides insight on the advantages and disadvantages of the study area in terms of costs, size and characteristics of the workforce and sensitivity of the area each of the various factors based on input-output tables, access to transportation, and quality of infrastructure to support growth in the region.

Targeting diagnostics evaluate sensitivity to a variety of economic factors, strength of area, production and labor costs, taxes, labor availability, workers, and transportation infrastructure.

Policy analysis allows users to analyze the effects of alternative future policies and investments on the future business attraction potential of a local area. Estimates include new jobs associated with improved business attraction potential.

### 4.3.4 Analytical Approach

This study differs from the other studies reviewed as part of this work effort. Rather than focusing on program performance, the model helps policy makers understand existing economic conditions, potential industries to target, and prospective economic development impacts associated with future policy initiatives. Because it is less a program evaluation tool and more a policy direction tool, the analytical approach described below does not follow the format of the other studies reviewed.

The first step to using the tool is to define the study areas. This requires identification of the study target area and comparison areas. The study area is generally a county or multi-county region. Identification of the study area should consider four factors:

1. The area of agency focus
2. The economic market area
3. The area of most appropriate data availability
4. The project policy impact area

Identification of comparison areas involves identifying one of two kinds of appropriate comparison areas based on their characteristics:

- **Local comparison areas** are generally adjacent and competing with the target area, and are used when looking at business mix and competitiveness factors. These should be of similar urban/rural density and share similar natural resources.
- **Industry trend comparison areas** are usually larger areas, such as the entire United States, and are used to compare local business trends.

Local Economic Performance Analysis evaluates the mix and performance of industries in the study area by comparing the target area to local areas and national averages. This is done using US Department of Census County Business Patterns and IMPLAN. The handbook identifies methods to interpret the economic performance analysis.

- **Business Mix analysis** to contrast the performance of current and historic data in the target area with that of the comparison area to estimate an “expected number” of jobs that would occur in the study area if it had an industry mix identical to the comparison area.
- **Business Trend Comparison** uses shift/share analysis to identify the types of business that are particularly thriving or declining in the area and compares their performance to the national average. This calculates the percent change in the number of employees in each sector for the study area and the US over the past five years using a ratio of the changes.



Quantitative measurement of area characteristics identifies key factors affecting the location of businesses including the cost of doing business, size of labor and customer markets, and access to transportation facilities and broadband connectivity.

The next step is to rate local facilities and resources at the local level including the conditions of industrial sites and buildings, the availability of business support programs, and the level of local labor force skills and education training. This is done using a series of six worksheets to analyze business facilities. The worksheets identify business support programs, land inventory, building inventory, labor force characteristics, and tourism.

Finally, the tool evaluates the results at an industry level using either business mix or business trends. This process has three steps:

- Analyze differences in business mix and trends against regional patterns and national trends to classify local business performance in terms of mix and growth trends;
- Identify industries that appear to be locally under-represented in terms of mix and/or locally under-performing in terms of trend, and identify them as potential candidates for improvement based on a measure of potential for additional job growth over a ten-year period; and
- Isolate the candidates for improvement that are in industries expected to be growing in the future and identify them as “strong candidates for future growth.”

The diagnostic analysis identifies business advantages and disadvantages for each industry in which there is a potential for growth and business attraction as identified in the assessment. This is done based on a variety of factors including: total production costs; labor costs; land/office costs; energy costs; taxes; availability of labor; availability of skilled workers; water transportation; air transportation; rail transportation; highway transportation; and broadband access. In this analysis, factors are identified as “critical” or “important” local disadvantages based on the level of importance to the competitiveness of specific industries.

Based on the results of this process, a strategic plan should be developed. The strategic plan consists of three basic steps: Strengths, Weaknesses, Opportunities and Threats (SWOT) Review, Mission Statement, and Strategic Plan Development.

#### 4.4 “Understanding Water and Sewer Reporting Issues”

This report was prepared for the Local Development Districts (LDDs) by Amy McAbee-Cummings in 1999.

##### 4.4.1 *Purpose and Goals*

The Economic Development Infrastructure and Resources Survey (EDIRS) is distributed to the LDDs every two years to monitor changes in household access to public water and sanitary sewer systems. The most recent survey (1998) revealed that many of the LDDs had difficulty collecting information. This report attempts to determine the reasons that collecting this data is problematic and to devise a way to obtain information that reflects the true situation of households in Appalachia regarding access to water and sewer facilities.

#### *4.4.2 Key Issues Identified*

LDDs indicate that a lack of man power and time are the most significant obstacles to obtaining accurate data. Some data had to be compiled from scratch, and the information that existed was not always in the format requested in the EDIRS. Public sewer systems are not regulated by federal law and there is no compiled data, making collection of data related to these systems time intensive. The US Environmental Protection Agency compiles information about public water systems, which is available through the internet, making this element of the data collection effort more straightforward. Another issue was the lack of current household population data; only 1990 county-level US Census data were available.

#### *4.4.3 Key Performance Measures*

The report attempted to better understand why water and sewer systems data collected by the LDDs was incomplete. The report was not intended to measure the performance of the water and sewer systems as much as the performance of the LDDs in collecting data for the 1998 survey. The report found that a lack of consolidated public sewer data and inconsistent measurement of the number of households contributed to the inaccuracy of the survey.

#### *4.4.4 Analytical Approach*

Ten LDDs were selected for phone interviews, in which they were asked about their experiences in completing the survey.

### 4.5 “Drinking Water and Wastewater Infrastructure in Appalachia: An Analysis of Capital Funding and Funding Gaps”

This report was prepared for the Appalachian Regional Commission by Jeff Hughes, Richard Whisnant, Lynn Weller, Shadi Eskaf, Matthew Richardson, Scott Morrissey, and Ben Altz-Stamm of the UNC Environmental Finance Center School of Government in July 2005.

#### *4.5.1 Purpose and Goals*

The purpose of this report was to help policy makers, including the ARC, understand how water and wastewater services are provided and funded, as well as what may be done to more effectively meet the needs of the region. The study was set forth to answer six basic questions about the current state, need for investment, funding sources, funding gaps, financial management strategies and policy implementations that can meet the water and wastewater infrastructure needs in the region.

#### *4.5.2 Key Issues Identified*

Types and sizes of water systems, methods of disposing of wastewater, funding programs, and institutional models for providing services vary widely across the states and sub-regions in the area. Significantly fewer households in Appalachia have access to centralized drinking water and wastewater services than in the rest of the country and those with access to systems pay a much higher percentage of their income for these services than elsewhere in the country. Each state has its own approach to administering federally supported programs and allocating funding from state-supported programs. Extracting county-level data from the existing data sets was difficult due to the manner in which the data were collected or compiled. Most of the information used in the analysis was from existing data sets,



which found a lack of reliable data to answer fundamental questions such as the percentage of households with onsite systems.

#### 4.5.3 Key Performance Measures

The study did not identify many performance measures, but rather identified an approach to evaluating the level of service for water and wastewater infrastructure to individuals and businesses in the region as a whole.

#### 4.5.4 Analytical Approach

This study primarily uses public sources and case studies to determine infrastructure needs, and the level of funding necessary to meet these needs. Public sources include the Environmental Protection Agency (EPA), the US Geological Survey (USGS) and the US Census Bureau, as well as private credit-rating agencies.

##### 1. Surveys and Site Visits:

- a. Looked at several different surveys, and there are a large number, but none of them provides all of the information necessary to generate needs estimates for Appalachia as a whole.
- b. Collected data about actual documented needs and conducted analysis to estimate the undocumented needs.
- c. Looked at information on particular towns, regions, and states to examine specific needs for drinking and wastewater and compared that to the available data and funds. Visited the offices of the towns under study to collect data.

##### 2. Application of Other Studies:

- a. Looked at both top-down and bottom-up studies. Information collected locally is different than that collected regionally and at the state level.
  - i. Estimates vary in accuracy and the amount of missing data.
  - ii. Reasons for missing data can be linked to the manner in which the survey is implemented and the perceived incentives or disincentives that systems have for providing information, as well as the capacity of a particular system to provide information.
- b. Needs data are often pulled together for policy purposes and do not necessarily consider the inclusion of the types of infrastructure improvements and costs necessary to improve conditions, which presents difficulties in accurately assessing and comparing needs across regions.

## 4.6 “Government Performance and Results Act of 1993”

This Act was passed by the 103<sup>rd</sup> Congress of the United States of America.

### 4.6.1 Purpose and Goals

The goal of this Act is to provide for the establishment of strategic planning and performance measurement. The stated purpose and goals are as follows:

1. Improve the confidence of the American people in the capability of the federal government, by systematically holding federal agencies accountable for achieving program results.

2. Initiate program performance reform with a series of pilot projects in setting program goals, measuring program performance against those goals, and reporting publicly on their progress.
3. Improve federal program effectiveness and public accountability by promoting a new focus on results, service quality, and customer satisfaction.
4. Help federal managers improve service delivery, by requiring that they plan for meeting program objectives and by providing them with information about program results and service quality.
5. Improve congressional decision making by providing more objective information on achieving statutory objectives, and on the relative effectiveness and efficiency of federal programs and spending.
6. Improve internal management of the federal government.

#### *4.6.2 Key Issues Identified*

There were no key issues identified.

#### *4.6.3 Key Performance Measures*

Rather than providing specific performance measures, this report provided evaluation guidelines. Specifically, agencies are required to prepare annual performance plans and reports that cover each program activity set forth in the budget that shall:

- Establish performance goals to define the level of performance to be achieved by a program activity;
- Express the goals in an objective, quantifiable, and measurable form unless authorized to be in an alternative form;
- Describe the operational processes, skills and technology, human, capital, information and other resources required to meet the performance goals;
- Establish performance indicators to be used in measuring or assessing the relevant outputs, service levels, and outcomes of each program activity;
- Provide a basis for comparing actual program results with the established performance goals; and
- Describe means used to verify and validate measured values.

Each annual report will review the success of achieving the fiscal year's performance goals and evaluate the performance plan for the current fiscal year relative to actual performance. It will also explain and describe where a performance goal has not been met, including reasons why the goal was not met, the plans and schedules for achieving the established goals and, if the goal is infeasible, reasons why and what can be done about it. Finally, the report will describe the use and assess the effectiveness of achieving performance goals, including the summary findings of program evaluations that have been completed during the fiscal year.

#### *4.6.4 Analytical Approach*

No specific analytical approach was recommended or highlighted.

### 4.7 OMB Circular A-11, "Preparation, Submission, and Execution of the Budget Applicable to Federal Agencies"

This report outlines the guidelines for federal agencies to prepare, submit, and execute their annual budgets. It is from August 2011.



#### 4.7.1 Purpose and Goals

The OMB Circular includes the following:

1. An overview of the budget process.
2. Development of the President's Budget and how to prepare and submit materials required for OMB and presidential review of agency requests and for formulation of the FY 2013 budget.
3. Supplementals and amendments, deferrals and presidential proposals to rescind or cancel funds, and investments.
4. Instructions on budget execution, including guidance on the apportionment and reapportionment process, a report on budget execution and budgetary resources, and a checklist for fund control regulations.
5. Federal credit programs, including requirements related to the preparation of budget estimates and to budget execution.
6. New requirements under GPRA Modernization Act; the Administration's approach to performance management; requirements for strategic plans and annual program performance reports; and an overview of the performance plan/performance budget.

#### 4.7.2 Key Issues Identified

The OMB Circular covers a great deal of budget-related information. Of relevance to ARC's program evaluation, however, is the Circular's emphasis on performance goals and measurement as a way to promote an agency's mission. Guidance on how to ensure that the data on which performance is measured is provided in the Circular and of relevance to ARC program evaluation. Data quality issues outlined in the Circular include:

- **Data Limitations:** Performance data must be appropriately accurate and reliable for intended use. Significant or known data limitations should be identified and evaluators should include a description of the limitations, the impact they have on goal achievement, and the actions that will be taken to correct the limitations. Examples of data limitations include imprecise measurement and recordings, incomplete data, and inconsistencies in data collection procedures.
- **Verification and Validation:** The OMB circular encourages agencies to consider the verification and validation procedures outlined below. Agencies should have in place verification and validation (V&V) techniques that will ensure the completeness and reliability of all performance measurement data contained in their Annual Performance Plans and reports. Agencies are encouraged to consider the following verification and validation factors:
  1. Standards and procedures
    - a. Source data are well defined/documented; definitions are available and used.
    - b. Collection standards are documented/available/used.
    - c. Data reporting schedules are documented/distributed/followed.
    - d. Supporting documentation is maintained and readily available.
    - e. Collection staffs are skilled/trained in proper procedures.
  2. Data entry and transfer
    - a. Data entry methodology is documented and followed.
    - b. Data are verified.
    - c. Procedures for making changes to previously entered data are documented and followed.
    - d. Data are available when needed for reporting and other critical decision making cycles.
    - e. Data entry staff are skilled and trained in proper procedures.

3. Data integrity
    - a. Equipment and program reliability cannot compromise data accuracy.
    - b. Accountability for data integrity clearly rests with the person entering the data, and the responsible program specialist and manager.
  4. Data quality and limitations
    - a. Accuracy limits of all data are defined in the context of intended use.
    - b. Any other data limitations are explained and documented.
    - c. Method for handling anomalous data is established and used.
    - d. Third party evaluations are conducted.
    - e. Use of externally controlled data is documented.
  5. Oversight and certifications
    - a. Accountability for data accuracy exists in responsible employee performance standards.
    - b. Responsible officials certify that procedures were followed each reporting period.
    - c. Responsible officials certify that data accuracy has been checked each reporting period.
- **External Assessments:** Evaluations, peer reviews, and performance audits can mitigate the risk of bias in performance reporting.
  - **Scope:** Because most agencies process a large amount of performance measurement data, agencies should apply judgment when deciding which performance measures will be verified and validated.
  - **Frequency of Validation and Verification:** Data quality should be known to users and the sufficiency of its accuracy for answering key questions. Validation and verification should be carried out on an appropriately periodic basis (i.e., annually or biennially).
  - **Agency Head Responsibility:** Agency heads are officially accountable for the accuracy and reliability of performance data. The agency head shall include in the transmittal letter of the agency's annual performance review a brief statement on the completeness and reliability of the performance data, and on what data limitations exist.

#### 4.7.3 Key Performance Measures

Not relevant, as this Circular was not an actual program evaluation, nor did it provide specific guidance, other than data related, on measuring performance.

#### 4.7.4 Analytical Approach

No specific analytical approach was recommended or highlighted.

### 4.8 "Moving Appalachia Forward: Appalachian Regional Commission Strategic Plan 2011-2016"

#### 4.8.1 Purpose and Goals

To ensure that Appalachia's leaders and citizens have the capacity, capability, and resources needed to build and strengthen local economies. The plan is a guide to take targeted and measurable actions toward its vision of bringing Appalachia into economic parity with the nation as a whole. ARC is uniquely suited to help guide and foster these efforts for change. The plan calls for alignment of resources to maximize results and performance measurement that ensures that the partnership is effective and accountable. It is intended to support general goals and six-year performance goals.



- **General Goals**
  1. Increase job opportunities and per capita income in Appalachia to reach parity with the nation.
  2. Strengthen the capacity of the people of Appalachia to compete in the global economy.
  3. Develop and improve Appalachia's infrastructure to make the Region economically competitive.
  4. Build the Appalachian Development Highway System to reduce Appalachia's isolation.
- **Six-Year Performance Goals (assuming that ARC's annual funding remains at the current levels)**
  1. 120,000 jobs created or retained.
  2. 120,000 households served with new or improved water and sewer infrastructure.
  3. 120,000 citizens of the Region will benefit from enhanced education and job-related skills.
  4. 150 miles of the Appalachian Development Highway System will be opened to traffic (based on the current level of transportation funding from the US Congress).

The ARC Strategic Plan identifies a number of guiding principles for program evaluation and selection, as follows:

- Promote homegrown solutions
- Create sustainable economic development
- Address persistent economic distress
- Seed innovation
- Stimulate investments by federal, state, and local agencies; philanthropies; and the private sector
- Support inclusive local decision making
- Act as a clearinghouse for ideas and expertise
- Capitalize on existing assets
- Encourage lifelong learning
- Seek regional solutions
- Strengthen global competitiveness

#### 4.8.2 Key Issues Identified

There were no specific issues identified.

#### 4.8.3 Key Performance Measures

- **Leverage:** Additional public and private financial and technical support attracted by ARC investments
- **Jobs:** Gauge involvement in job-generating programs by measuring jobs created and jobs retained
- **Employability:** Measure improvements in high school graduation rates, increases in college attendance and graduation rates, completion of workforce training programs and the number of children in early childhood education programs
- **Infrastructure development and connectivity:** Number of citizens served by new or improved infrastructure, connectivity improvements particularly between rail and highway, and new highway miles

#### 4.8.4 Analytical Approach

No specific analytical approach was recommended or highlighted.

## 4.9 “The Magenta Book: Guidance for Evaluation; United Kingdom Cross-Government Evaluation Group”

“The Magenta Book” was developed by the United Kingdom Cross-Government Evaluation Group in April 2011.

### 4.9.1 Purpose and Goals

This report aims to meet the needs of policy makers and analysts working in public policy. It explains the important issues and questions in designing and managing evaluations; evaluation options that are available; why evaluation improves policy making; how to interpret evaluation results and evidence; and why thinking about evaluation before and during the policy design phase can improve the quality of the evaluation results without hindering the policy process. It is complementary guidance to the HM Treasury Green Book, furthering guidance on the evaluation stage of the policy process, and it provides consistency if government departments and agencies follow the manual.

### 4.9.2 Key Issues Identified

This report delves into approaches for evaluation of process and improvements by different methodologies.

### 4.9.3 Key Performance Measures

The performance measures vary by the type of evaluation being conducted.

### 4.9.4 Analytical Approach

This report outlines approaches for individual interviews, group interviews, observation/participation, surveys, consultative and deliberative methods, statistical analysis of quantitative data, document analysis, and ethnography, as well as considerations for undertaking an evaluation and the stages and development of evaluations.

The book identifies practical issues to take into account when designing evaluations including laying out the main steps of the evaluation process and considering the timing and resources necessary to conduct the evaluation. The main steps in the evaluation process are as follows:

- Define policy objectives and intended outcomes
- Consider implications of policy design for evaluation or feasibility
- Define the audience for the evaluation
- Identify the evaluation objectives and research questions
- Select evaluation approach
- Identify data requirements
- Identify necessary resources and governance arrangements
- Conduct evaluation
- Use and disseminate evaluation findings



The guidebook then highlights the stages of an evaluation as follows:

- Recognize there are a number of stages in an evaluation, including determining which questions to ask, which type of evaluation is appropriate, and when and how to carry out the evaluation.
- Develop a logic model, define audience for the evaluation, identify evaluation objectives and research questions, select evaluation approach, identify data requirements, identify necessary resources and governance arrangements, and conduct the evaluation.
- Plan by specifying objectives, timeframes, resource requirements, governance arrangements and terms of reference. Consider who will use the findings and what for, to determine how to undertake the process.
- Consider that evaluation objectives and research questions should guide a review of existing evidence relevant to the research question.
- Make certain that evaluation planned to answer questions of immediate interest is also capable of having a longer-term strategic influence.

Key program evaluation methods discussed included:

**Case Studies:** Case studies, along with process evaluation and action research, can be used to evaluate the implementation and delivery of a policy to provide feedback on a wide range of issues. This can include whether policy is being implemented as planned, what is working and what is not, and whether the expected outputs and outcomes are being delivered. It is important to consider information requirements at the planning stage for any economic evaluation. These evaluation techniques use a range of qualitative and quantitative research methods including one-on-one interviews, group interviews, surveys, and observations. Multiple methods are often used to provide triangulation of data and corroborate findings.

**Causal and Statistical Analysis:** The guidebook sets out steps for empirical impact evaluation using statistical techniques. It is important to note that this is not feasible for every policy and there may be data constraints. The goal of the empirical impact evaluations is to determine whether a policy caused a particular outcome to occur by measuring the outcome compared to an estimate of what would have happened without the policy. These impact evaluations are not a guarantee of producing the “right answer” and can sometimes produce false results; risk of false results can be mitigated through careful design of the research, and sufficient investment in data collection. When using this technique it is best to control the comparison group to take into account the possibility of selection bias. Reporting the results of an evaluation should distinguish between descriptive statistics on outcomes and true impact evaluation that takes potential non-policy causes for observation into account.

There are several different types of comparison groups that can be used. Overall, the design of the empirical study is incredibly important, and the types of data analysis should be considered in the planning process. The guidebook suggests the possibility of using time trends through a difference-in-differences approach, or instrumental variables and before and after studies if there are no actual comparison groups.

Finally, after the evaluation it is important to draw together and report the evidence of the evaluation. The use and dissemination of the findings and the strategy for synthesizing the results should be decided upon during the planning stage to avoid any possible accusations of selecting the results that best support a particular viewpoint.

## 4.10 "Program Evaluation Methods: Measurement and Attribution of Program Results, Third Edition"

This study was prepared by and for the Deputy Comptroller General Branch, Treasury Board of Canada, Secretariat.

### 4.10.1 Purpose and Goals

The report discusses the appropriate methods for achieving timely, relevant, credible, and objective findings/conclusions on program performance, based on valid and reliable data collection and analysis. Its focus is on the methodological considerations present in the development of a study to assess program outcomes.

### 4.10.2 Key Issues Identified

There are three phases to an evaluation:

1. Evaluation assessment or framework: Planning phase for the evaluation
2. Evaluation issues
  - a. Continued relevance: Program continues to be relevant to government priorities and citizen needs
  - b. Results: Program meets its objectives, stays within budget, and does not cause unwanted results
  - c. Cost effectiveness: Program involves the most appropriate, cost effective and efficient method to meet objectives
3. Evaluation study
  - a. Decision-making based on findings/recommendations

The study recommended that the evaluator establish the incremental effects of the program and be wary of making generalizations based on the evaluation-determined results of the program. It is only appropriate to generalize in planning of a future program if the program can be replicated and is not specific to a particular time, place or other set of circumstances. To lend greater credibility to the evaluation findings, evaluators should address evaluation issues from a number of different perspectives using multiple lines of evidence.

### 4.10.3 Key Performance Measures

This study focused on analytical approaches to program evaluation, but not on specific performance measures.

### 4.10.4 Analytical Approach

The study discussed the following evaluation strategies:

1. **Surveys:** Approach is versatile and, when properly done, produces reliable and valid information. They require expertise in their design, conduct and interpretation and can be easily misused. Several basic steps should be followed before implementing a survey:
  - a. Identify what specific information will address a given evaluation issue.

- b. Pre-test the surveys on a representative sample of the survey population. Pretesting provides information on clarity of questions, response rate, time and length to complete, appropriateness of survey method.
  - c. Ensure that required data are not available elsewhere and cannot be collected more efficiently and appropriately by other data collection methods.
  - d. Keep in mind that collecting “nice to know” data adds to the cost of the program evaluation.
2. **Observation/Site Visits:** Technique involves on-site visits to locations where the program is operating to observe activities and to take notes. Notes from observations should be written up immediately after the visit and be detailed. Reliability/validity of observations depends on the skill of the observer and the observer's awareness of any bias he/she may bring to the task. Program staff may alter their behavior if they know they are being observed.
3. **Case Studies:** Usually involve a variety of data collection methods. To measure program results, a case study of a critical case may be more defensible than the case study of a representative sample. They allow the evaluator to perform an in-depth analysis that would not be possible with more general approaches. These are typically expensive and time consuming. As a result, the set of case studies chosen will usually lack a statistical basis from which to generalize conclusions.
4. **Analysis of Experimental Data:** This approach creates groups through the random assignment of participants to a “treatment” or separate “other than treatment” (i.e., control) group. This ensures groups to be compared are equivalent. It is the most rigorous approach available for establishing causal relations between programs and results. Its main drawback is that experiments are often difficult to implement.
  - a. Quasi-experimental designs are similar but do not use randomization to create treatment and control groups. Treatment group is usually already given and one or more comparison groups are selected to match the treatment group as closely as possible. These take creativity and skill to design but can give highly accurate findings.
  - b. Implicit designs make a measurement after exposure to the program and make assumptions about conditions prior to the program. It is the most typically used but least rigorous. They are typically weak in terms of measuring changes and attributing them to the program. It is basically a post-program design with no control group. They are flexible, versatile and practical to implement. They offer little objective evidence of the results caused by the program.
5. **Simulation Modeling:** Simulation models allow evaluator to estimate the incremental effects in complex and uncertain situations. Some skill in building quantitative models is required and the dynamics of the program must be well understood. A simulation has three main components:
  - a. Input data
  - b. Mathematical model
    - i. Stochastic – incorporates a random data generator
    - ii. Deterministic – does not incorporate a random data generator
  - c. Output data
6. **Application of Other Studies:** A literature or file review enables an evaluator to make the best use of previous work in the field under investigation and learn from their experiences, findings, and mistakes. Past research may suggest hypotheses to be tested or evaluation issues that should be examined in the current study. Specific methodological difficulties can be identified and mitigated. Evaluation questions may be directly answered on the basis of past work/redundant data collection in some cases. Sources of secondary data may be uncovered

and lessen the need to collect primary data. It is an economical approach but may not be entirely relevant and it may be difficult to determine the accuracy of the data gathered through a previous study.

7. **Other:**

- a. Expert opinion – Can be collected and summarized systematically. It is a method best suited to supplementing other measures of program outcomes. Identifying a large enough group of experts may be difficult and opinions may differ. Experts may also not be equally knowledgeable. Should not be used as a sole source of data for an evaluation.
- b. Statistical analysis – Statistical tabulations, graphical displays and statistics (e.g., mean, variance) can depict key characteristics of the data. Drawing conclusions about the relationships among variables and to generalize these conclusions to other situations is also a use of statistical analysis. In this case, all that is being established is a relationship. To conclude that the program caused the result requires a more rigorous analysis. This approach requires expertise. Not all program results can be analyzed statistically and the way data are categorized can distort as well as reveal important differences. Non-statistical data analysis allows the evaluator to use all available information, even that information that is not easily quantified. The validity and accuracy of conclusions of non-statistical analysis depend on the skill and judgment of the evaluator and logic of arguments presented.
- c. Causal model – An equation that describes the marginal impact of a set of selected independent variables on a dependent variable. This approach focuses on variables to be included in the model (endogenous and exogenous) and their postulated relationships. The program is only one of several independent variables that are expected to affect the dependent variable.
- d. Input-output model – Static economic model designed to depict the mutual interdependence among different parts of an economy. It describes how one industry uses the outputs of other industries as inputs, and how its own outputs are used by other companies as inputs. They can be misused in evaluations. Offsetting negative effects generated by taxes and borrowing necessary to support a program, for example, may not have been reflected in the I-O model.
- e. Micro-economic analysis – This model describes the economic behavior of an economic unit (e.g., individual, household, company). They are typically represented by equations that depict demand and supply functions for a good or service. These equations describe the relationship between price and output. Usually this model type requires use of an economist.
- f. Macro-economic analysis – These models deal mainly with inflation, unemployment and large aggregates such as gross national product. The model can identify critical links between aggregate broad variables, but they can generate erroneous results if they omit key factors. Many have poor predictive capability, particularly in the short run. If the program is large, relative to the economy, and derived impacts are long term, they can be appropriately used.
- g. Cost-benefit analysis – This analysis looks at the program's net worth and can judge and compare program alternatives. The issue of attribution or incremental effect of a program must be addressed before doing this type of analysis. They can often help an evaluator identify the full range of costs associated with a program but they do not, in and of themselves, explain particular outcomes and results. A sensitivity analysis of key assumptions is important.



## 4.11 “Designing Evaluations”

This report was prepared by the United States General Accounting Office, Program Evaluation Methodology Division for use by Congressional decision makers, March 1991.

### 4.11.1 Purpose and Goals

The report provides evaluation design ideas aimed at producing answers to descriptive, normative and impact (cause-and-effect) questions.

### 4.11.2 Key Issues Identified

1. Good front-end planning of evaluation design is critical. There are several key elements of a design that should be specified before information is collected. The choices made with respect to the following elements can significantly impact the quality of information that can be acquired, the strength of the conclusion, and the cost, timeliness and usefulness of the evaluation. Elements for consideration:
  - a. Kind of information to be acquired;
  - b. Sources of information (for example, types of respondents);
  - c. Methods to be used for sampling sources (for example, random sampling);
  - d. Methods of collecting information (for example, structured interviews and self-administered questionnaires);
  - e. Timing and frequency of information collection;
  - f. Basis for comparing outcomes with and without a program (for impact or cause-and-effect questions); and
  - g. Analysis plan.
2. Evaluator should determine whether a question is descriptive, normative or impact (cause-and-effect) as part of the evaluation design.
3. Design should reflect the size of the program being evaluated and likely use of the evaluation results.
4. Questions should be posed clearly, addressed appropriately, and inferences should be drawn “commensurate with the power of the design and the availability, validity, and reliability of the data.”
5. Consider utilizing a “pilot case” to test the initial assumptions about the program, data, and evaluation methodology is tested in the field. Choosing a site for the pilot case that represents the average is important.
6. Time, cost and staff expertise should be considered when designing an evaluation.
7. Secondary constraints include location and facilities. Make certain that facilities include equipment required to conduct surveys/observations.
8. Be sure that evaluator is aware of previous work completed.

### 4.11.3 Key Performance Measures

Key performance measures were not addressed in this report.

### 4.11.4 Analytical Approach

The study discussed the following four evaluation strategies:

1. **Surveys:** When considering a survey, it is important to define whether the evaluation is descriptive or normative. In addition, the survey should be structured so that conclusions about the sample and out-of-sample population can be drawn. Typically, information is collected in closed form where respondent chooses from responses provided by the evaluator. Probability sampling is recommended and it is important to choose neutral turf for survey implementation. Several survey types were mentioned in the study:
  - a. Cross sectional – Measurements are made at a single point in time. Proper sampling, pretesting survey instrument, following up on non-respondents are critical. A broad literature review and thorough understanding of events/conditions in question is important for causal inference.
  - b. Panel survey – Similar to cross-sectional survey but has the added feature that the information is acquired from a given sample unit at two or more points in time. Sampling, pretesting of survey instruments, non-respondent follow-up and causal inference must be paid attention to in designing panel surveys for evaluation.
  - c. Criteria referenced – Evaluators can use this survey instrument to answer normative questions, which compare actual performance to external standard of performance. Causal inference is not possible because the evaluation does not produce an estimate of what the outcomes would have been in the absence of the program.
2. **Observation/Site Visits:** Facilitates drawing inferences about programs to answer impact questions. Field experiments take place in less contrived settings. It is generally an impact (cause-and-effect) approach to evaluation. Some recommendations highlighted in the study include:
  - a. Considering social and cultural mores of the area where the evaluation is to be conducted.
  - b. Considering whether the population being studied is stable – transient residence vs. same home for 40 years.
  - c. Assessing whether the travel cost to the site is justifiable.
3. **Case Studies:** An analytical description of an event, process, institution or program. One reason for conducting a case study is that the data required is beyond what could be collected through a simple survey. This type of evaluation may be either descriptive or normative. The study indicated that a case study is weaker than a survey in terms of external validity and it emphasized the importance of good design of the case study. There were several case study types discussed in the report:
  - a. Single case – Information acquired about a single individual, process, or entity. Allows collection of qualitative information that describes events and conditions from various points of view. Selection of a case and data collection may be challenging. Analyzing and reporting qualitative data can be difficult and the evaluation design must have explicit plans for these tasks. Case studies can be illustrative of an event or condition, exploratory as providing preliminary information, or investigative of a problem or best practice.
  - b. Multiple case – This study may produce stronger conclusions than a single case study. May be appropriate for evaluating either program operations or results. Selecting variety among cases is important to avoid bias, as is uniform information collection.
  - c. Criteria-referenced – Case studies can be adapted to answer normative questions about how well program operations or outcomes meet certain criteria. How to reach consensus on the criteria and how to measure performance against a criterion should be considerations. Carefully choosing the sample of cases to evaluate is also critical.
4. **Analysis of Experimental Data:** Some units of study are randomly assigned to a treatment group and some are assigned to one or more comparison groups. The program's effects are estimated by comparing outcomes for the treatment group with outcomes for each comparison

group. This is usually the strongest design for causal inference and it provides a way to assess weaknesses or potential weaknesses in a cause-and-effect design. It typically permits very persuasive statements about the cause of observed outcomes. In evaluating a program to determine whether it causes a particular outcome, this approach would expose one group to the program and the other would not be exposed. The difference in outcomes would be attributed to the program, with some qualifications. One con to this approach is that if drop out rates between the groups vary, then the evaluator's estimate of effects may be distorted.

- a. **Non-equivalent comparison group** – The main purpose is to answer impact (cause-and-effect) questions. A treatment group and one or more comparison groups participate in this approach. Unlike a true experiment, membership is not randomly assigned. As a result, causal statements about treatment effects may be weakened. This issue can be somewhat mitigated by choosing comparison groups that are as similar as possible. This approach is administratively easier to implement than true experiments. It is important that data on how the groups differ is collected early on.
5. **Before/After Comparisons:** This approach compares outcomes for the units of study before the units were exposed to a program to outcomes measured one or more times after they began to participate in it. There is no separate comparison group. Multiple evaluation points in time strengthen this approach. With a sufficient number of evaluation points, an interrupted time series analysis can be applied to this design to help draw causal inferences. A rule-of-thumb is a minimum of 50 observations. Data consistency is also an important element to before/after comparisons. Time series need to be free of definitional and measurement changes, because these can be mistaken for program effects.
  6. **Use of Existing Data:** Because primary data collection can be expensive, it is wise to see if existing data will suffice. Even if it is determined that new data is needed, the analysis of already available data may provide quick questions that will be more completely addressed with new data at a later time.
    - a. **Secondary data analysis** – Secondary data analysis might answer an evaluation question utilizing other data, such as US Census. Most likely answers in secondary data analysis are descriptive, but normative and impact (cause-and-effect) questions can be considered. Some potential issues with this application is that data cannot be accessed, it is difficult to document data and collection, and the data collected for another purpose may not exactly meet the need of the current evaluation.
    - b. **Evaluation synthesis** – Evaluator combines a number of previous evaluations that essentially address the current question. The goal is to provide a conclusion that is more credible than that of any one study. This approach often reveals informational gaps, which may be useful to know when clarifying a debate or moving forward in the gathering of new data.

#### 4.12 “Public Works Program Performance Evaluation”

This May 1997 report was prepared by the Rutgers University, New Jersey Institute of Technology, Columbia University, Princeton University, National Association of Regional Councils, and University of Cincinnati for the Economic Development Administration (EDA), U.S. Department of Commerce.

##### 4.12.1 Purpose and Goals

The study evaluated impacts of 205 EDA Public Works Program projects, including industrial parks, water and sewer systems, industrial access roads, vocational/technical education facilities, harbors and

ports, and business incubators. The purpose of these projects is to attract new industry, encourage business expansion, diversify local economies, and generate long-term, private-sector jobs.

#### 4.12.2 Key Issues Identified

A small percentage of grantees cited EDA program management issues. No other program issues identified. With respect to data collection, difficulty of obtaining indirect job data noted.

#### 4.12.3 Key Performance Measures

- Private sector dollars invested in the project
- Additional public dollars invested in the project
- Additional dollars invested directly related to, but not part of, the project
- Other dollars invested indirectly related to the project
- Jobs created or retained
- Increases in local tax base
- Intended beneficiaries located, retained or expanded in the community
- Diversification of local economy (fulfillment of strategic plan)

#### 4.12.4 Analytical Approach

A methodology was developed to attribute jobs and private sector investments to EDA investments. EDA's method relied heavily on the judgment of the grantees and regional office directors, which could be subject to positive bias. While difficult to develop objective measures of attribution, respondents might have been asked a more rigorous set of questions. Alternatively, measures of local fiscal capacity might have been developed to assess the community's level of fiscal distress and need for federal support.

EDA's investments were classified as either critical (i.e., without funding, project would not have been undertaken), resulting in attribution of all jobs and private investment to EDA's investment; or essential (i.e., without funding the project would have been seriously compromised) resulting in attribution of jobs and private investment to EDA's investment proportionate to the investment of other public funders. Based on classifications made by grantees and regional office directors, the research team classified EDA investment as essential in all cases when the EDA share was less than 25 percent.

Information was collected through the following means:

1. **Surveys:** Mail and telephone solicitation to obtain project statistics and to quantify project outcomes, involving a mail survey and callbacks to obtain and verify project information.
2. **Observation/Site Visits:** Seminars with grantees held in 13 locations to instruct them on technicalities of information requests and the specific information that would be required as part of the evaluation. In addition, half-day site visits to 25 percent of grant locations for field verification of scale and health of the project, and number of direct and indirect jobs.
3. **Case Studies:** A brief one-page case study write-up for the projects visited was also compiled.
4. **Input-Output and Statistical Analysis:** In a related study, EDA conducted input-output analysis to estimate indirect employment and investment impacts of the EDA investments, and conducted regression analysis to estimate the impact of the EDA investments on countywide employment and wages.



## 5 PERFORMANCE MEASURE DATABASE

### 5.1 Discussion of Performance Measure Database

A database of performance measures was developed based on information collected through a survey sent to all grantees that had received infrastructure funding from ARC between 2004 and 2010. The survey requested information about the outcomes and long-term impacts of these projects.

The team started with the ARCnet infrastructure database of all ARC funded infrastructure projects from 2004 to 2010. This database of 811 projects contains information from the Grant application, including project number, open/closed status, amount of ARC funding, location, project type, and anticipated outcomes and outputs.

Based on the information in the database and an attempt to be consistent with other program evaluations, such as those for education and health services, the team created a survey to distribute electronically to grantees. The goal of the survey was to collect as much information as possible about actual project outputs and outcomes as compared to the anticipated outputs and outcomes that were provided on the grant applications. A copy of the electronic questionnaire is available in Appendix A.

An electronic correspondence (see Appendix B) was sent to all grantees with information about the survey purpose and background, accessing the survey on-line and requesting participation. For those e-mails that were undeliverable and those grantees that did not provide e-mail addresses, paper letters were mailed to the provided addresses containing the same information as the electronic correspondence.

Of the 811 grantees that were contacted, the team received 197 responses that contained enough information to analyze. There were 211 survey responses, but 14 were either blank or duplicate and thus not counted. There were respondents from every state, with Mississippi, Kentucky and Ohio accounting for the highest response rates with 28 responses (14 percent) from Mississippi and 26 (13 percent) each from Kentucky and Ohio.

A breakdown of projects funded and survey responses received by state is presented in Table 4 below. As mentioned previously and shown below, Mississippi received the largest number of grants during the study period, followed by Ohio and Kentucky. This is consistent with the response rate; these three states provided the most survey responses. Alabama received 10 percent of grants but only accounted for seven percent of responses. Looking at response rates relative to the share of projects, New York, West Virginia, Maryland and Kentucky had the highest response rates.

**Table 4: Number and Share of Grants Received and Survey Responses by State**

State	MS	KY	OH	PA	TN	WV	MD	AL	NY	NC	SC	GA	VA	Total
<b>Database Projects</b>	120	82	92	74	65	44	44	79	35	51	32	67	26	811
<b>Share of Projects</b>	15%	10%	11%	9%	8%	5%	5%	10%	4%	6%	4%	8%	3%	100%
<b>Survey Response Projects</b>	28	26	26	16	16	16	14	13	13	9	9	8	3	197
<b>Share of Responses</b>	14%	13%	13%	8%	8%	8%	7%	7%	7%	5%	5%	4%	2%	100%
<b>Response Rate</b>	23%	32%	28%	22%	25%	36%	32%	16%	37%	18%	28%	12%	12%	

The majority of responses were for either water or sewer systems,<sup>6</sup> followed by access roads, telecommunications projects and industrial site developments. These five categories of projects accounted for more than 95 percent of responses. A breakdown of responses by project type is shown in Table 5 below. The distributions of survey responses are very similar to the distribution of all projects funded.

**Table 5: Number and Share of Survey Responses by Project Sub-Type**

Projects by Sub-Type				
Sub-Type	All Projects	% of Total	Survey Responses	% of Total
Water System	315	38.8%	70	35.5%
Sewer System	217	26.8%	52	26.4%
Access Road	116	14.3%	30	15.2%
Telecommunications	65	8.0%	19	9.6%
Industrial Site Development	86	10.6%	17	8.6%
Highway	1	0.1%	3	1.5%
Intermodal Facility	3	0.4%	2	1.0%
Rail	3	0.4%	2	1.0%
Airport	1	0.1%	1	0.5%
Gas Line	4	0.5%	1	0.5%
<b>Total</b>	<b>811</b>	<b>100%</b>	<b>197</b>	<b>100%</b>

The largest number of responses was water systems in Kentucky, with 17 survey responses received by the team. Additionally, Ohio, Tennessee, and West Virginia each had nine responses relating to water projects and Mississippi had nine sewer system responses. The breakdown of responses by state is presented in Table 6 below, with the blue shaded cells indicating the highest response rates. A table showing the distribution of the full database by project type and state can be found in Appendix C. The full database and the survey responses are relatively consistent in terms of distribution.

**Table 6: Survey Responses by Self-Identified Project Type and State**

	AL	CO	GA	KY	MD	MS	NC	NY	OH	PA	SC	TN	VA	WV	Total
Access Road	0	0	3	0	8	6	1	1	4	6	1	0	0	0	30
Airport	0	0	0	0	0	0	0	0	0	1	0	0	0	0	1
Gas Line	0	0	0	0	0	0	0	0	0	0	0	1	0	0	1
Highway	0	0	0	0	0	0	0	1	1	0	0	0	1	0	3
Industrial Site Development	2	0	0	0	4	4	0	0	1	3	1	2	0	0	17
Intermodal Facility	0	0	0	1	0	0	0	0	0	1	0	0	0	0	2

<sup>6</sup> Note that the responses from the ARCnet database for all projects are based on the project sub-type as categorized by ARC. The categories for the survey responses are based on information provided by the respondent. While generally consistent, there were some cases where the infrastructure type in the response was different than the database.



<b>Rail</b>	1	0	0	0	0	0	0	0	1	0	0	0	0	0	2
<b>Sewer System</b>	4	0	1	8	1	9	2	2	9	2	3	4	0	7	52
<b>Telecommunications</b>	2	0	0	0	2	2	1	7	1	1	1	0	2	0	19
<b>Water System</b>	4	0	4	17	0	6	5	2	9	2	3	9	0	9	70
<b>Total</b>	<b>13</b>	<b>0</b>	<b>8</b>	<b>26</b>	<b>15</b>	<b>27</b>	<b>9</b>	<b>13</b>	<b>26</b>	<b>16</b>	<b>9</b>	<b>16</b>	<b>3</b>	<b>16</b>	<b>197</b>

Note: Project Type is based on the type identified by survey respondent and not ARCnet project type.

As mentioned above, the team considered 197 of the responses complete enough to analyze; however, not all of these responses provided complete information. The survey contained an option to enter a value of “Did Not Track” or “Not Applicable” for some questions, which meant that a numerical response was not provided for every question. In other cases, respondents left questions that were not mandatory blank. Again, no numerical value was provided. Thus, many of the performance metrics that the team attempted to measure, including the size of the capacity improvement (miles, linear feet, millions of gallons per day, etc.) and the outputs, including concepts such as telecommunications speed, previous water system capacity, number of water system failures, access road traffic, etc., were not tracked with numeric values. This reduced the number of results that could be quantitatively analyzed. Complete details of the survey results are available in Appendix D.

## 5.2 Analysis and Summary of Project Performance Measure Database

The project team examined more than 50 performance measures to assist ARC staff, managers, and grant applicants in the process of evaluating the benefits of the program as clearly and transparently as possible.

The analysis focuses on four key areas:

- **How is the program funding spent?** These measures describe how ARC has made investments across several dimensions, including by state, by year, and by the economic status of regions.
- **How do recipients perceive program benefits?** These measures describe how grant recipients perceive the long-range impacts of the projects on the economy, the environment, and the quality of life in the communities.
- **What are the real impacts of the program?** These measures evaluate economic development impacts, such as jobs created/retained, businesses created/retained, households/businesses improved, communities served, etc. In addition, this tier includes project outcome measurements, such as linear feet of pipes installed, miles of road built, telecommunication sites developed, and miles of rail tracks built. Real impact performance measurements were evaluated for projects that are currently closed and for which real measurements of impacts can be made. Projected outcomes for projects still under development are also captured.
- **How cost-effective is the program?** These measures compare the relative costs and outcomes of the projects by infrastructure type.

In order to conduct the analysis, the team reviewed the ARCnet database and 2012 survey responses and combined the information received from the survey with the information in the ARCnet database. Several challenges were encountered sorting the data since many respondents left answers blank or, in many instances, did not know the outcome or benefits of the project. To accurately depict the benefits of the program, assumptions were made in the process of cleaning the data. The full ARCnet database was used to obtain information about the funds allocated by ARC to individual projects per fiscal year. Though all

projects considered were funded between 2004 and 2010, not all of the projects are considered “closed.” Also, when a respondent provided a range of values – for example “between 10-15 jobs created” – the median was assumed.

The following sections provide results from the performance measure analysis and the econometric analysis conducted as part of this study.

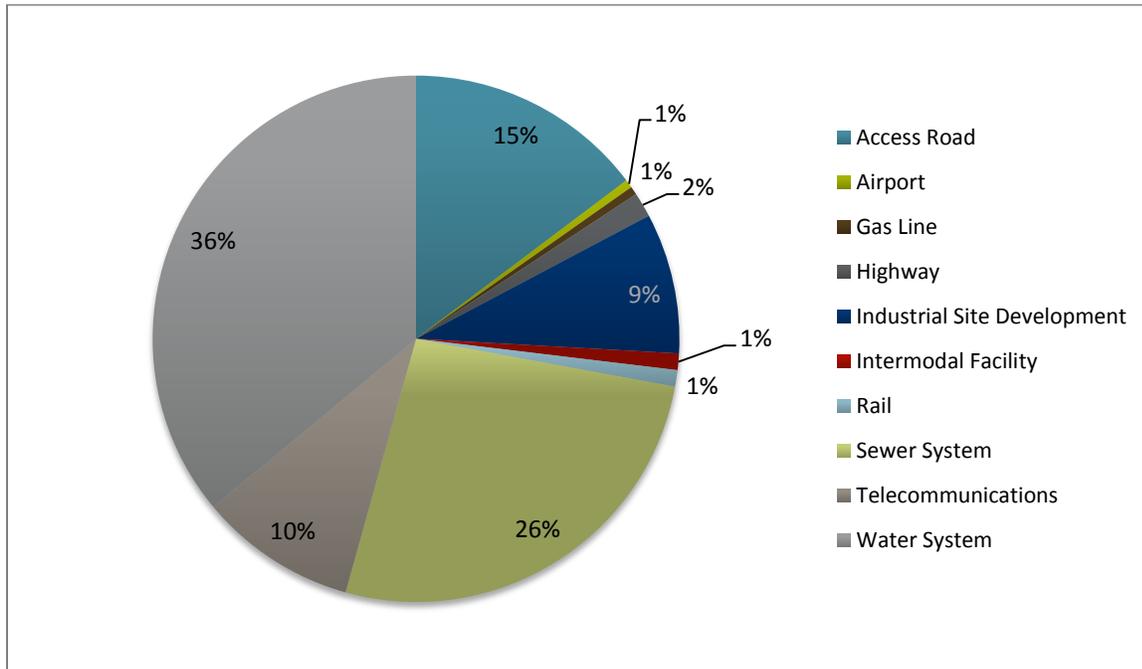
### *5.2.1 Descriptive Statistics*

From 2004 to 2010, the ARC contributed nearly \$206.7 million toward funding 811 various infrastructure projects that totaled more than \$1 billion in value.

Based on the survey response, a total of 197 projects funded in part by ARC between 2004 and 2010 were evaluated in detail. The sample projects are distributed among all 13 Appalachian states and include a wide range of infrastructure programs, including highway corridors, water and sewer infrastructure projects, telecommunications projects, rail, gas line, and airports. Of the 197 projects analyzed, 123 (62 percent) are related to water and sewer infrastructure. Multiple access road projects, telecommunications projects and industrial site development projects were also funded. Figure 1 below shows the distribution of these 197 projects by infrastructure type.



**Figure 1: Project Distribution by Self-Identified Infrastructure Type, Survey Responses (n=197)**



It is important to note that this information and the following detailed analysis are strictly based on the self-identified responses to the survey, and as highlighted in the previous section, the characteristics of the projects for which surveys were completed may vary from the characteristics of the overall investments in infrastructure funded during the relevant time period by ARC.

### ARC Investments Overview

Business location decisions are made based on a number of factors, including the labor force, access to suppliers, appropriately developable land, and adequate public infrastructure. ARC investments are intended to enhance economic development in the Region by attracting new industry, encouraging business expansion, diversifying local economies, and generating permanent, private-sector jobs. This section of the report aims to identify how ARC has made investments across several dimensions, including by state, by year, and by the economic status of regions.

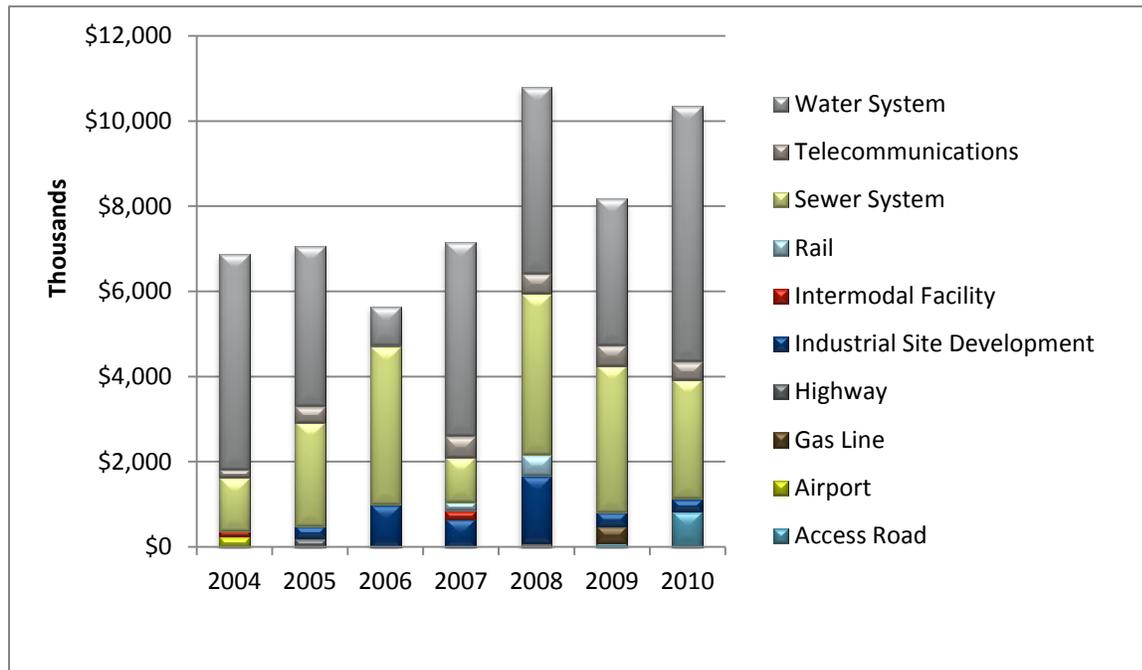
### Expenditures

The survey responses accounted for a total of slightly more than \$56 million of the \$206.7 million that ARC invested during the time period. Of this, nearly \$46.5 million was spent on water and sewer system investments, \$28 million on water (50 percent) and \$18.4 million on sewer systems (33 percent) accounting for 83 percent of the total spending from 2004 to 2010, according to the survey responses.

The ARCnet database includes all projects funded by ARC from 2004 to 2010. The share of water and sewer projects actually funded is slightly less than the share of these project types in the survey responses; 78 percent of all projects in the ARCnet database were water or sewer systems. Forty-five percent, or \$93 million, of all ARC grant funds during the 2004-2010 period were spent on water system projects and 33 percent, or \$67.4 million, were spent on sewer system projects. As seen in Figure 2, water

and sewer system projects account for the largest segment of spending in each year of the study period as well. While the distribution of projects by type in the survey responses is not identical to the distribution of projects by type in the ARCnet database, the relative shares by project type are similar.

**Figure 2: ARC Investment (\$) by Year and Self-Identified Infrastructure Type, Survey Responses (n=197)**



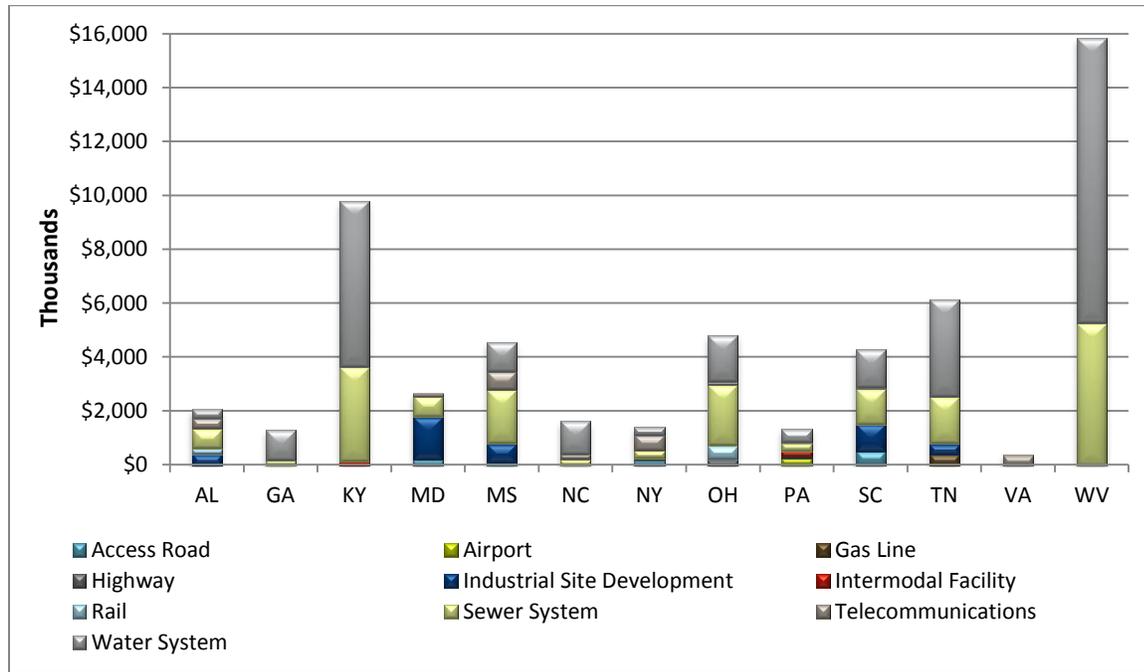
The survey responses show an average of \$8 million spent annually, with expenditures in 2008 and 2010 exceeding \$10 million and expenditures in 2006 the lowest at approximately \$5.7 million. The total project database also demonstrates relatively even spending with an average of \$29.5 million spent per year during the study period, with the highest spending in 2009 – \$33.2 million – and the lowest spending in 2006 – \$27.0 million.

Consistent with the full ARCnet database of 811 projects, West Virginia and Kentucky received the highest levels of funding among survey respondents. Based on the survey responses, funds were primarily spent on water and sewer infrastructure projects. West Virginia received \$10.6 million for water systems projects and \$5.3 million for sewer system projects, while Kentucky received \$6.2 million and \$3.5 million, respectively.

This can be compared to the \$25 million in water system improvements and \$10.5 million in sewer improvement in West Virginia from the full database and the \$18.4 million in water and \$10 million in sewer improvements in Kentucky. Figure 3 presents the number of projects by type and by state as reflected in the survey responses.



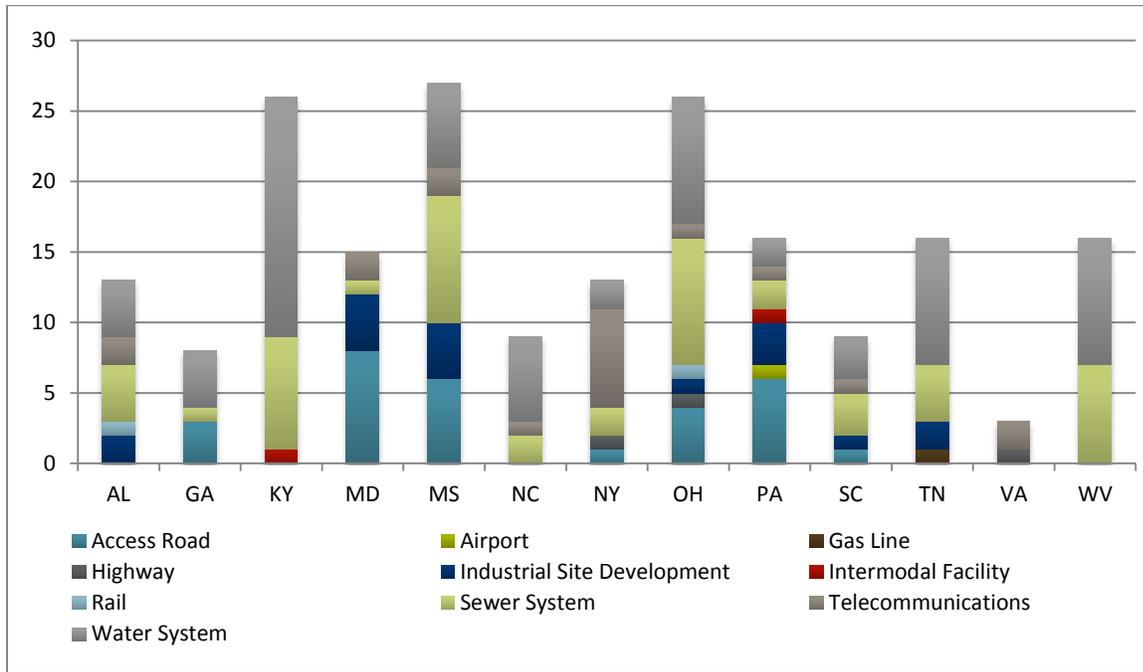
**Figure 3: ARC Funding by State and Self-Identified Infrastructure Type, Survey Responses (n=197)**



### Projects by State

Based on the survey responses, the ARC contributed to the greatest number of infrastructure projects in Mississippi (27), Kentucky (26), and Ohio (26) between 2004 and 2010. Of the projects in Mississippi, nine were sewer systems, six each were water systems and access roads, four were related to industrial site development and two were telecommunications related. Based on survey responses, ARC contributed funding to 17 water systems, eight sewer systems, and one intermodal facility project in Kentucky. The mix of projects in Ohio was nine water and nine sewer projects, four access roads, and one each of highway, industrial site, rail, and telecommunications projects. The full distribution of projects by state, based on survey responses, is presented in Figure 4 below.

**Figure 4: Number of Projects by State and Self-Identified Infrastructure Type, Survey Responses (n=197)**



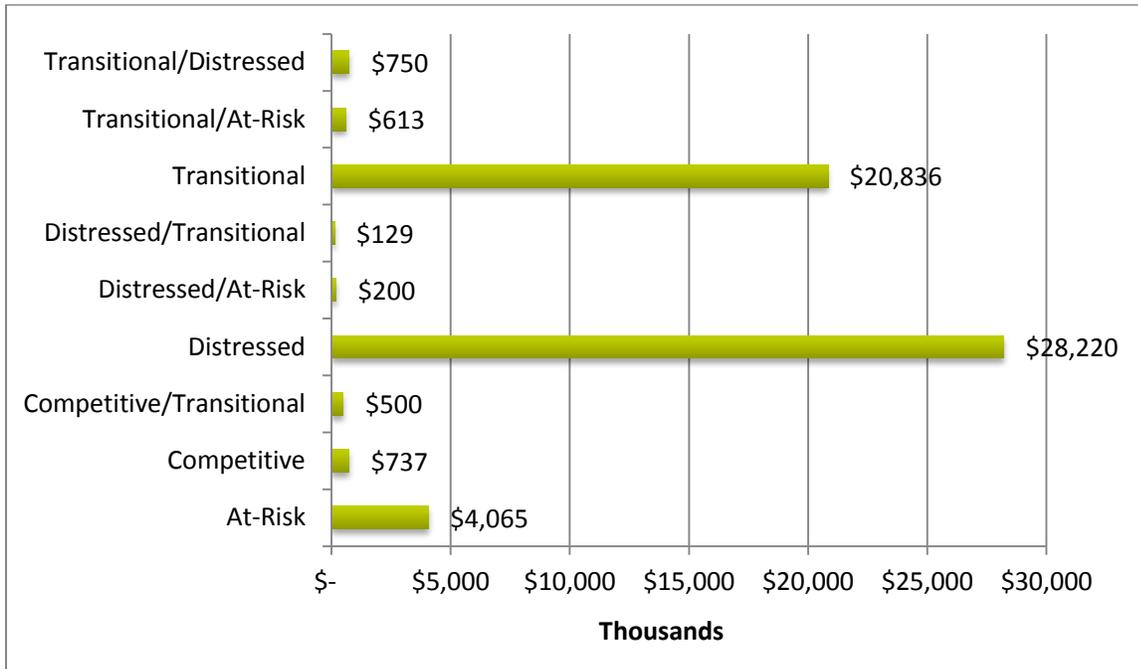
### County Economic Status

The ARC uses an index-based county economic classification system to identify and monitor the economic status of Appalachian counties. The system involves the creation of a national index of county economic status by comparing each county's averages for three economic indicators—three-year average unemployment rate, per capita market income, and poverty rate—to national averages. Based on this information and their relative position nationally, the Appalachian counties are classified into one of five economic status designations: distressed, at-risk, transitional, competitive, or attainment.

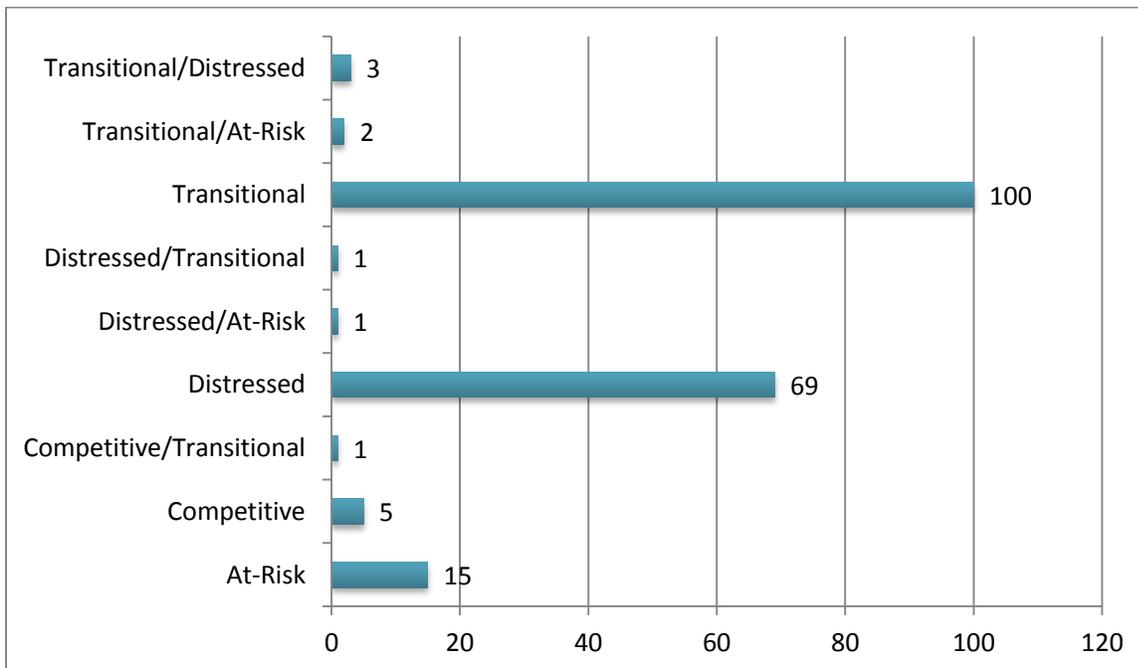
Distressed counties rank in the worst 10 percent of economically depressed counties in the nation, and attainment counties are the strongest 10 percent of the nation’s counties. The largest share of the nation’s counties – between the worst and best 25 percent – are transitional. The following figure shows ARC investments by economic status in the year the project was approved for funding. The Appalachian Region has a higher proportion of distressed and at-risk counties than the nation as a whole. Thirty-seven percent of the ARC funds spent on the 197 projects that responded to the survey (approximately \$20.8 million for 100 projects) were invested in transitional counties and 50 percent (approximately \$28.2 million for 69 projects) were invested in distressed counties. The full breakdown of number of projects and funding by county status can be seen in the following two figures.



**Figure 5: ARC Investments by Economic Status – Dollars of Investment, Survey Responses (n=197)**



**Figure 6: ARC Investments by Economic Status – Number of Projects Invested, Survey Responses (n=197)**



The 100 projects located in transitional areas were across a mix of infrastructure types. Approximately one-quarter of projects were for access roads, sewer systems and water systems (22, 23 and 26, respectively). There were a total of 69 projects funded in distressed counties; shown in Figure 6, 85 percent of these (a total of 59 projects) were for water or sewer systems; specifically, 35 water systems and 24 sewer systems.

### Economic Development Impacts

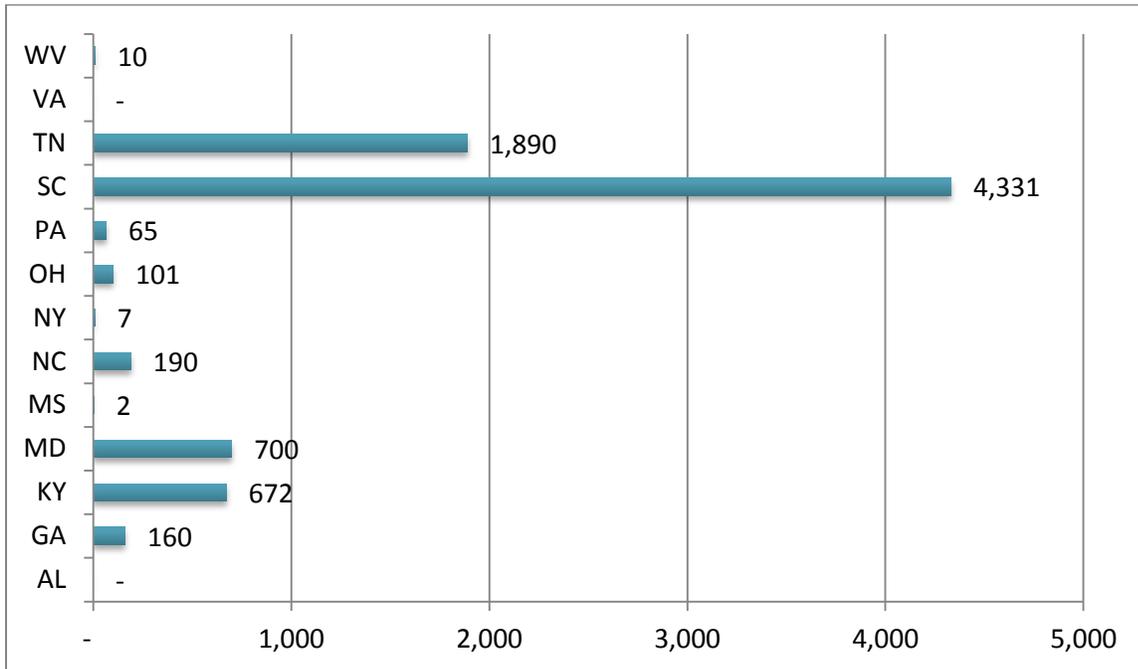
Another aspect of the evaluation was to look at the quantitative impacts of the project funding. These measures examine real, tangible economic development impacts, such as jobs created/retained, businesses created/retained by state and infrastructure type. The limited set of completed surveys leaves some investment categories and states without sufficient impact data to adequately analyze the effects of ARC projects. In addition, it is important to note that not all of the respondents to the survey tracked or provided answers to every measure. For instance, of the 197 survey responses received, only 84 (43 percent) provided a value for jobs created, with 38 of those values being zero and only 54 (27 percent) provided a value for jobs retained, with 22 of those being zero.

Based on the responses for which sufficient data were available (i.e., 34 out of the 92 “closed” projects), ARC infrastructure investments created or retained a total of more than 8,000 jobs as indicated by the respondents. This total is driven by a few large projects in a few states. For example, South Carolina projects resulted in the largest number of jobs created/retained among the ARC states, 4,331. Of this, 3,000 jobs were created from a single project, the Greer Water Treatment Plant in Greenville. Tennessee, Tennessee and Maryland projects also generated a relatively high number of jobs, as shown in Figure 7. Most of these jobs are due to the 1,600 jobs retained by the Hawkins County Water Storage Tank project in Tennessee, the 850 jobs retained by the Donaldson Industrial Hangar Upgrades in South Carolina, and the 450 jobs created by the Barton Business Park project in Maryland.

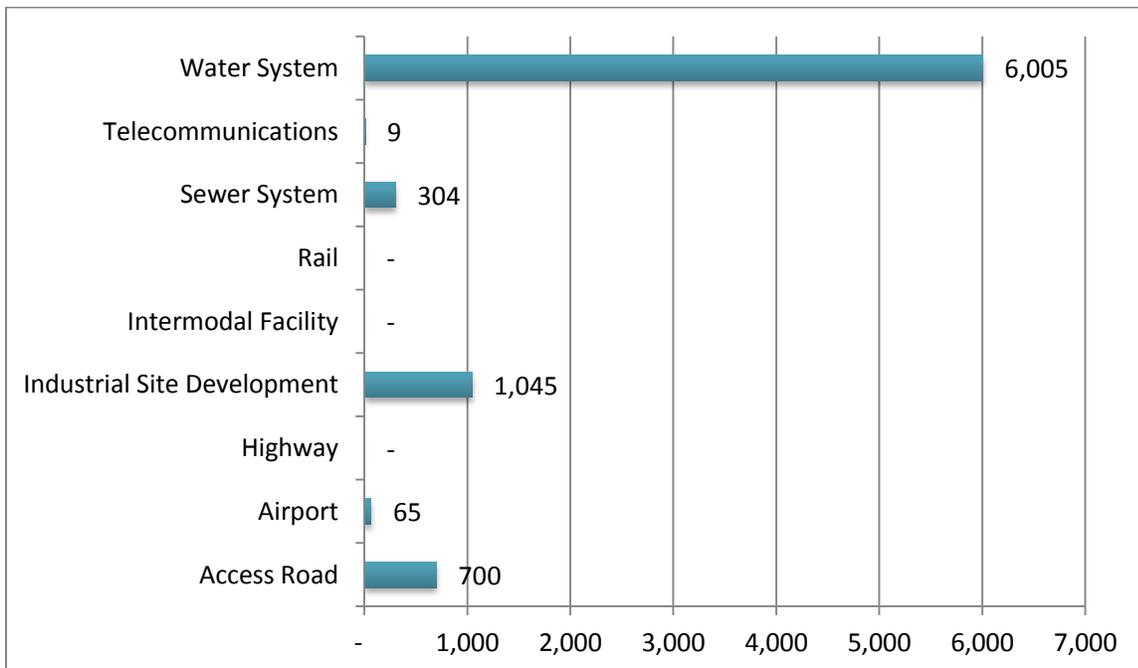
As illustrated in Figure 8 below, the majority of jobs created or retained were attributable to water systems and industrial site development projects. These two categories of projects account for nearly 87 percent of all jobs created or retained. Access road and sewer projects also supported the creation or retention of more than 1,000 jobs. According to survey respondents, the majority of these jobs, approximately 55 percent, are in manufacturing.



**Figure 7: Number of Jobs Created or Retained by State, Survey Responses Closed Projects (n=34)**

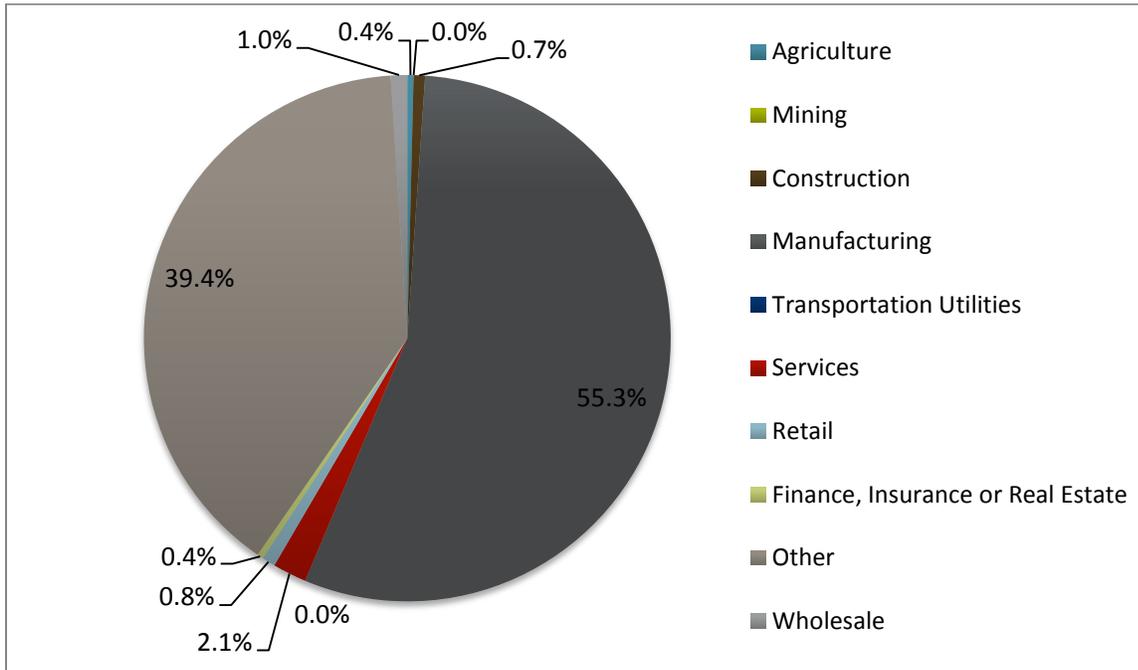


**Figure 8: Number of Jobs Created or Retained by Self-Identified Infrastructure Type, Survey Responses Closed Projects (n=34)**



Approximately 39 percent of jobs created or retained were unable to be classified to a specific industry. The largest number of jobs created or retained was in manufacturing industries – approximately 4,500 jobs or more than 55 percent. Aside from “other,” services then accounted for the next largest share with 2.1 percent, or 170 jobs created or retained, as shown in Figure 9 below.

**Figure 9: Jobs Created or Retained by Industry,<sup>7</sup> Survey Responses Closed Projects (n=30)**

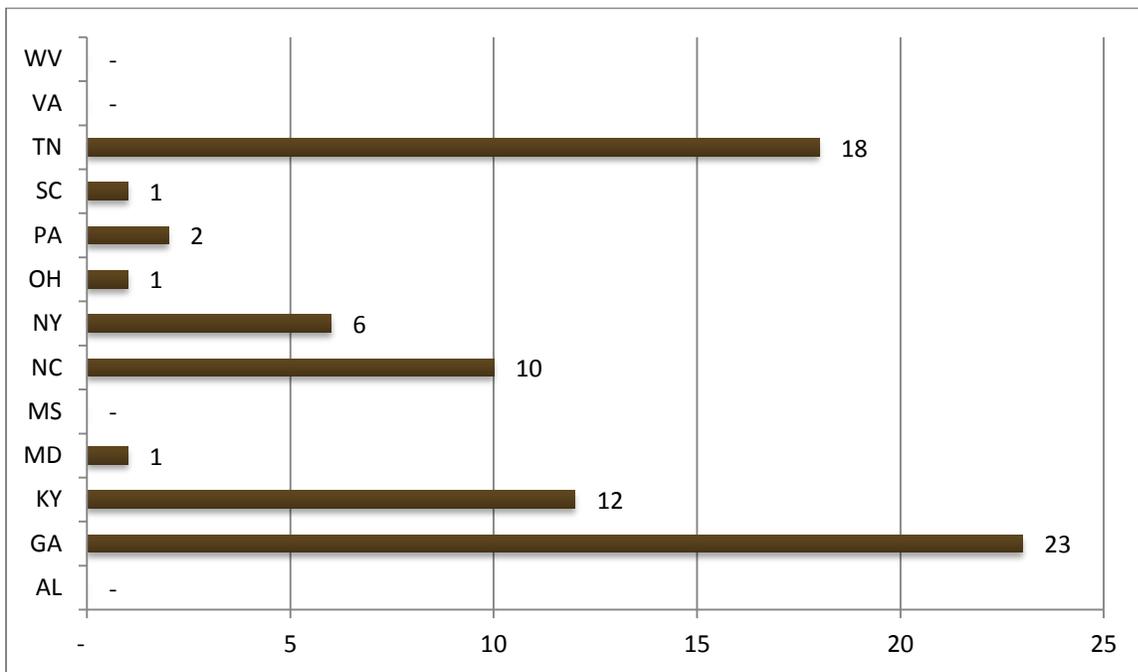


<sup>7</sup> Note that these are only for closed projects, and “other” may include some jobs in categories shown in the graphic when respondents were uncertain of the industry classification.



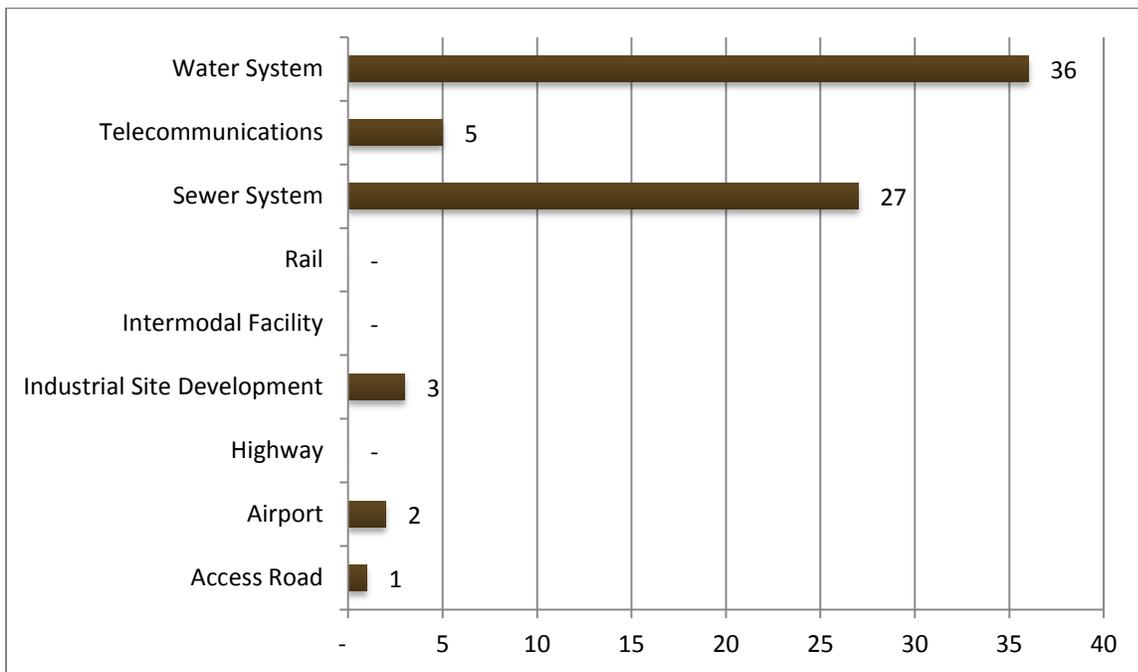
Examining only the 92 projects that are “closed” from the survey responses, 30 of which provided a numerical response for businesses, funding from ARC between 2004 and 2010 contributed to the creation or retention of 74 business establishments, as shown in Figure 10 below. The ARC investments contributed to the largest number of establishments in Georgia with a total of 23 new or retained businesses. This is due to the creation of four businesses and the retention of 19 business sites because of the Jefferson Waste Water System Improvements. The Hawkins County Water Storage Tank in Tennessee created three businesses and allowed for the retention of 14 more during the same time frame.

**Figure 10: Number of Businesses Created or Retained by State, Survey Responses Closed Projects (n=30)**



The business establishment outcomes were primarily the result of sewer and water system improvements, with 36 new or retained businesses due to water system improvements and 27 due to sewer improvements, as shown in Figure 11. As noted previously, the Jefferson Waste Water System Improvements in Georgia created or retained a large number of businesses due to a water system investment, four and 19, respectively. The largest business creation or retention associated with a water system project was the Hawkins County Water Storage tank in Tennessee, which created three new establishments and retained an additional 14.

**Figure 11: Number of Businesses Created/Retained by Self-Identified Infrastructure Type, Survey Responses Closed Projects (n=30)**



In addition to impacts on jobs and businesses, the infrastructure investments also contributed to improvements to households. Based on survey responses, 51 of the closed ARC infrastructure investments, those which provided a numerical response, improved more than 57,000 households. The largest shares of those improvements were in Kentucky and Tennessee, with more than 25,000 and 23,000 improved households, respectively. These impressive numbers are primarily due to improvements to water systems. The Hawkins County Water Storage Tank in Tennessee has improved more than 20,000 households, and the Wood Creek Water Treatment Plant Expansion in Kentucky serves more than 16,000 households.

The ARC contributed nearly \$25 million in funding to closed projects that totaled \$131.8 million from 2004 to 2010. According to the 42 survey respondents who provided a numerical response, these projects leveraged an additional \$1.2 billion in private investments. Detail related to both the funding sources for project completion and the additional leveraged investments was not available from the survey responses.



### Anticipated vs. Actual Impacts

When applying for ARC funding, the prospective grantees are asked to estimate the impacts of their projects. An additional assessment of the success of projects is to examine the actual outcomes compared to the perceived outcomes. This comparison was made for only the closed projects that had numerical values for both ARC predicted outcomes and survey responses, the number of which varied by question and is indicated in the third column of the table below. The results indicate that actual impacts for households served and jobs created exceed the anticipated outcomes. Two of the metrics fell short of reaching anticipated outcomes – job retention and businesses served. Job retention was about 1,000 jobs short of projections with grantees predicting that there would be 2,354 jobs retained and the actual results for these projects were 1,379 jobs retained. Grantees predicted that there would be 1,029 businesses served but the actual results showed only 714 businesses served for the 21 cases that provided responses. It is important to note that the sample sizes are limited to only those projects that provided numerical responses in both their grant application and in their survey response, which reduces the sample size and may not reflect all outcomes.

**Table 7: Comparison of Predicted and Actual Household Served and Jobs Created and Retained**

	Predicted	Actual	n
Households Served	13,148	27,488	37
Job Creation	4,181	5,051	21
Job Retention	2,354	1,379	8

As seen in Table 7, respondents anticipated serving approximately 13,000 households and actually served more than 27,000. This is more than double the amount initially anticipated. More information would be required to determine the exact explanation for why actual outcomes were greater than predicted outcomes, but some possible explanations include greater impacts due to a combination of this grant with other related investments, missing responses, or a misunderstanding of the question. Job creation saw better than anticipated outcomes among these projects, 5,051 compared to 4,181.

### Perceived Project Outcomes

In addition to questions seeking quantitative data, the evaluation survey also contained questions to qualitatively assess the long-range project outcomes. These measures describe how grant recipients perceive the long-range impacts of the projects on the economy, the environment, and the quality of life of the communities. Grantees were asked a series of questions related to the project and asked to respond according to the following scale:

- **None:** Project had little to no impact on trend
- **Slight:** Project impact was not large enough to reverse or stabilize trend
- **Moderate:** Project impact contributed to the stabilization or reversal of trend
- **High:** Project impact was responsible for significant improvement in trend

Questions were asked regarding economic impacts, competitiveness impacts, and environmental impacts. Of the 197 survey responses, 157 (80 percent) provided answers to the questions related to project outcomes.

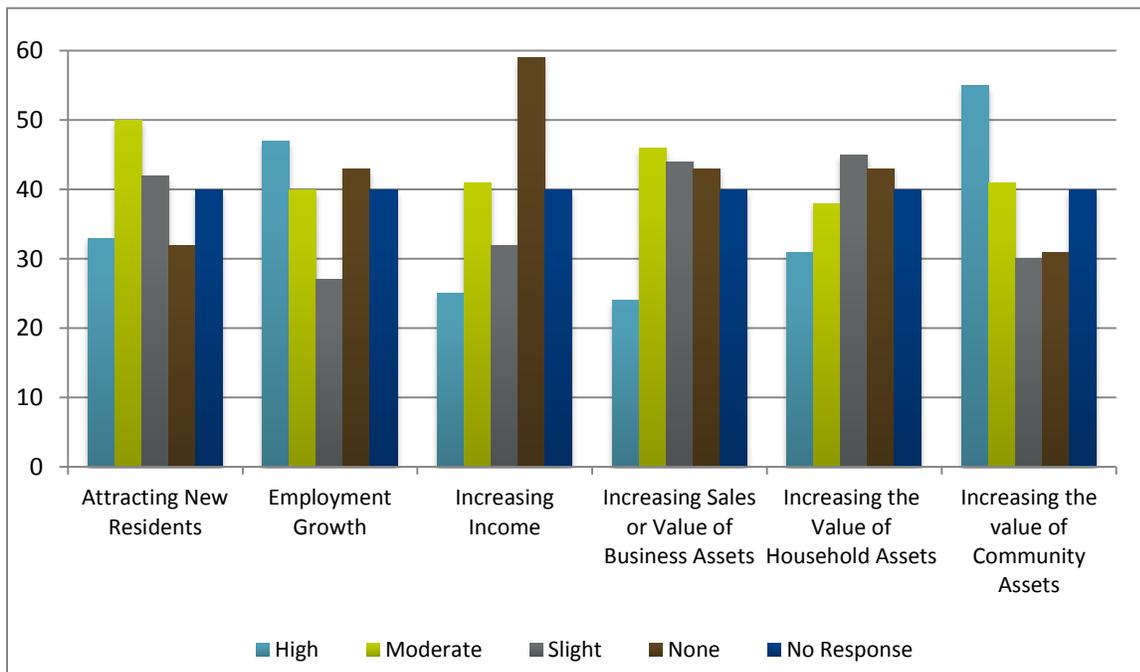
Ratings were sought to the following statements about long-term **economic impacts** of ARC projects:

1. Attracting new residents or stabilizing the area’s population
2. Attracting new jobs or increasing employment at existing businesses
3. Creating new sources of income or increasing income for local residents
4. Increasing local business sales or the value of business assets (such as equipment, real estate)
5. Increasing the value of household assets (such as homes, land, farms) for local residents
6. Increasing the value of community assets (such as community buildings, schools, infrastructure, parks)

The range of success on these projects varied by question, as shown in Figure 12, though those who responded viewed their project as having the most success at increasing the value of community assets – 26 percent believed there was a moderate improvement and 35 percent a high improvement. Only 20 percent of respondents saw no improvement and 19 percent believed there to be a slight improvement in the value of community assets.

Respondents also found the projects to have high or moderate success at both attracting/stabilizing the population and increasing employment. Respondents found the projects least successful at creating new sources of or increasing income for local residents; 38 percent believed that there was no impact while only 16 percent believed that there was a high impact. Overall, the ARC projects were viewed by the grantees as able to reverse or stabilize an economic trend approximately half of the time.

**Figure 12: Qualitative Survey Responses Regarding Economic Impacts (n=197)**



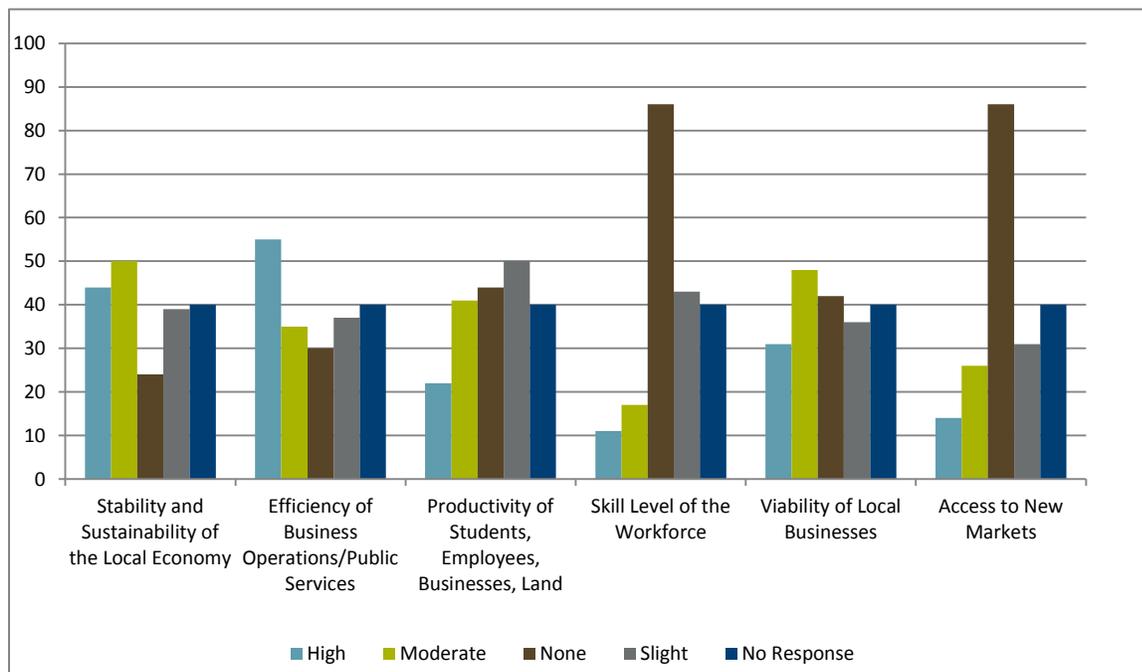


The second set of qualitative questions sought long-term outcomes related to the following competitiveness measures:

1. Improving the stability and sustainability of the local economy
2. Improving the efficiency of business operations or public services
3. Improving the productivity of students, employees, businesses, land, or other assets
4. Improving the skill level of the workforce
5. Increasing the viability of local businesses
6. Improving access to markets for local products, businesses, artisans, and entrepreneurs
7. Reducing the cost of doing business

The findings of these questions are shown in Figure 13. Of the measures, respondents found the projects to be the most successful at improving the stability and sustainability of the local economy. Eighty-five percent indicated that the impact ranged from slight to high and only 15 percent of respondents believed that there was no impact. With respect to improvements in the efficiency of operations, 35 percent of respondents believed that their project had a high impact, 22 percent moderate, and only 19 percent did not see any impact. The respondents found their projects to be least successful at improving work-force skill levels and access to new markets. Fifty-five percent indicated there was no impact. This finding is not unsurprising as the infrastructure investments evaluated as part of this study do not typically impact worker skills.

**Figure 13: Qualitative Survey Responses Regarding Competitiveness Measures (n=197)**

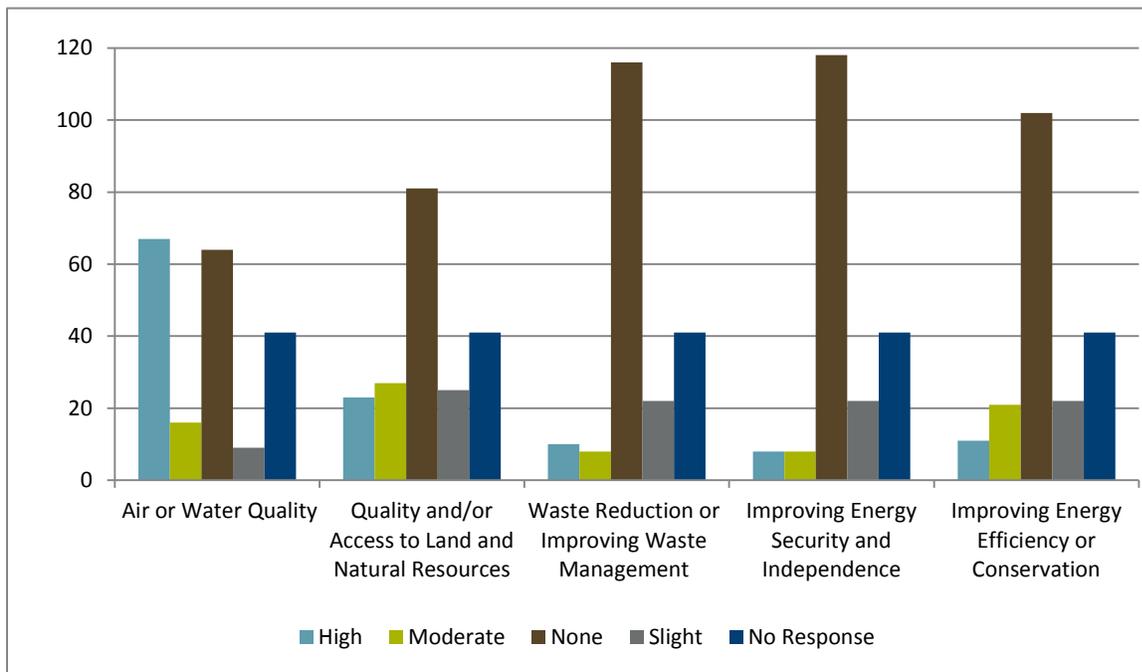


The final category of qualitative impacts related to the **environmental outcomes** of the investments. Of the economic, competitiveness and environmental impacts, grantees found their projects to be the least successful at improving environmental outcomes, as shown in Figure 14. The following are the topics posed as questions that were presented to the grantees:

1. Impact on improving air or water quality
2. Impact on improving quality and/or access to land and natural resources
3. Impact on waste reduction or improving waste management (reuse, recycling, alternative energy, biofuels)
4. Impact on improving energy security and independence
5. Impact on improving energy efficiency or conservation

Of the environmental impact measures, the greatest success was related to improvements in air and water quality; 43 percent of respondents believed that their project had a high impact while 41 percent believed there was no impact. From the grantees’ perspectives, the projects also had mild success – approximately 48 percent reporting at least a slight improvement – at improving the quality of or access to land and natural resources. At least two-thirds of respondents found no impacts at all in regards to improvements of waste reduction, energy security or energy efficiency.

**Figure 14: Qualitative Survey Responses Regarding Environmental Measures (n=197)**

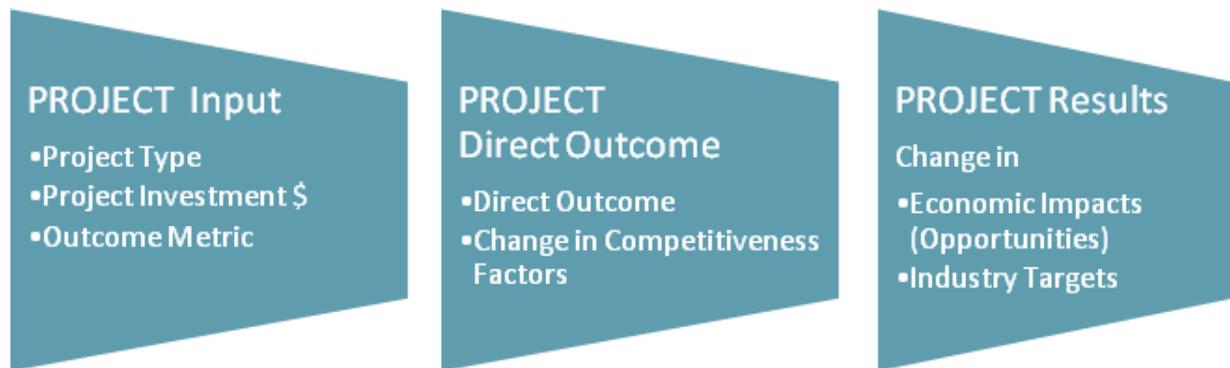


### 5.2.2 Econometric Analysis

This section of the report provides the methodology and results of econometric analyses conducted on both the full ARCnet database for 2004 to 2010 and the data collected through the online survey of grant recipients previously described. Some background on the tools utilized to conduct the analyses is provided, as well as the econometric approach employed and the results of the two analyses. ARC’s level of investment in projects and project results are examined, and an assessment of the extent to which project direct outcomes can be used to help predict results is provided. Specifically, the findings are designed to:

1. **Measure intermediate project outcomes** (e.g., miles of road, linear feet of water and sewer systems, or numbers of businesses served) and establish the typical range of program outcome/cost ratios;
2. **Measure final economic development results** (i.e., jobs created) and establish the typical range of economic result/cost ratios;
3. **Develop models that predict project outcome/cost ratios** in terms of how they vary by type of project and characteristics of the setting (including its population, density and economic cost structure); and
4. **Develop models that predict economic development result/cost ratios** in terms of how they relate to project type, intermediate project outcomes and characteristics of the setting (including economic profile).

The third and fourth items also enable further use of study findings for grant review and program benefit evaluation. The steps in this process are indicated below.



Those latter uses are enabled by the use of ARC-LEAP, which is a software system supported by ARC that was initially designed to enable the Commission and its Local Development Districts (LDDs) to assess their region's economic performance and growth opportunities. It was later redesigned and updated to enable ARC to evaluate grant funding proposals, by helping applicants define realistic expectations for program outcomes and economic development results. The initial prototype of this program evaluation function was developed in 2011 for broadband and telecom-related grants, and later updated in 2012 to cover education grants.

### Databases

The first step in the methodology was to collect information regarding types<sup>8</sup> of recent infrastructure investment projects and their outcomes. To accomplish this, two datasets were analyzed – the full universe of projects contained in the ARCnet database, 811 cases, and a subset of 197 of these cases for which survey responses were received. Not all of these cases contained sufficient information for analysis, and the limitations and sample size reductions will be discussed. Analysis of both datasets allows for a comparison of job impacts **predicted** by grant recipients at the time of application in the ARCnet database and the **actual** job impacts reported by those that responded to the survey. Because the various project types have unique characteristics that can lead to very different outcomes, with the exception of water and sewer, the types were not aggregated.

<sup>8</sup> For statistical analysis, the project types considered were based on the ARC classified type. In some cases, these varied from the self-identified type indicated by the survey respondent, which were used in the previous section.

The analysis showed that in both datasets, less than half of the projects provided information on job impacts and only three of the eleven project types had sufficient cases with job data to enable statistical analysis.<sup>9</sup> Table 8 shows the number of each of these types of projects and the number with job data for both the full database and the survey results. The top portion of the table indicates types that did not have sufficient cases for statistical analysis, and the bottom half shows the three types that do contain enough information to analyze.

**Table 8: Number of Projects and Projects with Jobs Data by Type for Full ARCnet and Survey Responses**

Project Type	ARCnet Database (Predicted Jobs)		Survey Results (Actual Jobs)	
	Total Projects	Projects with Job Data	Total Projects	Projects with Job Data
<b>Project Types with Insufficient Cases to Analyze</b>				
Airport	1	1	0	0
Business Site Development	1	1	0	0
Gas Line	4	3	1	0
Highway	1	0	1	0
Intermodal	3	1	1	0
Rail	3	0	0	0
Telecommunications	65	5	19	1
Water Tank	34	9	0	0
<i>Subtotal</i>	<i>112</i>	<i>20</i>	<i>22</i>	<i>1</i>
<b>Project Types with Sufficient Cases for Statistical Analysis</b>				
Access Road	116	76	32	15
Industrial Site Development	86	61	18	9
Water/Sewer	497	161	125	47
<i>Subtotal</i>	<i>699</i>	<i>298</i>	<i>175</i>	<i>71</i>
<i>Total</i>	<i>811</i>	<i>309</i>	<i>197</i>	<i>72</i>

Table 8 shows that after filtering both datasets for:

- Project types deemed too underrepresented for statistical analysis;
- Access road, water/sewer, and industrial site development projects with no job impact data; and
- Outlying projects that had job impact or spending data so extreme as to skew the analysis and decrease predictive power (see Appendix E for details on the outlier detection and removal process, as well as a replication of the regression analysis in Table 12 including outliers),

<sup>9</sup> In order to expand the number of observations, water system and sewer system projects were combined to create a single “water/sewer” category as they have similar outcomes.



there were 298 cases from the ARCnet database and 71 cases in the survey response data with actual job outcomes. Water/sewer projects were the most represented in both databases while industrial site development was the least represented. As mentioned previously, projects in the ARCnet database contain information on **predicted** job creation provided by ARC grant applicants, while projects from the survey responses provided information on **actual** job creation.

### Comparison of Predicted Job Impacts to Actual Job Impacts

Before proceeding with the regression analysis, a comparison of job creation predictions to actual job creation after project implementation was done for the 31 grant recipients that provided job data in both ARCnet and the survey, shown in Table 9. This provides a glimpse into the accuracy of predictions made by recipients before projects were undertaken as compared to the actual results of the projects, in terms of outcomes.

**Table 9: Comparison of Predicted and Actual Job Creation**

Project Type	Predicted Job Creation				Actual Job Creation			
	Min	Max	Average	Median	Min	Max	Average	Median
Access Road	50	500	170.4	115	0	1,000	174.6	45
Industrial Site Development	50	1,200	248.1	100	0	500	120.3	70
Water/Sewer	6	530	101.0	45	0	3,000	324.4	55
N	31				31			

The results for access roads, in Table 9, show that while some grant recipients reported job creation estimates that were less than their predictions when they applied for the grant (as reflected by the decreased minimum, maximum, and median **actual** job creation values), an upward revision by one or more recipients caused the average value to increase slightly. Among industrial site projects, lower minimum and maximum values, a lower average, and a lower median value also reflect a general pattern of downward revision, indicating overestimation of job creation at the time of grant receipt. Unlike the other categories, water/sewer projects in this sample underestimated the likely impacts at the time of grant application. While at least one recipient did revise their job creation value down to zero in the survey, an overall upward revision is indicated by a higher maximum, average, and median **actual** job creation value.

In addition to comparing predicted job impacts to actual job impacts, the average rate of job creation per million dollars in total project spending, including funds from all sources, was also calculated. This analysis was expanded to include all projects with job data for these three project types from Table 8 in order to assess program-level effectiveness, or the impact of total spending, rather than the accuracy of survey respondent predictions, as analyzed in Table 9. While the regression analysis in the next section isolates the effect of total spending while controlling for other variables, this analysis demonstrates how job creation spending rates vary by project type, even when actual job creation values are considered. Access road projects create the most jobs per million dollars in total spending, as shown in Table 10, while water/sewer projects create the fewest. These ratios fall for each project type in terms of actual job creation, reflecting the earlier finding that a sample of recipients may have overestimated their job creation at the time of grant request.

**Table 10: Average Job Creation by Project Type for Predicted and Actual Jobs**

Project Type	Jobs per Total Spending (\$1 Million)	
	Predicted Job Creation	Actual Job Creation
Access Road	280	275
Industrial Site Development	121	66
Water/Sewer	84	48
N	298	71

The share of ARC spending that contributed to total project spending is also important to consider. While it is difficult to ascertain which jobs ARC spending was responsible for creating, especially in the case of projects with multiple sources of funding, ARC’s share of support does vary quite considerably across project types. When considering the 298 projects in the ARCnet database, ARC was, on average, responsible for five percent of access road spending, 27 percent of industrial site development spending, and 18 percent of water/sewer spending. These disparities indicate that access road projects are reliant on diverse funding sources while industrial site development and water/sewer projects are reliant on ARC spending.

**Statistical Analysis**

The second step in the methodology was to use statistical analysis, in the form of linear regressions,<sup>10</sup> to assess the extent to which variation in predicted and actual job creation could be explained by differences in project differences in project spending levels and geographic settings – including local economic distress and local population density – with the latter effectively representing rural/urban differences. The analysis seeks to explain variation in both predicted and actual job creation because the survey responses contain too few too few projects to generate statistically significant results, which are shown in

Table 13. An analysis and interpretation of the larger dataset of predicted values is shown in

Table 12. Though, on average, actual job creation values are lower than predicted values due to the overestimation previously described, the analysis of predicted job values is justified on the grounds that:

1. A larger dataset generates results in which more confidence can be placed;
2. Project-level spending does not change across the ARCnet and survey cases; and
3. Project-level geographic settings – economic distress and density – do not change across the ARCnet and survey cases.

Because the size and settings of projects do not change across the two datasets, the following analysis provides great value in its contribution to the understanding of how changes in project type, spending, and geographic setting affect job creation outcomes. The choice of explanatory variables to include in this analysis, as shown in Table 11, was influenced by economic development theory as well as a practical understanding of project-level job creation dynamics.

**Table 11: Explanatory Variables Tested in Regression Analysis**

Explanatory Variable	Description	Source
----------------------	-------------	--------

<sup>10</sup> Various functional forms were tested before proceeding with a linear model. These included double-log and semilog functional forms, as well as models that did not suppress the constant term.



Total Spending	Total project spending in constant 2011 dollars	ARCnet
Population Density	Persons per square mile	ARCnet
Density x Total Spending	Interaction of population density and total spending	Calculated by EDR Group
Economic Distress	ARC-generated county economic distress index <sup>11</sup>	ARCnet
Distress x Total Spending	Interaction of economic distress and total spending	Calculated by EDR Group

It is hypothesized that spending on a project is directly and positively related to job creation outcomes; through an infusion of outside (or exogenous) funding, project managers are able to hire construction workers, for example. While not directly related to hiring made possible by a new project, population density and economic distress in a project’s surrounding county are also hypothesized to affect rates of job creation and the impact of spending by ARC and other funders.

It is expected that population density will exhibit a positive relationship with project-level job creation. Even when controlling for spending, projects in more urban counties, defined as those with higher population density, have access to a larger, more mobile labor force and the ability to support job creation in other industries. The interaction of density and spending, indicated as population density multiplied by total spending, may have the opposite effect on job creation given the difficulty of construction in more urban settings as compared with rural settings. Delays and extra precautions associated with congestion and interference with public spaces in urban areas may result in less efficient use of funds.

Economic distress in a project’s surrounding county, as defined in Footnote 11, is hypothesized to have a positive relationship with job creation. This is anticipated because counties with higher levels of unemployment, income, and poverty are more likely to have lower wages caused by either an oversupply of or lack of demand for workers, a process referred to as “wage determination.” With lower prevailing wages in a county, projects may hire more workers, even when controlling for spending and other factors. In the case of predicted job creation, this relationship may also materialize out of a bias on the part of grant recipients in more distressed counties to overestimate job creation. The interaction between distress and spending, indicated as economic distress multiplied by total spending, is also expected to have a positive relationship with job creation, as project funds may be allocated more effectively toward job creation given lower prevailing wage rates in distressed counties.

---

<sup>11</sup> The Appalachian Regional Commission (ARC) uses an index-based county economic classification system to identify and monitor the economic status of Appalachian counties. The system involves the creation of a national index of county economic status through a comparison of each county’s averages for three economic indicators—three-year average unemployment rate, per capita market income, and poverty rate—with national averages. The resulting values are summed and averaged to create a composite index value for each county. Each county in the nation is then ranked, based on its composite index value, with higher values indicating higher levels of distress.

The regression equation representing the series of hypothesized relationships is

$$Jobs\ Created_p = \beta_1(Total\ Spending_p) + \beta_2(Density_p) + \beta_3(Density_p \times Total\ Spending_p) + \beta_4(Distress_p) + \beta_5(Distress_p \times Spending_p)$$

where

$$p = Project\ Type$$

This equation specifies how job creation is a function of project type, spending level, population density, and economic distress. Interaction terms are included to reflect how the spending effect differs as density and distress vary. Finally, the regression has no constant term as jobs associated with a project cannot be created in the absence of project spending and associated efforts.

The analysis of variations in predicted job creation shows that total spending, population density, and economic distress all affect job impacts. Full results, presented in terms of linear regression coefficients for factors affecting the predicted number of jobs created by project type, are summarized in **Error! Reference source not found.** Table 12. This analysis shows that predicted job creation, as hypothesized, rises with project expenditures: it is estimated that an additional \$1 million in project spending results in 151 access road jobs, 52 water/sewer jobs, and 129 industrial site development jobs.

**Table 12: Regression Results: Predicted Job Creation (ARCnet Database)**

Explanatory Variable	Coefficient by Project Type		
	Access Road	Industrial Site	Water/Sewer
Total Spending (\$1 Million)	151.4**	129.1***	51.9**
Density (10 persons/square mile)	6.02**	1.43	0.51
Density*Total Spending (\$1 Million)	-.595*	-0.128	0.049**
Distress (10 units)	4.65*	3.36***	5.50***
Distress*Total Spending (\$1 Million)	-2.04	-0.577***	-.0310**
Percent Explained	$R^2 = 0.515$	$R^2 = 0.657$	$R^2 = 0.486$
Model Significance (F-score)	***	***	***
N	76	61	161

Note: Linear regression through the origin: Dependent (predicted) variable is “jobs created.” The constant term was suppressed so that there would be no jobs predicted if no spending occurred.

\*Significant at 90% confidence level; \*\*Significant at 95% confidence level; \*\*\*Significant at 99% confidence level.

Population density also has a positive relationship with access road job creation, affirming the hypothesis and suggesting that 10 additional persons per square mile in a county is associated with approximately six jobs. The interaction between population density and total spending has an effect on access road and water/sewer job creation, but the impact differs by project type. The negative relationship between this interaction term and job creation for access road projects affirms the hypothesis that spending on access road projects is less effective in more urban counties where congestion may hinder construction. For water/sewer projects, however, the results suggest that spending becomes more effective at creating jobs as population density increases.

Economic distress is estimated to have a positive relationship with job creation for all three project types. A 10-unit increase in a county’s ARC distress index (see Footnote 11 for the definition) is associated with close to five access road jobs, six water/sewer jobs, and just over three industrial site development jobs.



While the impact of economic distress on job creation is not nearly as strong as that of total spending, the influence of this variable is still significant and in-line with the earlier hypothesis. The interaction between economic distress and total spending is related only to water/sewer and industrial site development job creation. The influence of this variable occurs in the opposite direction of what was hypothesized; while higher economic distress alone is associated with greater job creation, when controlling for spending, spending actually becomes less effective at creating jobs among projects located in more distressed counties.

Across the regression estimates for project type – access road, water/sewer, and industrial site – the explanatory variables explained between 49 and 66 percent of the variance in predicted job creation. Due to the low number of projects containing job impact data in the survey results as shown in Table 8, however, the regression estimates provide little insight into the variations in actual job creation among access road and water/sewer projects. The data provide no insight into industrial site development job creation, as data were especially sparse for this project type. These results can be seen in Table 13.

**Table 13: Regression Results: Actual Job Creation (Survey Results)**

Explanatory Variable	Coefficient by Project Type		
	Access Road	Industrial Site	Water/Sewer
Total Spending (\$1 Million)	561.5*	N/A	276.2
Density (10 persons/square mile)	1.09	N/A	-16.0
Density x Total Spending (\$1 Million)	0.480	N/A	1.75
Distress (10 units)	1.65	N/A	0.11
Distress x Total Spending (\$1 Million)	-4.02	N/A	-1.19
Percent Explained	$R^2 = 0.933$		$R^2 = 0.264$
Model Significance (F-score)	**	--	**
N	15	9	47

Note: Linear regression through the origin: Dependent (predicted) variable is “jobs created.” The constant term was suppressed so that there would be no jobs predicted if no spending occurred.

\*Significant at 90% confidence level; \*\*Significant at 95% confidence level; na = not available due to insufficient sample size.

### Role of Intermediate Outcomes

The third step in the methodology was to collect information from the survey data regarding the most commonly available measures of intermediate program outcomes that occur apart from job creation. The goal of recording these intermediate measures is to draw an association between project-level expenditures and physical outcomes, acknowledging the fact that not all project types are expected to create jobs. Of the survey responses, only the access road and water/sewer project types had enough cases with both total spending *and* intermediate outcome information to analyze. A total of 16 access road projects provided both spending and intermediate outcome data, while 63 water/sewer projects provided both pieces of information.<sup>12</sup>

Among access road projects, the minimum length of road constructed was 0.05 miles, while the maximum was three miles, with an overall average of 0.62 miles. The length of piping developed by water/sewer projects also varied greatly; the minimum length developed was 185 feet, while the maximum was 195,739 feet, with an average of 34,858 feet. Though industrial site development project

<sup>12</sup> Note that the number of projects with both spending *and* outcome data is different than the total number of projects that provided actual job creation information in Error! Reference source not found..

outcomes were not included in the regression analysis, they did exist; the minimum number of businesses served was one, while the maximum was 24. On average, these projects served nine businesses each.

The regression results suggest that total spending has a positive relationship with intermediate outcomes for both access roads and water/sewer projects. As shown in Table 14, an additional \$1 million in access road spending results in 0.333 miles of road. The same investment is also estimated to result in approximately 11,000 linear feet of pipe infrastructure if spent on water/sewer projects. For this sample of available data, the regression estimates explained between 27 and 53 percent of the variation in intermediate outcomes.

**Table 14: Regression Results: Intermediate Outcomes as a Function of Total Spending (\$1 Million) (Survey Results)**

Project Type	Intermediate Outcome	Coefficient	Percent Explained (R <sup>2</sup> )	Model Significance (F-score)	Cases with Both Spending & Outcome Data (N)
Access Road	Miles of Road	.333**	.526	**	16
Water/Sewer	Linear Feet	10,938**	.272	**	63

Note: Linear regression through the origin: Dependent (predicted) variable is intermediate outcome. The constant term was suppressed so that there would be no intermediate outcome predicted if no expenditure occurred.

\*\*Significant at 95% confidence level.

A similar analysis was performed to explore the relationship between intermediate outcomes and actual job creation. Industrial site development projects were again excluded from this analysis due to the low number of cases, but 15 access road projects provided both intermediate outcome *and* job creation data and 47 water/sewer projects provided both pieces of information.<sup>13</sup> The results in Table 15 below suggest that the intermediate outcomes associated with access road and water/sewer projects are positively and significantly related to actual job creation. The estimates suggest that an additional mile of access road developed is associated with 144 jobs, and an additional 10,000 linear feet of water/sewer piping is associated with 10 jobs. The regression estimates explain between 11 and 32 percent of the variation in job creation.

**Table 15: Regression Results: Actual Jobs Created as a Function of Intermediate Outcome (Survey Results)**

Project Type	Intermediate Outcome	Coefficient	Percent Explained (R <sup>2</sup> )	Model Significance (F-score)	Cases with Both Job Creation & Outcome Data (N)
Access Road	Miles of Road	144.1**	.324	**	15
Water/Sewer	Linear Feet (10,000)	10**	.111		47

Note: Linear regression through the origin: Dependent (predicted) variable is “jobs created.” The constant term was suppressed so that there would be no intermediate outcome predicted if no expenditure occurred.

\*\* Significant at 95% confidence level.

<sup>13</sup> Again, note that the number of projects with both job creation *and* outcome data is different than the total number of projects that provided actual job creation information in Table 9 and differs from the data in Table 14.



## Systematic Underestimation of Job Creation

To explore in greater detail how well the regression equations were able to estimate predicted and actual job creation beyond a measure of percent explained ( $R^2$ ), an analysis of residuals was performed. Residuals represent the difference between job creation values observed in both the full ARCnet and survey datasets and the values estimated by the regression equations. The details of this analysis can be found in Appendix F. The results indicate that while the regression-estimated job creation values are very close to those observed values for the majority of projects, there was a small group for which the regressions consistently under-estimated job creation values either predicted in ARCnet or confirmed as actual in the survey.

This finding suggests that some projects may have non-observed factors causing them to generate significantly greater-than-expected job creation. The most logical explanation for this, which is supported by some case studies, is that certain ARC-funded infrastructure projects were bundled with other non-infrastructure economic development actions to create a comprehensive package. Any such non-infrastructure actions, such as other grants, tax incentives, or loans, would not be captured by the inputs into the ARCnet database or the survey questions, yet they would tend to increase job creation beyond what would otherwise be expected from the project spending alone. This bundling can involve multiple grantors at multiple levels of government, each collecting grantee data separately. In the absence of coordination, outcomes reported by projects receiving significant amounts of support from multiple agencies could thus appear greater than expected. Given this finding, it may be a useful exercise to ask grantees about other sources of funding or related projects in the future.

### 5.3 Performance Measure Conclusions

Overall, the bulk of ARC investment was in water and sewer infrastructure projects. While ARC sponsored many projects in both Kentucky and Mississippi, as well as projects in other ARC states, the largest share of investment was spent in West Virginia. Throughout the region, most of the projects were in transitional counties, but the largest share of funding was spent in distressed counties.

Based on the survey results, water projects generated the most benefits in terms of jobs created or retained, businesses served, and households served. Additionally, projects in Kentucky seemed to have the highest benefit in terms of households and businesses improved.

Based solely on the survey responses, ARC funding of water system, industrial site development, sewer system and access road projects offered the highest return on investment. Of the studied cases, water systems projects have created or retained 6,005 jobs and 36 businesses. Industrial site development created or retained the second-highest number of jobs with 1,045 and three businesses. Sewer systems created or retained fewer jobs, 304, but the second highest number of businesses, 27. Access road projects created or retained 700 jobs and one business.

It is worth noting that predictions or anticipated outcomes of grant recipients were often lower than actual outcomes. For example, survey respondents predicted that they would serve approximately 13,000 households but actually served nearly 27,500 – more than double the anticipated amount for the 37 cases with responses. Job creation was greater than anticipated, with 5,051 jobs compared to 4,181 predicted for the 21 cases with responses. Job retention, however, fell short of predictions only keeping 1,370 jobs rather than the 2,354 jobs predicted among the eight cases with sufficient information. For many projects and outcomes, projects were predicted to be less successful as job and business generators than they actually were.

The funding contributed to attracting new businesses and jobs to the communities as well as improving the efficiency of business operations. ARC funds accounted for 20 percent of total project costs for those projects that completed surveys. According to the grantees, ARC funding had a significant effect on the outcome of the projects. Without this funding, 35 percent of the projects for which responses were gathered would not have happened.



## 6 CASE STUDIES OF BEST PRACTICES FOR INFRASTRUCTURE

The team conducted case studies of 13 projects, one in each state in the region. The case studies were intended to be exemplary in character in order to provide ARC and communities considering similar projects with insights into the ingredients of successful projects. Exemplary projects were identified through review of survey data and discussions with ARC program staff and state program managers. ARC defines exemplary projects as follows:

- Met or exceeded outcome projections
- Unexpected outcomes
- Consistency with ARC objectives and strategies
- Projects that achieved multiple objectives/strategies
- Particularly strong local commitment (e.g., financial contribution; participation of key actors)

The case studies focused on project planning and implementation, challenges encountered and how they were addressed, economic and community impacts, and “lessons learned” for communities undertaking similar projects. Information was obtained through review of ARC documents and interviews with key project participants, beneficiaries, and observers. Three of the case studies were conducted on-site and the remaining ten through telephone interviews. In addition to geographic diversity, the case studies were selected to obtain a mix of project types. The following sections contain the detailed reports from each case study. Basic information on each of the case study projects is presented in the following table.

**Table 16: Case Study Summary**

Grantee	Project Title	Project Description	Project Category & Type	ARC Funding	Total Cost	Primary Outcomes
Allegany County, MD	Barton Business Park Sewage Treatment Plant	Construction of a sewage treatment plant for 150-acre Business Park. Targeted users include advanced manufacturing and defense-related production facilities	Business Development/ Sewer System	\$371,000	\$1.94 million	364 jobs created; \$12 million Leveraged Private Investment (LPI)
Dickenson County, VA	Big Caney Water	Phase 2 of five-phase project to repair water infrastructure and extend water service to homes and businesses in unincorporated parts of county	Community Development/Water System	\$300,000	\$3.1 million	453 residences and 10+ businesses served
Carroll Tomorrow, Carroll County (GA)	Burson Center for Business Development	Development of small business incubator providing affordable space for small, early-stage businesses for periods ranging from	Business Development/ Business Incubation	\$216,882	\$1.9 million	362 jobs created; \$42 million LPI

Grantee	Project Title	Project Description	Project Category & Type	ARC Funding	Total Cost	Primary Outcomes
		one to five years.				
Village of Canaseraga, NY	Canaseraga Wastewater Collection and Treatment System	Construction of new wastewater treatment system to replace failing residential septic systems	Community Development/ Sewer System	\$150,000	\$4.59 million	215 residences and businesses served; 155 jobs retained
Borough of Canton, PA	Canton Water System Improvements	Replacement of 75-year old water mains and the construction of water storage tank	Community Development/ Water System	\$285,000	\$3.7 million	750 households and 70 businesses served; 200 jobs retained
City of Clinton, TN	Clinton I-75 Industrial Park Sewer Line	Improvements to wastewater collection and transmission system to support construction of auto parts production plant	Business Development/ Sewer System	\$450,000	\$1.26 million	560 jobs created; \$65+ million LPI
Town of Dobson, NC	Dobson I-77 Infrastructure	Extension of municipal water and wastewater service to a site of planned commercial development at interstate highway exit	Business Development/ Water and Sewer Systems	\$200,000	\$2.2 million	77 jobs created; \$18.25 million LPI
City of Muscle Shoals, AL	Muscle Shoals Industrial Infrastructure	Utilities and road improvements in a new industrial park to support construction of auto parts production facility	Business Development/ Industrial Site Development	\$500,000	\$2.73 million	800 jobs created; \$60 million LPI
City of Owingsville, KY	Owingsville/Bath County Industrial Park Wastewater Treatment Plant	Installation of wastewater treatment plant to meet the expansion needs of food processing plant	Business Development/ Sewer System	\$500,000	\$3.04 million	222 jobs created and retained; \$26.2 million LPI
SC Budget & Control Board/Powdersville Water District	Powdersville Water District Water Storage Tank	Construction of water storage tank	Community Development/ Water System	\$500,000	\$1.69 million	410 jobs created
Village of Racine, OH	Racine Water Treatment Plant and Storage	Replacement of deteriorating water facilities with new water treatment	Community Development/ Water System	\$457,000	\$1.96 million	315 households served; 55 jobs created



Grantee	Project Title	Project Description	Project Category & Type	ARC Funding	Total Cost	Primary Outcomes
	Facility	plant and ground water storage tank				and retained
Canaan Valley Institute, WV	Wastewater Solutions for Small Communities	Support for development of decentralized wastewater treatment facilities in small, unincorporated communities in southern WV's coal region through technical assistance to nonprofit organizations	Community Development/ Sewer System	\$96,811	\$176,865	77 residences and 1 business served; additional 900 residences projected
City of Water Valley, MS	Water Valley Sewer & Water Improvements	Repair of deteriorated sewer lines in residential area and part of downtown, and extension of water and sewer service to another residential area	Community Development/ Sewer and Water Systems	\$152,547	\$602,547	354 residences and 15 businesses served; 100 jobs retained

## 6.1 Barton Business Park Sewage Treatment Plant – Cumberland, MD

The project involved the construction of a sewage treatment plant for the Barton Business Park in Cumberland, Maryland. This investment turned the industrial park into a highly attractive location for new industry. Targeted users include advanced manufacturing and defense-related production facilities. The Appalachian Regional Commission provided \$371,000 in project funding, approximately 25 percent of total costs. The project was completed in 2006.

### 6.1.1 Community Profile

Allegany County, located in northwest Maryland, is part of the Cumberland, MD-WV Metropolitan Statistical Area, with a 2010 population of 75,087. The Barton Business Park is located on US 220 near Cresaptown and seven miles south of Interstate 68. The county has experienced minimal population growth in recent years, with an increase of only 0.2 percent between 2000 and 2010, compared to nine percent statewide and 9.7 percent nationally.

Employment in the county has suffered over recent years. Between 2001 and 2011, employment decreased by 2.2 percent in contrast to statewide employment and national employment growth of two and one percent, respectively. The local unemployment rate has generally exceeded the state rate and matched or exceeded national rates during the past decade. In 2011, the county unemployment rate of 8.5 percent was 1.5 percentage points above the state rate and .04 percentage points below the national level.

The county's industry mix includes a large base in education and healthcare with 8,182 jobs. Other significant industries include art and entertainment, manufacturing, and retail trade, employing 3,711, 3,147, and 2,728, respectively. As compared to the five-year average for 2006-2010, 2011 industry employment in Allegany County shows substantial decreases in retail trade (982 jobs) and construction

(552 jobs). Art and entertainment is the only industry that has seen significant job growth over this period with 761 jobs gained. Education and healthcare saw a minor increase over this period, an increase of 89 jobs.

Allegheny County is suffering economically compared to the state and the nation. Median household income during the 2006-2010 period averaged 53 percent of the state level and 73 percent of the national level. The poverty rate was 5.9 percentage points above the state level and 0.7 percentage points above the national level. The county was classified as “transitional” in both 2004, when the ARC grant was awarded, and 2012. A transitional county is defined as economically positioned between the 25 percent most distressed and 25 percent most robust U.S. counties.

Allegheny County's age distribution shows a smaller adolescent (0-19) population than the state and national levels and a much higher elderly (65+) demographic. This indicates that in coming decades Allegheny County will have a smaller workforce and a larger elderly population leading to a potentially smaller tax base.

### 6.1.2 Project Description

The project involved the construction of a 50,000-gallon-per-day package sewage treatment plant that created tremendous potential for industrial development at the 150-acre business park. Funding was allocated in 2004, and the project was completed in 2006. The initial project cost estimate was \$1,635,000, which was then lowered to \$1,480,000 of which \$237,000 was to be funded by an ARC grant, \$1,000,000 from the state of Maryland, and \$243,000 from local sources. The original bid for construction was \$1,727,000 but final project cost was \$1,954,054. The applicant later requested, and was granted, an additional ARC grant of \$134,000 that was used to contribute to the additional project costs. The final breakdown of funding was \$371,000 from ARC grants, \$1,093,595 from the state of Maryland, and \$489,459 from local sources.

### 6.1.3 Project Planning and Implementation

Allegheny County has suffered from high unemployment in recent decades stemming from the closure of major industries such as PPG, Celanese, and Kelly-Springfield. The 150-acre Barton Business Park land lacked the necessary water, sewer, and electrical infrastructure to support new industries. This project gave Allegheny County marketable land to attract new or expanding industries in an area where job creation was desperately needed. It was anticipated that industry relocation to the Barton Business Park could create between 800 and 1,000 jobs, potentially addressing up to 1.3 percent of local unemployment.

The Allegheny County Commissioners awarded the design of the Barton Business Park wastewater treatment plant to Rummel, Klepper and Kahl on July 26, 2001, in the amount of \$75,764. Since the development of the business park would likely be by sections, the plant had to be designed to accommodate flows as low as 15,000 gallons per day with an ultimate capacity of 200,000 gallons per day. At the time of the project, Allegheny County funds were, and continue to be, extremely tight due to a declining tax base.

Before the project could proceed to construction, Allegheny County had to retain an archaeological data recovery firm to mitigate two archaeological sites in the path of the proposed sewer outfall. The contract was awarded to R. Christopher Goodwin on March 25, 2004 in the amount of \$153,168. The sewage plant contract was awarded to Lashley Construction Company, Inc. on April 14, 2005, and the Notice to Proceed was given May 31, 2005. The completion time for the project was 300 consecutive business days. During the construction process, there were nine change orders. Change Order 1, issued on July 13, 2005, involved changing doors, changing the foundation on the control building, adding both water and sewer



lines, and widening the road. Change Order 2, issued on October 7, 2005, called for the installation of a concrete floor in the process building and constructing additional fencing along the access road per the Maryland Historical Trust. Change Order 5 was to install a gate at the entrance. Change Order 6 was to cut a new opening for air conditioning in the control building. Change Order 7 was to install a new exhaust fan. Change Order 8 was to set UV units in parallel rather than in series per plans. And, finally, Change Order 9 was for an additional 5" PVC to relocate a transformer. The water line, sewer main, road widening, concrete floor, and fencing led to an approved 42-day extension to the contract time. The project was completed in June 2006.

According to the grant recipient, the initial bid was for \$1,727,000 and was \$227,054, or thirteen percent, over budget for a total cost of \$1,954,054. The nine change orders led to a 42-day approved extension in the project time. There were no significant differences between the initial plans and the completed project.

#### 6.1.4 Economic and Community Impacts

As a direct result of the project, Allegany County was able to market eight lots for new and expanding development. The lots range in size from 3.3 acres to 43 acres. Since completion in 2006, American Woodmark Corp. invested \$12 million in a 250,000-square-foot manufacturing plant on the site. This plant currently employs 364 full-time employees earning at least \$10 per hour. The project has also attracted other businesses to the area. Chessie Credit Union bought land adjacent to the business park in 2008 where it plans to build a branch location. Allegany County has included the building of a 50,000-square-foot shell building in the business park in its Capital Improvement Plan to satisfy a demand that has been expressed specifically in regards to the business park.

To date, the economic impacts have not met the expected job creation figures of 800 to 1,000, though the potential exists if more businesses decide to locate at the business park. American Woodmark expects to eventually increase its workforce to 500 employees. While the project boasts job creation, it remains unclear whether the community views the outcomes as successful.

#### 6.1.5 Lessons Learned

While it has attracted some business, the Barton Business Park project was not a resounding success. A few lessons can be learned from the project's struggles.

- **Forecast Potential Project Obstacles or Risks.** The project planners did not anticipate that the proposed sewer outfall would lie on archaeological sites. It should be noted that careful investigation of potential obstacles/risks can avoid project delays and allow for projected costs that involve all mitigating factors; in this case, archeological data recovery. As a general note to future planners, projects on or near the Potomac River will likely encounter an archeological site.
- **Be Realistic About Job Creation Timeframe.** The project anticipated the creation of 800 to 1,000 jobs. Six years after the project's completion, only one company has located at the business park and job creation sits at 364. Project planners must differentiate between the potential for site development and real interest in site development. A sound marketing strategy at the time of project completion may have helped drive industrial interest.

#### 6.1.6 Conclusion

The Barton Business Park sewage treatment plant has failed to attract the level of industrial development anticipated at the time of project conception. The project exceeded budget and time expectations as well

as encountered an unanticipated problem with archaeological sites that cost the cash-strapped Allegany County an additional \$153,168. The project outcomes demonstrate the importance of sound project planning and implementation strategies.

## 6.2 Big Caney Water Project Phase II – Dickenson County, VA

Phase 2 of the Big Caney Water Project was one phase of what has become a five-phase project to repair water infrastructure and extend water service to most of the homes, businesses, and public facilities in Dickenson County, Virginia. ARC provided a grant of \$300,000 for the project, about 10 percent of the total project cost of \$3.124 million. The design phase of the project began in late 2005 and construction was completed in late 2007.

### 6.2.1 Community Profile

Dickenson County, located in rural southwestern Virginia, had a population of 16,395 in 2010. Its largest town, Clintwood, had a population of 1,414. Traditionally heavily dependent on the coal industry, the county has seen its population decline dramatically in the past 60 years along with the drop in coal mining employment. Between its peak in 1950 and 2010, the county lost one-third of its total population. During the past decade, population has stabilized somewhat, declining by only three percent, although this continued downward trend compares unfavorably to statewide and national growth of 13 percent and 9.7 percent, respectively.

The county has experienced fairly strong employment growth during the past decade, driven in large part by the increase in coal mining employment. Total wage and salary employment increased by 15.4 percent between 2001 and 2011, to 3,710. This compared to an increase of only 4.1 percent statewide and a decline of 0.2 percent nationally. In numerical terms, total employment growth was about 500, with over 400 of that in the coal industry. The county's unemployment rate also declined relative to state and national averages. In 2011, it stood at 8.1 percent, 1.9 percentage points above the state level, but 0.8 percent below the national level. However, the county's labor force participation rate, the number of workers employed or actively searching for employment, was very low – only 40.3 percent, compared to 67.4 percent statewide and 65 percent nationally. This is not the result of an aging population since the percentage of working age residents is only slightly below state and national averages.

The county economy remains heavily dependent on mineral extraction, primarily coal mining. Mining, quarrying, and oil and gas extraction comprised 27 percent of total wage and salary employment in 2011. Other important industries are healthcare and social assistance, with 13 percent of total employment, and retail trade, with 11.2 percent. Employment in mineral extraction increased by 80.9 percent between 2001 and 2011, while employment in healthcare and social assistance declined by 1.2 percent. In retail trade, the decrease was 6.5 percent.

The economic well-being of county residents is far below state and national averages. Median household income averaged \$29,080 during the 2006-2010 period, only 47.4 percent of the state average and 56 percent of the national average. The poverty rate of 19.1 percent was 8.8 percentage points above the state average and 5.3 percentage points above the national average.

The county was categorized by ARC as “at-risk” in 2012, an improvement over the “distressed” categorization in 2004, when the ARC grant was approved, reflecting its somewhat brightening economic picture. At-risk counties rank between the worst 10 percent and 25 percent of the nation's counties, while distressed counties rank among the worst 10 percent of counties.



Recognizing the risks and limitations of dependence on the energy industry, county government officials and local and regional economic development professionals have been working to diversify the county economy. They have experienced some success in developing recreational and cultural tourism and have attracted a few significant employers, including a large call center for the federal government retirement system. However, the county has faced a number of serious barriers to diversification, most notably a limited number of large developable sites, and limited transportation, telecommunications, and water and sewer infrastructure. The Big Caney water project was conceived as a comprehensive effort to address the deficiencies in the county's water infrastructure.

### *6.2.2 Project Description*

The project was the second phase of a comprehensive multi-year, multi-million-dollar initiative to renovate parts of the county's existing water system, which had seriously deteriorated since their construction in the 1960s, and extend water service to previously un-served areas of the county. Phase 2 funds were used to replace 14 miles of old service lines and construct a 200,000-gallon water storage tank. The total project cost was \$3,123,514. In addition to the \$300,000 ARC grant, other funding included a state Small Cities Community Development Block Grant (CDBG) grant of \$500,000, funding from the Virginia Department of Health, split into a grant of \$1,010,955 and a zero-interest long-term loan of \$520,790, and a local contribution of \$170,177.

### *6.2.3 Project Planning and Implementation*

Beginning in the mid-1960s, Big Caney Water Corporation, a private, nonprofit corporation formed by local citizens, constructed a water system that supplied running water to portions of Dickenson County. Big Caney was the only water source for the county's unincorporated areas until the mid-1980s, when the Dickenson County Public Service Authority (PSA) was established. The PSA is an autonomous public authority with a board of directors appointed by the county board of commissioners. It was initially tasked with extending water service to areas of the county not served by Big Caney or municipal water systems.

By the late 1990s, the Big Caney system had seriously deteriorated. As a private corporation, it did not have access to most public funding sources and was not able to pay for adequate system maintenance and equipment replacement through its own revenues. Its water lines were in poor repair, losing more than 2.4 million gallons of water each month, almost half of total water production. Its water tanks and pump stations were also in very poor condition, and it was drawing its water supply from a source that did not meet state health standards. Meanwhile, the PSA was expanding and, with access to government funding, was on a sounder operational and financial footing. In 2002, after lengthy discussions, the two systems agreed to merge under the management of the PSA.

With the merger complete, the PSA and its consulting engineer developed a plan to integrate the two systems and rebuild the Big Caney system. The latter would involve replacing all the tanks, pump stations, and transmission lines. Planning was conducted in close consultation with the county supervisors to ensure county support. Rather than attempting to raise all the funds for the project at one time, the PSA broke it into four phases, which would enable it to size each phase to fit within the grant limits of ARC, the state's Small Cities CDBG program, and other key funders. The phasing also enabled it to prioritize the work based on the extent of deterioration of different parts of the system.

The PSA was assisted with grant writing and grant administration by the Cumberland Plateau Local Development District. ARC did not participate in Phase 1 of the project; the United States Department of

Agriculture Rural Development funded this phase. ARC, in addition to participating in Phase 2, also provided part of the funding for Phases 3 and 4.

Ron Phillips, the PSA's executive director, reported that funders were initially reluctant to support the project because they were more accustomed to funding projects that served areas with no prior access to running water in order to promote new economic growth. However, through discussions with funders, the PSA was able to persuade them of the important role improving water quality and service reliability could play in enhancing the quality of life and economic prospects for the county. Moreover, because the project was relatively expensive on account of the area's mountainous terrain, funding it internally without grants and low-cost loans from other sources would result in prohibitively expensive water rates for the county's primarily low- and moderate-income population. Once persuaded, funders were willing to provide the support needed to bring the system up to acceptable standards.

Phase 2 began in late 2005 and was completed roughly according to schedule in late 2007. As with the other phases, the construction was overseen by a consulting engineer with assistance from the PSA staff. The final cost was \$3,123,515, about \$278,000 above the original estimate. The additional cost involved the installation of new meters and service lines to properties. The PSA was originally expected to cover this cost, but did not have sufficient funds to do so. The additional cost was met by a funding increase of about \$108,000 from the Virginia Department of Health and an increase in the county contribution of about \$170,000.

Phases 3 and 4, which were eventually combined, were completed in 2010. The PSA later added a Phase 5, which was in progress as of the end of 2012. With the completion of Phase 5, virtually the entire county will have access to water service. A Phase 6 is planned to replace undersized spur lines to improve pressure to isolated areas. The PSA has also installed several generators to maintain uninterrupted service during power failures.

#### *6.2.4 Economic and Community Impacts*

Phase 2 of the Big Caney water project improved the quality and reliability of water service to 453 households, 84 more than the 369 projected in the ARC grant application. Replacement of water lines, many of them seriously undersized, resulted in increased water pressure and reduced water loss. This was particularly important for residences at the far end of the system, which sometimes lost water for a day or more during periods of particularly low pressure.

In addition to improved and expanded residential service, the project also improved service or facilitated the construction of businesses and public facilities not anticipated at the time of the ARC application. These included:

- Improved water service to about 10 small convenience stores and other community-serving businesses in the areas served by the project;
- Service to two new educational facilities – a combined middle school, high school, and career-technical center campus, and an elementary school – which were needed as a result of school consolidation and could not have been constructed at the selected locations without the improvements;
- Improved service to the Breaks Interstate Park, which supported the construction of a water park and 10 tourist cabins; and
- New service to a structural metals fabricator with 25 employees.

The project is also estimated to save the county approximately \$35,000 annually through reduced water loss, according to an engineering report.

Moreover, the project should be viewed as part of the larger initiative to rebuild the entire Big Caney system as well as to extend service to virtually the entire county. Through the Big Caney and other PSA projects, the percentage of households receiving water service increased from only 34 percent in 1992 to 93 percent in 2012.

This initiative has had important community and economic impacts beyond improving water service to residents and businesses. Perhaps most important, it has improved the value of residential properties and strengthened the residential real estate market. It has enhanced the value of residences that previously had poor or no service, and has opened up areas served by both the existing system and system expansions to new residential development. The result has been increased investment in existing housing as well as increased construction of new housing. County officials and economic development professionals believe that improved housing quality and availability is helping to stem the population outflow, convincing more young adults to remain in the area and attracting new residents such as retirees who earlier left the area to find work. In fact, while it cannot be conclusively attributed to these improvements, the county's population decline has been slowing – from 11 percent in the 1980s, to seven percent in the 1990s, to only three percent in the most recent decade.

The initiative has also provided a foundation for economic diversification. It has already supported tourism development through improved water service to Breaks Interstate Park and will enable the development of more lodging facilities and second homes. It is hoped that it will also help to attract a diverse range of businesses to the county. When searching for a business location, employers give careful consideration to quality of life for their employees, and the availability of good-quality housing is an important factor in that calculation. In addition, while the county's current and planned industrial parks are served by municipal water systems, areas served by the PSA are now better positioned to attract smaller business facilities.

Finally, the initiative has had positive fiscal implications for the PSA and the county. Drastically reducing water loss has resulted in significant cost savings for the PSA, kept water rates reasonable, and reduced the possibility that the PSA will ever require a county subsidy. In addition, new home construction and increases in property values have generated new tax revenues for the county.

### 6.2.5 Lessons Learned

While PSA staff, county officials, and local economic development professionals all recognized the importance of improving the county's water system at the outset, they expressed surprise at how much impact the initiative has already had. Notes Ron Phillips, "We always had a vision, and we felt it was going to work, but we didn't foresee how well it would work. The rewards we are seeing in sustainability and improved quality of life are considerable." Phillips and others also point to the critical importance of ARC and other funders. Without these resources, they say, the improvements would have taken far longer to achieve.

Participants in the project point to a number of lessons learned:

- ***Develop a collaborative culture.*** The PSA's collaborative approach extends back to its merger with the Big Caney Water Corporation, which was carefully negotiated to achieve a positive outcome for both parties. During the Big Caney project, the PSA worked closely with the county, municipalities, local development district, and state health officials to bring all ideas and perspectives to the table and distill them into a plan on which all stakeholders could agree. This collaborative approach continued through all phases of the project.

- ***Know where you are going and take your funders with you.*** The plan to rebuild the Big Caney system and extend water service throughout the county was ambitious and costly, particularly for economically depressed Dickenson County. The PSA and its partners developed a long-term vision for the project, and were able to convey to funders its importance to the county's future. At the same time, they recognized that the project could not be taken on all at once and would have to be broken into phases. This enabled funders to understand the project's overall funding needs and at the same time see that it could be sequenced to meet their funding restrictions.
- ***Be driven but realistic.*** Ron Phillips acknowledges that the technical and financial challenges presented by the project sometimes appeared insurmountable, but the strong commitment of the PSA and its partners would eventually yield solutions. He advises, "Never go into a project and throw up your arms and say it can't be done. There are always bumps, but stay focused, develop good relationships, and keep strong people around you." At the same time, he notes the importance of adjusting plans to align with funding limitations, stating, "you look at your funding sources, you look at your priority list, and you have to cater the project to the funding."
- ***Keep key constituencies informed.*** When a project involves substantial public expenditures, water line construction along roadways, and potential service disruptions, local leaders and the public expect to be kept informed. The PSA made sure to keep communication lines open and, as a result, encountered few complaints.
- ***Recognize and value your human resources.*** The PSA understood the importance of engaging skilled, highly qualified people in the project, and maintaining their involvement through respectful relationships. When it found that the Big Caney Water Corporation's as-built drawings were deficient, it was able to rely heavily on the staff it had retained from the Big Caney Corporation who had worked on the system and had extensive knowledge of it. While it competitively bid its contracts, it made sure that local contractors were fairly paid so that, in Phillips' words, "we don't nickel and dime them out of business." It also developed a strong, long-term relationship with its consulting engineer, who later became the county engineer.

### 6.2.6 Conclusion

Phase 2 of the Big Caney water project exceeded expected outcomes in terms of households served and contributed to the larger initiative to improve and extend water service to most of Dickenson County. The project significantly improved quality of life for county residents and strengthened the economic environment in a number of important ways, including promoting residential development, increasing quality housing choices for existing and new residents, and supporting tourism growth. The project shows that even ambitious, technically complex, and costly projects can succeed if they are undertaken with sound planning, tenacity, collaboration among key stakeholders, and the cultivation of human talent. These lessons will serve the community well as it tackles other infrastructure challenges, including improving wastewater treatment, telecommunications, and transportation.

### 6.3 Burson Center for Business Development – Carrollton, GA

The Burson Center for Business Development is a small business incubator located in the City of Carrollton in west central Georgia. The facility provides affordable space for small, early-stage businesses for periods ranging from one to five years. It also serves as a central location for a range of business support services for tenants and other businesses in Carroll County and the surrounding region. It was developed and is operated by Carroll Tomorrow, a public-private county-wide economic development



partnership. ARC provided a grant of \$216,882 to support project development costs, approximately 20 percent of total costs, excluding the value of the property itself, which was donated. The center opened in 2006.

### 6.3.1 Community Profile

Carroll County, located in west central Georgia, is an edge county of the Atlanta Metropolitan Statistical Area with a 2010 population of 110,527. Carrollton, its largest municipality, is 50 miles west of downtown Atlanta. The county has experienced rapid population growth in recent years, with an increase of 27 percent between 2000 and 2010 compared to 18 percent statewide and 10 percent nationally.

Employment in the county has increased at a relatively rapid pace. Between 2002 and 2011, employment increased by almost 15 percent in contrast to flat statewide employment and national employment growth of only one percent. While employment growth has been robust, the unemployment rate has generally exceeded state and national rates during the past decade, and the difference has increased somewhat during the recent recession. In 2011, the county unemployment rate of 10.7 percent was 0.9 percentage points above the state rate and 1.8 percentage points above the national level.

The county's industrial mix is strongly oriented to manufacturing. About one-quarter of all private wage and salary employment is in manufacturing. The manufacturing sector has remained relatively robust during the past decade, experiencing net employment growth between 2002 and 2011 (although it shed jobs from a peak in 2006 through 2010) in contrast to steep losses at both the state and national levels. The continuing strength of manufacturing can be largely attributed to a shift from declining industries such as textiles and apparel to growth industries such as fabricated metals, electronics, and automotive equipment. The second and third largest private sector employers are health care and retail, both about 16 percent of total private employment.

The county is somewhat less well off than both the state and the nation. Median household income during the 2006-2010 period averaged 92 percent of the state level, and 88 percent of the national level. The poverty rate was 1.4 percentage points above the state level and 3.5 percentage points above the national level. The county was classified as "transitional" in 2004 when the ARC grant was awarded and again in 2012. A transitional county is defined as economically positioned between the 25 percent most distressed and 25 percent most robust U.S. counties.

### 6.3.2 Project Description

The Burson Center is a 24,500 square foot small business incubator located in the Carrollton Industrial Park. The facility has 23 leasable furnished offices, 5,000 square feet of warehouse space with loading docks, a 2,000 square foot conference room, a library, a break area, and administrative offices. The center, which opened in mid-2006, is owned and operated by Carroll Tomorrow, a public-private partnership chartered to address the community and economic development needs of Carroll County. Carroll Tomorrow covers the cost of staffing, which includes the executive director and an administrative assistant, and covers any operating shortfalls, which typically run between \$30,000 and \$35,000 annually.

Tenants may lease space for a period of up to five years, but typically graduate in the third year if not earlier. Tenants are expected to achieve one of the following goals by the end of the third year: 1) annual gross sales of one million dollars or more; 2) growth to more than 10 employees; 3) acquisition by a larger firm; or 4) consistent profitability or income exceeding expenditures by 75 percent. Lease rates are structured to encourage tenants to reach one or more of these goals as quickly as possible, starting at

significantly below the local market rate and then increasing in year three and again in year four to approximately market rate.

The incubator provides several services included in the lease rate. These include copiers and printers, media equipment, a networked telephone system, high-speed internet, reception and clerical support, 24-7 secure building access, mail/shipping service, and a research library. Tenants also have access to a number of business assistance services, including: business plan development; seminars and trainings; counseling and coaching; industry and market research; legal and accounting assistance; graduate assistants and interns; mentors and peer-to-peer advice; conventional and alternative financing; and international trade assistance. In addition to its own staff, the center draws on the expertise of an attorney and accountant, who are given free space in exchange for assisting other tenants, Georgia Tech's Procurement Technical Assistance Center and Manufacturing Extension Partnership, both of which have on-site offices, and the University of West Georgia's Small Business Development Center, Center for New Business Ventures, and Richards College of Business faculty and students.

The center is housed in a renovated industrial facility donated by its namesake, Dr. John Burson, a local physician and community leader. The construction cost of approximately \$1.3 million was funded by a combination of federal, state, and local grant dollars, including ARC (\$215,882), the U.S. Economic Development Administration (\$648,000), the State of Georgia (\$216,118), the Development Authority of Carroll County (\$100,000) and the City of Carrollton (\$130,000). The donated property was valued at approximately \$600,000. The Community Foundation of Carroll County also provided Carroll Tomorrow with a five-year \$25,000 annual grant which can be used to support operating costs.

### *6.3.3 Project Planning and Implementation*

The idea for a business incubator emerged several years before construction even began. In the late 1990s, business and community leaders saw fundamental changes occurring in the local economy, and were concerned that outside forces rather than the community's own vision were shaping its future. The county's traditional manufacturing economy, particularly its textile and apparel industry, was suffering from plant closures and job losses brought on by increasing international competition. Meanwhile, Carroll County was increasingly moving into the orbit of the Atlanta metropolitan region, raising the fears that the county would become a bedroom community, with a loss of its unique identity.

In 1999, the community, led by the CEOs of two of the county's largest employers, embarked on an economic development planning process, assisted by a well-known Atlanta-based economic development consultant. The planning process, undertaken with widespread community involvement, led to the development of a five-point economic development strategy. Two major elements were the creation of Carroll Tomorrow to lead the county's economic development efforts, and an increased emphasis on promoting local entrepreneurship. The entrepreneurship component was viewed as building on the county's considerable local entrepreneurial history. At about the same time, a group of entrepreneurs, some of whom were also involved in the strategic planning process, began to pursue the establishment of a small business incubator. They hired a consultant to perform a feasibility study that laid out a path for establishing a nonprofit incubator. The two groups then joined forces, and in 2001 assigned Carroll Tomorrow the task of planning and developing the incubator.

The planning process, led by Carroll Tomorrow's new executive director, was extensive and thorough. Conducted over a two-year period, it included market analysis, plans for facility design and renovation, financial projections, and discussions with business assistance organizations. Interviews with and trips to other incubators were part of the process. Finally, national trends and "best practices" were studied using such resources as the National Business Incubation Association. The design evolved through several iterations as concepts were proposed, discarded, researched, and refined.

The next phase of the process, which took another two years, involved securing a property and obtaining funding. The Burson property was identified as a strong candidate in light of its size, layout and location, and negotiations were successfully concluded with Dr. Burson for donation of the property. With a local match in hand, proposals for grant funding were submitted to Economic Development Administration (EDA), ARC and the One Georgia Equity Fund. While the grant process was complicated and time-consuming, sufficient funding from these sources was secured to begin construction. Once construction began, additional costs were covered by the Carroll County Development Authority and the City of Carrollton. The cooperation and joint commitment by the county and city to support the project was unusual and reflected the broad stakeholder engagement achieved in the project planning and development process.

The renovation was designed according to guidelines published by the National Business Incubation Association. Particular attention was paid to the interaction between tenants, leading to the design of common space surrounded by tenant offices to serve as informal meeting space and encourage discussion among tenants. Flexibility was incorporated into the design. Most of the tenant offices use demountable, movable walls combined with removable flooring and subflooring to allow rapid access to wiring and cabling. This was intended to provide flexibility to accommodate the varied needs and continually changing tenant mix characteristic of an incubator facility. In addition, it was intended to provide an architectural and aesthetic look to the facility intended to attract high-quality tenants at market or near-market rates.

Construction began in mid-2005 and was completed by mid-2006.

#### *6.3.4 Economic and Community Impacts*

During the six years from its opening in mid-2006 through mid-2012, the Burson Center has hosted more than 79 businesses, of which eleven have met formal graduation requirements and 49 others are considered positive outcomes (firms that have left before reaching one of the defined graduation benchmarks, but remain successfully in business). The 11 formal graduates have created 192 jobs and attracted \$11.1 million in equity investment. All 60 formal graduates and positive exits have created 362 jobs and attracted \$42 million in investment. Since initial lease-up, the center has maintained an average occupancy rate of 87 percent.

Tenants cite a number of reasons for the center's contribution to their success. These include the quality of the facilities and the positive image this creates among clients, networking opportunities with other tenants, increased credibility with potential financing sources, the support from the staff in terms of direct assistance, arranging assistance from other sources, and facilitating connections with potential clients, and the presence of valuable resources within the center such as the free accounting and legal services.

Beyond these tenant outcomes, the center has become a business resource center for both startup and established businesses throughout Carroll County and beyond, significantly magnifying its impact. Since its inception, it has hosted more than 16,000 visitors for over 1,300 seminars, expos and programs. These include seminars presented by the Small Business Development Center, government procurement fairs, a "Business Success Luncheon" series organized by the center director, and presentations by state economic development organizations. The center's conference room is also used for meetings by a variety of local and regional economic development, business, and civic organizations.

Less tangible, but perhaps no less important, has been the center's impact on the perception and reality of the community as a supportive entrepreneurial environment. Business and community leaders note that the center, with its wide range of business resources, has become the "go-to" place for budding

entrepreneurs and has played a significant role in encouraging the growth of entrepreneurship within the region. In addition, it has become a model of success that has drawn visitors from many other communities and organizations, and created the image of a community that values and nurtures entrepreneurship. This, in turn, has increased confidence within the community in its ability to shape its economic future. More broadly, the center is held up as an example of successful collaboration among a variety of stakeholders that has paved the way for increased cooperation on other local projects.

### 6.3.5 Lessons Learned

The Burson Center is widely viewed within the community as a strong success. Several lessons can be drawn from the favorable results of this project.

- **Consider the project in the context of larger economic development objectives.** The development of the Burson Center was not pursued in isolation, but rather as part of a broader community strategy that placed a strong emphasis on entrepreneurship development. The foundation of a comprehensive strategic plan with strong community support increased the likelihood that the project would gain support of key stakeholders and complement other efforts to promote local entrepreneurship.
- **Plan carefully.** The project participants engaged in a thorough planning process before proceeding with the project. This included engaging professional assistance to conduct a feasibility study, exploring models and best practices, and thoroughly considering such issues as size, design, financial structure, tenant services and resources, and operations. While observing other successful incubators, they took pains to customize the project to meet local needs and conditions.
- **Structure the project to be financially sustainable.** The project leaders calculated that the project would be unable to take on any debt because, as designed, it would not generate sufficient revenue to service debt, and Carroll Tomorrow, the operator of the incubator, could not develop a sufficient revenue base from dues and contributions to do so. As a result, they focused on securing a donated building and grant funding from multiple sources to cover for all renovation costs. They also ensured that Carroll Tomorrow's revenue base would be sufficient to cover projected gaps in operating revenues.
- **Foster a spirit of cooperation.** The project was unlike any other undertaken in the community. The project leadership recognized early on that a wide variety of stakeholders would need to be engaged and relied upon for material support if the project were to succeed. Great pains were taken to reach out to city and county government, business and civic leadership, and higher education institutions to involve them in the process and gain their support.
- **Establish metrics to measure results.** Carroll Tomorrow developed very clear metrics to assess the track record of the incubator in helping incubator businesses to succeed. This enables incubator management to determine whether the incubator is achieving its objectives, to make changes if necessary, and to report to the community how its "investment" is performing.
- **Maintain a long-term focus.** Carroll Tomorrow and other business and community leaders recognize that developing and growing a local entrepreneurial base is a long-term process. They had the patience to take the time required to ensure that the incubator was well-designed and professionally managed and, while they are rigorous in measuring the progress of incubator tenants, recognize that the larger economic changes they are seeking to promote will take more than a few years to materialize. As one community leader commented, "this is a marathon, not a sprint."



### 6.3.6 Conclusion

In summary, the Burson Center has made a strong contribution to Carroll County's efforts to promote entrepreneurship, economic diversification and job growth. A strong consensus has developed among community leaders that the project has met and even exceeded expectations. The project outcomes demonstrate the importance of establishing a strategic focus for economic development, careful planning, stakeholder engagement and collaboration, and developing and applying clear metrics to measure project results.

## 6.4 Canaseraga Wastewater Collection and Treatment System – Canaseraga, NY

Canaseraga, New York, is a small village of 550 residents in Allegany County, part of the state's Southern Tier. Between 2004 and 2008, the village constructed a new wastewater treatment system to replace residential septic systems, many of which were failing and discharging contaminated water into a local river. The Appalachian Regional Commission provided a \$150,000 grant in support of the project, 3.3 percent of the total project cost of \$4.59 million.

### 6.4.1 Community Profile

Canaseraga, like many small upstate New York communities, was sustained by traditional manufacturing until the 1970s. At that point, it was a bedroom community of nearly a thousand, with most of its residents commuting to bustling manufacturing centers like Hornell, Dansville, and Genesee. Its small downtown was thriving, with many retail and eating and drinking establishments.

Today, as these jobs have disappeared, Canaseraga's downtown consists of only a grocery store, barber shop, and a barroom. "The population is leaving," Mayor Robert Ames notes. "People are going places for jobs." Between 2000 and 2010, the village continued a trend of declining population, with a loss of 7.4 percent, compared to a 2.1 percent gain statewide and a 9.7 percent gain nationally. Among those who remain, incomes are relatively low. Median household income during the 2006-2010 period averaged only 64 percent of the statewide level and 70 percent of the national level. At the same time, there are fewer individuals at the low end of the economic scale, with a poverty rate of 9.1 percent, 5.1 percentage points below the state average and 4.7 percent below the national average.

Despite a decline in manufacturing employment, including a decline of about 20 percent between 2001 and 2011, workers in Allegany County continue to rely upon manufacturing for a considerable amount of employment. Approximately 16 percent of total county employment is in manufacturing. The largest manufacturers still remain in small cities like Hornell. Other large non-manufacturing employers include the local public school system, located at the village's edge, and the Livingston Correctional Facility, located to the north in Sonyea.

In fiscal year 2012, as in 2005 when the project was initiated, ARC continued to categorize Allegany County as a "transitional" county, or an area "transitioning between strong and weak economies." Total employment declined by 3.1 percent during this period, compared to slight growth of 0.3 percent statewide and a slight decline of 0.2 percent nationally. The county's unemployment rate averaged about 0.5 percentage points above the statewide average and 0.3 percentage points above the national average between 2001 and 2011.

### 6.4.2 Project Description

The Canaseraga Wastewater Collection and Treatment System project consisted of the construction of 5.4 miles (28,400 linear feet) of sewer and a 0.1-million-gallon-per-day treatment plant. It serves 215 households and 18 businesses. The project was undertaken to replace residential septic systems, many of which were failing and discharging waste into a local river. The total cost of the project was \$4.59 million. In addition to the \$150,000 ARC grant, funding was obtained through a \$1.879 million United States Department of Agriculture (USDA) Rural Development Grant, a \$2.161 million zero-interest USDA Rural Development Loan, and a \$400,000 Small Cities Community Development Block Grant (CDBG) grant from the State of New York. Construction began in late May 2004 and was completed in late May 2008, spanning four years.

### 6.4.3 Project Planning and Implementation

The village had long been aware of its sewage issues, and their environmental, health, and economic impacts. Many property owners had been financially unable to properly maintain their septic systems, leading to widespread leaks and failures as the housing stock aged. When the systems failed, these homeowners had to choose between finding money for costly repairs (sometimes in excess of \$10,000), abandoning the property altogether, or diverting the sewage into storm drains or the local river. For those choosing the latter two options, an environmental and health hazard was created for residents, their neighbors, and those using the river nearby or downstream. It also created a significant economic issue, depressing property values, and reducing recreational hunting and fishing. Wildlife was observed to be increasingly scarce, a fact attributed to increasing river pollution, forcing hunters to look elsewhere. Local fishermen were also becoming concerned about diseases in locally caught fish.

In the mid-1990s, the village began to receive citations from New York State for sewage treatment compliance issues. However, the citations were rescinded when it became clear that the community did not have the financial resources necessary to construct the required sewer system.

In late 2001, a consulting engineer for the Village of Canaseraga, having contacted the USDA Rural Development office in Bath, New York, on an unrelated matter, mentioned the village's wastewater issues to J.C. Smith, USDA's local manager. Smith then contacted village leaders, volunteering to help them find a way to address the problem.

The consulting engineer prepared a design for the system with an estimated cost of approximately \$4.6 million. During 2002, Smith worked with the village to prepare applications for USDA funding, state Small Cities CDBG funding, and an ARC grant. They also conducted an environmental review and prepared the documents required to comply with the State Environmental Quality Review Act. Soon, the pieces began to fall into place.

Later that year, USDA Rural Development issued an eligibility letter of grant support for \$1.879 million, and also offered the village a zero-interest loan of \$100,000. The New York Environmental Facilities Corporation also offered a \$2.061 million low-interest loan from its USDA-funded State Clean Water Revolving Loan Fund. With almost 90 percent of the funding in hand, local leaders began to hold local information meetings about the project and its impacts and worked to pass a village referendum in support of the project. All this occurred in careful synchronization with the April CDBG funding due date in order to submit the strongest application possible.

In late 2003, the village was notified of its \$400,000 CDBG award through the Governor's Office for Small Cities. With most of its funding now committed, demonstrating a feasible, actionable project, the village's ARC funding application was scored highly, and ARC awarded the final \$150,000 needed to



fund the project. ARC had rejected two earlier applications because of concerns about the project's financial feasibility.

The final design and construction of the system occurred between 2004 and 2008. No major delays or cost-overruns were encountered. The village's superintendent of public works did report that in order to complete the project within budget, the village did not build planned protective structures around certain pieces of equipment. This exposes this infrastructure to the elements and makes monitoring the equipment more difficult, particularly during the winter months.

#### 6.4.4 Economic and Community Impacts

Village and county officials believe that the project's greatest impact has been on improving local environmental quality and resident health. Notes Wilson Rowley, the local superintendent of public works, "I remember when I was a kid, trout fishing in the creek. You could literally see someone's gray water running off. There still are rural areas like that. People try to hide it. [Canaseraga] was like that. [But now] most people, overall, are real thankful [that we're not]." Agrees County Administrator John Margeson, "The best thing to come out of this project is correcting the threat to public health. Any future economic development impact will be icing on that cake."

According to Wilson, with the river cleaner, wildlife has returned to the area, a boon for the many local hunters and gamesmen. And the systems will also benefit financially in the long run. "I know that people are going to complain about debt service charges. But they don't always remember that they don't ever have to pump their septic tanks again. It alleviates a lot of worries on the taxpayer. If the power goes out, we still have sewer service. And you never have to worry about septic service backing up. If it does, on your property, the village is going to take care of it. It has all been beneficial."

Approximately 215 households are now being serviced by the sewer system. In addition, an estimated 155 local jobs were retained. Further, as Margeson notes, it allows for possible future development, leveraging a growing nearby tourist attraction, the Swain ski area. "The introduction of the sewage system makes it more attractive to individuals of some means who might want to put up seasonal homes in the village to take advantage of its proximity to Swain. Further, within the village proper, we could see possibly some light industrial development and substantial residential development if the infrastructure is extended west towards Swain."

#### 6.4.5 Lessons Learned

- ***Tackling big projects in small areas takes dedication and patience.*** Projects serving small, rural communities, as ARC projects often do, may take a considerable amount of time to launch, convincing funders of project viability, especially given the naturally high cost per-person-served of such endeavors. In Canaseraga, the process took over six years from initial conception to completion. For the first financial commitment alone, a crucial \$1.85 million USDA Rural Development grant, the village had to wait two years. However, once the first funder committed, successive financing became more easily available, concluding with the \$150,000 ARC grant. It was through this often arduous process that a group of dedicated local leaders were able to complete a project previously thought financially infeasible. However, by the time the project came to fruition, leaders had achieved a high level of local buy-in, developed a sound, well thought out plan, and honed an effective case for why this project was necessary. It was all accomplished by having a process through which stakeholders learned from failure and did not get discouraged in the pursuit of their goals.

- *Addressing health and environmental concerns is a foundational step to successful economic development.* For economic development to occur, many of Appalachia's small villages first require infrastructure investments to address basic quality of life concerns. In the Village of Canaseraga, health and environmental issues were paramount, with sewage leaking into natural water sources, and impacting the health and aesthetics of the village itself. Addressing these needs was the main catalyst for the project, and it has successfully addressed these issues. However, in doing so, it has also made the village a better place to live and to work, with new businesses now able to connect to modern sewer amenities. The small downtown, too, can offer small businesses the option of connecting to a sewer line. And while residents will bear the costs of the project's operations and debt service, they will never have to worry about septic tank leakage or maintenance in their yards. The project has allowed Canaseraga to compete on a more even playing field with other similar communities for business and residential development by first addressing its health and environmental concerns.

#### 6.4.6 Conclusion

Through the 1990s, Canaseraga's failing septic systems threatened the village's health and economic well-being. Starting in 2001, dedicated local officials, supported by USDA Rural Development, were able to demonstrate the need for the project and piece together funding, including persuading village residents to pass a referendum to take on substantial debt and ensure its financial viability. Today, the village benefits from a centralized sewage system and, with it, a higher quality of life and a greater chance to compete for residents and businesses that expect such modern amenities.

### 6.5 Canton Water Improvement Project - Canton Borough, PA

The Canton Water Improvement project consisted of the replacement of five miles of water mains and the construction of a 300,000-gallon water storage tank. The project was necessary to replace the 75-year-old distribution lines that were in poor condition and losing over 65 percent of their treated water supply through leakages. The water tank was necessary to expand storage capacity and to improve the services for the entire community. The Appalachian Regional Commission (ARC) provided a grant of \$285,000, approximately eight percent of the total project cost of \$3.7 million.

#### 6.5.1 Community Profile

Canton Borough is located in the southwest corner of Bradford County, Pennsylvania. It had a population of 1,976 in 2010, an increase of 9.4 percent over 2000. Its growth was more rapid than statewide growth of 3.4 percent and approximately on par with national growth of 9.7 percent.

Bradford County is classified by ARC as a non-metro area adjacent to a small metro area and had a population of 62,622 in 2010. At the time the ARC grant was awarded in 2006, the county was classified as a "transitional county," according to the ARC economic classification system, and continued to be classified as such in 2012. A transitional county is defined as economically positioned between the 25 percent most distressed and 25 percent most robust U.S. counties.

The county's economic performance was relatively weak between 2001 and 2009, but began to improve significantly between 2009 and 2011, primarily as a result of increased shale gas development. Between 2001 and 2009, county wage and salary employment declined by 7.5 percent, compared to declines of 1.5 percent and 0.8 percent, respectively, at the state and national levels. However, between 2009 and 2011, this relationship was reversed, with county employment growing by 4.9 percent, compared to respective



declines of 0.3 percent and 0.2 at the state and national levels. During this latter period, employment in the gas industry grew by over 1,000 jobs and from less than one percent to five percent of total county employment. The county's unemployment rate generally tracked state and national averages during the 2001-2009 period, but fell significantly relative to state and national averages in 2010-2011.

The three major industries in Bradford County are manufacturing, retail, and healthcare and social assistance. In 2011, these industries accounted for approximately 18 percent, 12 percent, and 20 percent of wage and salary employment respectively. Between 2001 and 2011, manufacturing experienced a significant employment decline, while retail remained stable and healthcare and social assistance grew moderately. As noted, while the mining sector is still relatively small, it has added over 1,000 jobs between 2009 and 2011.

Borough residents suffer from relatively low economic status. Median household income averaged \$28,382 during the 2006-2010 period, little more than half state and national levels. The poverty rate of 29.7 percent was more than double both state and national levels.

### *6.5.2 Project Description*

The Canton Water System Improvement project consisted of the replacement of five miles of water mains and the construction of a 300,000-gallon water storage tank. The reconstruction of the old system and the water tank started early in 2006 and took nearly 16 months to complete. The project replaced a water distribution system that was built in the early 1900s and had outlived its useful life. The former system no longer provided the adequate supply needed to fight major fires, and more than 65 percent of the treated water supply was lost through leakage.

The upgrade project was completed at a total cost of \$3.7 million. ARC provided a grant of \$285,000. Other funding sources included \$50,000 from Pennsylvania's Community Development Block Grant (CDBG) program, \$3.2 million in loans from United States Department of Agriculture Rural Development, and \$162,400 in local funds.

ARC funds were needed to increase the scope of the improvements and alleviate the financial burdens on the community. ARC funds mainly contributed to the decision to build the water tank, a project that likely would not have otherwise been completed due to lack of funds. While water rates were increased by 40 percent to achieve the project, they would have been 45 to 50 percent higher had ARC funds not been available.

### *6.5.3 Project Planning and Implementation*

The initial impetus for the project came from two of the community's major employers, which were under pressure from their insurance companies to increase water flow and storage for fire protection. Therefore, the project was needed to provide an adequate infrastructure to serve the community, retain existing businesses, and attract new industries.

Another factor that contributed to undertaking the project was the necessity to separate an existing combined sewer system. The sanitary and stormwater were in the same piping, resulting in the discharge of raw sewage during a significant rain event. Although ARC funds were only used for the water line improvement portion of the project, the water upgrade parallel to the sewer system upgrade made sense due to significant cost savings from mobilizing and repaving.

The project planning started in 2002 and construction started late in 2006. The initial project cost was estimated at \$3.2 million. The engineering firm Larson Design Group was hired to conduct daily inspections, and the Canton Borough Authority (CBA) provided personnel to assist the inspection and

construction crews in locating existing mains and service lines. According to CBA staff, no major obstacles or challenges were encountered during the planning and implementation phase of the project. However, two unanticipated events increased the project cost by \$0.5 million. First, additional highway restoration was required on one state highway due to an unstable base; and, second, the number of water main fittings needed was significantly underestimated. These unexpected events brought the total project cost to \$3.7 million. The cost overrun was covered with an additional loan, and the project engineer, Larson Design Group, provided \$100,000 for its estimating error. Despite these changes, the project was completed within the anticipated timeframe.

#### 6.5.4 Economic and Community Impacts

The projected outcomes for the project were to minimize water loss by half (to 30 percent), increase fire-fighting capacity, and to provide adequate water supply to residents, the Shop Vac plant, and to the former Paper Magic plant to encourage a new company to utilize the facility. The project met the grantee and community expectations. It improved the service for 750 households, 70 commercial customers, and retained nearly 200 jobs. While two miles of the system still require replacement, the project reduced water loss from nearly 65 percent to less than 20 percent. Given that the operating efficiency improved more than anticipated, CBA has been able to sell water that had been previously lost through leakage to gas companies. The sale of the water has generated an additional \$1 million in annual revenue over two years. This additional revenue is used to pay the 40-year USDA loan. It is expected that once the loan is paid, rates will come down and the additional revenue will be applied to new projects and to a new equipment replacement fund.

Overall, the project both alleviated environmental concerns and improved the economic potential of the area. It improved the water quality, reduced water losses to less than 20 percent, served the projected households and businesses, and created an unexpected revenue source. In addition, while the community lost Shop Vac when the company relocated its facility, it gained another company, in part because of the infrastructure project. Cudd Energy Services relocated its Pennsylvania headquarters into an empty Parker Hannifin plant, hiring or relocating more than 150 workers.

#### 6.5.5 Lessons Learned

Several lessons can be drawn from the outcome of this project:

- **Identify the basic needs of the community in order to maximize its economic and social development.** The water system upgrade was a priority because the inadequate system was jeopardizing the social and economic development of Canton Borough. The inefficiencies were limiting the expansion of major employers, were causing excessive expenditures by local government, and were a risk to human health. The infrastructure upgrade exceeded the expectations of stakeholders, retained and attracted new businesses, and generated a new revenue source for Canton Borough.
- **Pay careful attention to project design.** The reconstruction of the water distribution system was carried out in parallel with the sewer system upgrade to reduce costs and maximize resources. As part of the strategic planning process, different types of water main materials were evaluated to compare advantages and disadvantages. Polyethylene pipes were selected due to unique physical characteristics: low weight, corrosion resistance, high-impact resistance, and flexibility. Leaks were substantially reduced, increasing the efficiency of the system.

- **Conduct routine project inspections.** The project's success was due in large part to the diligent coordination between CBA and the project engineer. Daily inspections conducted by the project engineer ensured that the construction was carried out according to the plans and specifications. Canton Borough Authority also assisted the construction team in locating existing mains and service lines to reduce errors.
- **Keep the community informed.** A factor to consider on future projects and recommended for other communities is increasing coordination with the community. Downtown businesses received several water advisories from CBA, but they were not prepared for the project and CBA did not do enough to prepare them.
- **Develop a contingency plan.** The original cost of the project was projected at \$3.2 million, yet the final cost increased by \$500,000 as a result of unexpected events and the estimating error by Larson Design Group. Although the engineering firm provided \$100,000, CBA had to make an additional loan to cover the overrun. CBA recommends that future grantees allocate a contingency fund or secure access to credit markets for additional loans to cover unexpected expenses.

### 6.5.6 Conclusion

During 2007, the Canton Borough Authority replaced nearly 60 percent of its 75-year-old water distribution system because of the poor condition of distribution lines and inadequate water pressure to serve businesses or to fight major fires. A total of five miles of water line were replaced and a 300,000-gallon water storage tank was constructed. The reconstruction of the water line eliminated major leaks in the system and immediately improved operating efficiencies and fire protection levels. The project served 750 households and 70 employers in the Borough and Canton Township. An unexpected but positive outcome is that as a result of the improved efficiency, CBA is selling water to gas drilling companies and collecting additional revenues.

## 6.6 Clinton I-75 Industrial Park Sewer Line – Clinton, TN

In 2006, the City of Clinton, Tennessee's Utilities Board completed major improvements to the wastewater collection and transmission system in the city's I-75 Industrial Business Park. The project was undertaken to accommodate the needs of Aisin Automotive Castings, an automotive component supplier that wanted to build a production facility in the park. The ARC awarded the city a grant of \$450,000, which covered 30 percent of the project's total cost of \$1.49 million.

### 6.6.1 Community Profile

The City of Clinton, located in Anderson County, Tennessee, just northwest of Knoxville, had a population of 9,841 in 2010. The city experienced modest population growth of 4.6 percent between 2000 and 2010, but lagged the growth rate at both the state and national levels by more than half.

ARC categorized Anderson County as "transitional" in fiscal year 2013, as it also did in 2005, or an area "transitioning between strong and weak economies," ranking between the "worst 25 percent and the best 25 percent of the nation's counties." The county experienced employment growth of 5.3 percent between 2001 and 2011, while state and national employment declined by 4.6 percent and 3.3 percent, respectively. Unemployment rates during this period averaged slightly below both state and national rates. In 2001, the county unemployment rate was 8.4 percent, compared to 9.2 percent statewide and 8.9 percent

nationally. The county has traditionally, and continues to, rely heavily on manufacturing jobs. In 2011, fully 25.6 percent of jobs were in manufacturing, only a slight decline from a decade earlier.

The economic status of county residents is about average relative to the state. The average median household income during the 2006-2010 period was 95 percent of the state level, while the poverty rate of 14.4 percent was 2.1 percentage points lower. Compared to the nation as a whole, the county is somewhat less well-off, with median household income 79 percent of the national level and the poverty rate 0.6 percentage points higher.

At the time of the Aisin sewer line project, the community had been hit hard by the downsizing of the Department of Energy's (DOE) facilities in neighboring Oak Ridge, Tennessee, which employed many local residents. Over the previous 10 years, the DOE facility had reduced its staff from 20,000 to 12,800. Further, as Terry Bobrowski, executive director of East Tennessee Development, noted, "A lot of folks [have been] retiring" in the area, and the younger families that have remained are finding themselves "unable to keep their kids at home with good paying jobs," leading to a young professional brain-drain and an increasingly older population, with 19.3 percent of local residents age 65 or older – over six percentage points higher than the United States average.

### 6.6.2 Project Description

To address Aisin's infrastructure needs, the Clinton Utilities Board undertook major improvements to the park's wastewater collection and transmission system: the installation of 6,800 linear feet of sewer line, the construction of two new pump stations, one at the Aisin site and the rehabilitation of another. The plant was expected to produce an average of 180,000 gallons of wastewater per day. The final cost of the project was \$1.26 million. In addition to the ARC grant of \$450,000, funding sources included \$450,000 from the state of Tennessee's Fast Track Infrastructure Development Program, and contributions of \$225,000 by Anderson County, \$75,000 by the City of Clinton, and \$299,550 by the Clinton Utilities Board.

### 6.6.3 Project Planning and Implementation

In 2004, Aisin Automotive Castings, a subsidiary to Aisin Seiki Limited, one of the world's top automotive component suppliers, indicated interest in building a metal casting facility in Clinton, Tennessee's Interstate 75 Industrial Business Park. The new park, one of Anderson County's largest, was set on 252 acres along the Interstate and had been, to that point, largely vacant. However, Aisin also indicated that the park's current wastewater collection infrastructure would not be able to handle the expected 180,000 gallons of wastewater released per day by the prospective plant. "We had the basic infrastructure there," Greg Fay, general manager of the Clinton Utilities Board recalled. "What we needed was a main section of line in order to move the waste forward."

Aisin's investment was expected to be significant – approximately \$65 million to construct and equip a 280,000-square-foot production facility. It expected to create 400 new jobs after three years, with average wages of \$16.00 per hour, plus benefits. For the community, suffering from workforce reductions by one of its major employers, the Department of Energy, the investment would be a much needed employment generator.

Local leaders convened to see what could be done to meet Aisin's infrastructure needs. Engineers determined that in order to accommodate Aisin approximately one mile of sewer line, two new pump stations, and the rehabilitation of another would have to take place. The cost would total approximately \$1.26 million. Given that the local utility, the Clinton Utilities Board, serving only 6,000 customers, could not absorb such an investment alone, "everyone pulled together," Fay noted. Everyone gave "as much as



everyone could stand, which was sufficient to make it work.” In addition to contributions by the city, the county, and the utilities board, grants were also obtained from the state of Tennessee’s Fast Track Infrastructure Development Program (FTIDP) and the Appalachian Regional Commission.

From the start of implementation to project completion, local stakeholders met and spoke regularly after setting expectations for financial contributions and project responsibilities. The Clinton Utilities Board was responsible for overseeing construction.

The project experienced some normal weather delays, but was completed on schedule in early 2006. However, costs exceeded the original budget by a considerable amount. “East Tennessee is nothing but a rock bed,” Fay reported. When the contractors hit rock when digging the sewer line, they exercised the “fair” terms of their contract to charge more. The additional overruns amounted to slightly over \$200,000, bringing the total final project cost to \$1,494,500. The Clinton Utilities Board covered these overages from its own reserves, raising its initial contribution from \$67,700 to \$299,550.

#### *6.6.4 Economic and Community Impacts*

The payoff from the installation of the Clinton I-75 Industrial Park sewer line has been significant. Aisin moved into the industrial park in late 2004 and created the promised 400 jobs. In late 2007, it doubled its manufacturing space from 240,000 square feet to 480,000 square feet, and added another 160 positions to bring its workforce to 560. Exercising an initial option, it arranged to purchase 36 additional acres of industrial park land at a subsidized rate of \$100 per acre.

Aisin has become the county’s second largest taxpayer and is widely expected to soon top the list. Even with a 25 percent, 10-year tax abatement on the original plant, which was part of a larger incentives package arranged separately from the infrastructure investment, Aisin pays \$525,402 a year in county property taxes and \$136,233 in city taxes. These figures do not include payroll taxes or the sales and property taxes generated by Aisin employees, which would bring the tax dividends from this investment to well over a million dollars per year.

Noted Terri Bobrowski, “This was one project that really has not only met initial expectations, but has consistently provided additional benefits over time. Aisin is a great employer and corporate citizen, a poster child for good investment on the public side.”

Further, since Aisin’s arrival, the industrial park and the adjacent area have expanded significantly. The industrial park is now close to capacity, with another 10 to 12 industrial businesses establishing themselves within it or nearby. The total available acreage in the 252-acre park is down to less than 25.

“It also opened up an entire Interstate exit,” Bobrowski reported, with a Wal-Mart, a Toyota dealership, and several restaurants and hotels springing up since. A Junior Achievement Center has also opened a 15,000-square-foot facility that serves the region with a business learning center and regular entrepreneurial programming for local students.

Bobrowski estimated that 50 new commercial businesses have since opened, all using the sewer system built for Aisin, and that that 1,500 new jobs have been created from subsequent development that relied on that infrastructure.

#### *6.6.5 Lessons Learned*

All interviewees agreed that the project exceeded all previously held expectations. The ultimate \$1.5 million investment was likely recovered in tax revenue gains alone by the second year of Aisin’s operation. Further, Aisin has gone on to expand its employment base and its property holdings. The once

vacant industrial park is now near capacity, and the surrounding area, also once vacant, hosts restaurants, hotels, and approximately 50 new commercial businesses, all of which are using the infrastructure built out for Aisin.

While the build-out may not have been the sole contributor for this growth, it was the investment that allowed for Aisin's arrival that spurred other development in the industrial park and along the Interstate that may not have occurred otherwise. It was a catalytic investment.

However, even with the most positive economic implications that resulted from the investment, interviewees noted that many lessons were learned throughout the process:

- ***“Committed” funding is not necessarily the same as having money in-hand.*** Five different organizations contributed funding to the Clinton project. Each funding organization often had its own standard set of use restrictions and methods for funding distribution. For instance, Bobrowski noted, as East Tennessee Development served as the Clinton project administrator, it was “tough tracking wage rates,” with the state and federal guidelines requiring different levels of pay. Ultimately, he said, “it ended up costing the project money to deal with the complexity, in terms of the detail required.”
- ***Each funding source may come with its own restrictions and requirements of which grantees need to be continuously aware.*** “When you mix money,” Bobrowski stated, “there’s always administrative cash flow problems,” which naturally arise. Some funding sources may only pay for certain expenses, while others want the project administrator to pay for everything up-front and then get reimbursed. This may then require the project administrator to access lines of credit from local banks, which may not always be available, especially in small communities, and which will also add previously unaccounted for interest payment expenses to the project. Having a clear, detailed understanding of the restrictions and parameters of the funding from all partners from the start of the project can allow for a smoother transaction process.
- ***Having trust in your local partnerships is crucial to smooth project planning and implementation.*** All interviewees noted the importance of trust and partnership in what went into making the Clinton project a particular success. Greg Fay of the Clinton Utilities Board noted, “Trust is key. We didn’t have any trouble with any of the partners, but that’s about relationships. I’ve been here for 35 years. You have to have a relationship with your city council, your county commission. That’s imperative...you have to sometimes take people where they might be uncomfortable going at first. And that takes professional comfort and trust.” All interviewees knew each other and thought highly of one another. This sense of trust allowed all of the key players to effectively work together to get the proposal done, win funding, and implement the project.
- ***Informed and knowledgeable staff can more effectively oversee implementation.*** Terry Bobrowski noted that the Clinton Utilities Board had a local wastewater specialist on staff who was invaluable throughout the process. The knowledgeable individual consistently conducted quality checks on the materials and construction. “He understood what was going into the ground and was able to make field adjustments as needed.”
- ***When looking for contractors, do not just look at the dollar value; look at what will be gained by that investment.*** When putting a contract out to bid, as in Clinton, Greg Fay emphasized that while it was important to ensure that the bid process is open and fair, the contractor ultimately selected must be capable of doing the job at hand and getting it done on time. He warned not to just “hire people one knows” or ones that give the “lowest bid.”

- *Sometimes supporting smaller, locally grown projects can pay greater dividends than other statewide attraction efforts.* Terry Bobrowski added that when looking at infrastructure investment projects like the one for Aisin in Clinton, it is important to put it in the perspective of how many jobs would be created. “Just a little bit of money can make a lot of difference,” he noted. While “tens of millions were spent by Tennessee to land [the now defunct] Saturn,” this small infrastructure grant had an immediate payoff and opened up an entire area for subsequent development.

#### 6.6.6 Conclusion

Greg Fay called the Clinton I-75 Industrial Park sewer line project, funded in part by ARC, and Aisin's resulting build-out, the “gift that keeps on giving.” The I-75 Industrial Park in Clinton went from being vacant to now running at near full capacity. The local area around the park, once empty, now holds over 40 new businesses, including restaurants, hotels, and an entrepreneurial education center. The gap funding the ARC was able to provide directly resulted in Aisin, which now employs over 600 individuals from across the region, locating in the area. Indirectly, it helped to create the infrastructure needed for the area to flourish, with one interviewee approximating the creation of well over 1,000 additional jobs. Noted Terry Bobrowski, “This project would not have happened without an ARC grant. They were a critical partner. And the results have been tremendous.”

### 6.7 Dobson I-77 Infrastructure Project – Dobson, NC

In 2006, the Appalachian Regional Commission (ARC) provided a grant of \$200,000 to support a \$2.2 million extension of municipal water and wastewater service to the site of a planned commercial development at I-77 Exit 93 outside the Town of Dobson in Surry County, North Carolina. The project serves various commercial and residential customers, but its primary purpose was to provide the basic infrastructure needed for the construction of the Village at Shelton Vineyards, a hotel-centered commercial complex by the town's interstate exit conceived by the owners of Shelton Vineyards, a large nearby vineyard and winery that is open to tourists.

#### 6.7.1 Community Profile

Surry County is a predominantly rural county with a population of 73,673 in 2010, located in northwest North Carolina next to the Virginia border. The county is split between the Piedmont and the Blue Ridge Mountains, which makes it a part of both the urbanizing, agricultural Piedmont Triad region of north-central North Carolina and the more rustic Appalachian foothills region of western North Carolina. It is also considered a part of the Yadkin Valley. Dobson, the county seat, lies at the center of the county and had a population in 2010 of 1,586. There are three other incorporated municipalities in Surry County: the Towns of Elkin and Mount Pilot, and the City of Mount Airy. Through most of the 20<sup>th</sup> century, textile manufacturing and tobacco cultivation were central to Surry County's economy, but after several decades of decline in these industries, Surry County has a more diverse, but smaller, industry base with a much larger role for the service sector. Farming and processing of agricultural products still play a significant role in the economy, but livestock has replaced tobacco as the most important commodity.

In 2012, Surry County was designated as an ARC “transitional” county, the same designation it had in 2006 when the ARC grant was approved. ARC defines transitional counties as being in the middle 50 percent of counties in terms of level of distress. While it is far from depressed, Surry County underperforms across many different indicators when compared with North Carolina and the country as a whole. Surry County did grow in population between 2000 and 2010, but it only grew by 3.4 percent, a

rate much lower than the state's 18.5 percent growth rate and the nation's 9.7 percent growth rate. Surry County's median household income in the 2006-2010 period was \$37,294, 82 percent of the state median and 72 percent of the national median. In that same period, it had a poverty rate of 16.9 percent, higher than the state's 15.5 percent rate and the country's 13.8 percent rate. Its unemployment rate for 2011 was 11.3 percent, 0.8 percentage points higher than the state rate and 2.4 points above the national rate.

Perhaps the most drastic statistic in Surry County is its shrinking employment. Between 2002 and 2011, payroll employment in the county fell 18 percent, from 33,166 to 27,206, even as state employment rose by approximately two percent. Losses in the manufacturing sector, where employment fell 58 percent from 9,328 to 3,958, account for almost all of the county's employment decline. The manufacturing job loss was itself concentrated in what was once the county's most important industry, textiles. In 2001, there were 6,123 jobs at the county's apparel manufacturers and textile mills; in 2010, only 875 remained.

Job growth in other industries generally did not counteract the decline in manufacturing jobs. Some parts of the service sector, such as education and healthcare, have grown.

Tourism is one of the few bright spots in the county's employment numbers. Between 2002 and 2011, the county's private sector employment in leisure and hospitality grew from 2,100, about six percent of total employment, to 2,679, about 10 percent of total employment. In this area, Surry County has actually outperformed the state's growth level by almost eight percentage points. This was a result of sustained local, county, and regional efforts to promote tourism and build tourism-related industries. Part of this involved finding ways to take better advantage of existing natural, cultural, and historical attractions, like scenic roads, state parks, traditional music, and the Andy Griffith-related sights of Mount Airy (or "Mayberry" as it is known to fans of the show). But another side of the story was the creation of something almost entirely new in the area: winemaking and wine tourism. In 2000, when Ed and Charlie Shelton founded their winery outside Dobson, there was only one other winery in the region. Today, the Yadkin Valley, an American Viticultural Area (AVA) since 2003, has over 30 wineries that attract tourists who want to visit wineries and explore the area. About 12 of these wineries are in Surry County, due in large part to Shelton Vineyards and the Shelton-Badgett Center for Viticulture and Enology at Surry Community College in Dobson.

### *6.7.2 Project Description*

The Dobson Exit 93 infrastructure project consists of a water and sewer system extension that brings services from the Town of Dobson to the area around I-77 Exit 93, a site of existing and planned commercial development three miles west of the main part of town. The town owns and manages the systems.

The water extension was designed to serve commercial customers around the interchange as well as households and churches. Its major elements are a booster pump station, about 19,500 linear feet of eight-inch water lines, and a 200,000-gallon water tower. The pump station was built with the ability to connect to additional water systems, and it was subsequently used to provide water for a different interstate interchange development project several miles north of Dobson.

While the sewer system travels along approximately the same route as the water line, in order to reduce costs and prevent overdevelopment of farmland, it was designed with a long force main so that only the area around its destination would be easily served. The primary components of the sewer extension are two pump stations by the interchange, 4,000 linear feet of eight-inch gravity sewer, and 18,700 linear feet of two- and four-inch sewage force main.

The completed project cost \$2,263,368. Non-local funders included ARC (\$200,000), the North Carolina Rural Economic Development Center (Rural Center) (\$500,000), and the Golden LEAF Foundation

(\$200,000), a nonprofit that uses a portion of North Carolina's Tobacco Master Settlement money to support economic development in distressed communities, especially those economically dependent on tobacco. The rest of the funding was split among the town of Dobson (\$451,968), Surry County (\$411,400), and the Sheltons (\$500,000).

### 6.7.3 Project Planning and Implementation

The idea of extending water and sewer infrastructure to the unincorporated area around I-77 Exit 93 goes back decades. Surry County officials had always imagined that the county's highway interchanges would become prime sites for commercial and industrial development, but lack of a county water and sewer system and the high cost of extending the independent municipal utilities meant that servicing these areas would be very difficult. Most of the interstate exits remained unserved and underdeveloped. Before this project, Exit 93 had a small motel, a gas station, a restaurant, farms, and little else, despite being one of the flattest and most easily accessible parts of the county.

By the year 2000, efforts to expand the county's utility services had increased in urgency. Due to the rapid loss of manufacturing firms during the 1990s, the municipal water and sewer systems were operating significantly below capacity. Dobson was becoming dependent on a single water customer, a poultry processing plant, which consumed over half of the town's output. In 2001, the county worked with the municipalities and an engineering firm, Adam-Heath Engineering, to study the area's water and sewer capabilities, assess the county's needs, and develop a 20-year capital plan.

The plan included recommendations for the extension of services to many unincorporated parts of the county and interconnections between the municipalities. It also placed a priority on expanding services to the county's highway interchanges, starting with Exit 93 that was tentatively scheduled to receive both water and sewer services by 2005. Because the Dobson interchange was just three miles from the town's border, the utility lines would be relatively inexpensive. In addition, the town had a special incentive to participate in the project—under North Carolina's satellite annexation rule, Dobson could incorporate the land of any consenting property owners less than three miles away as long as it provided them with municipal services.

An exciting opportunity for development around the interchange came along in 2004, when Ed and Charlie Shelton, two wealthy businessmen who had grown up outside Mount Airy, came to the town with plans for a large development and a request for utility services. Five years earlier, the brothers had established Shelton Vineyards, a vineyard and winery southeast of Dobson. They became increasingly devoted to promoting and supporting winemaking and winery tourism in the region. Not long after, they helped set up a viticulture and enology program at Surry Community College in Dobson, and took the lead in advocating for an American Viticultural Area designation for the Yadkin Valley, which was approved in 2003. By 2004, Shelton Vineyards had grown into the largest estate vineyard in North Carolina, and the Sheltons were looking to expand the tourism angle of their business further and make a bigger impact on the region.

Their plan for the Village of Shelton Vineyards was to build a large hotel-centered development on about 80 acres of land they had purchased on the east side of the interchange. The project would require utility service to go forward. The original plan for the Village at Shelton Vineyards that was proposed to infrastructure funders had four phases. The first, scheduled for completion in 2007, included a 100-room all-suites hotel and an upscale restaurant, totaling \$7.5 million of investment and providing 62 new jobs. The second phase, scheduled for 2008, would invest \$5.5 million in a convention center, another restaurant, a bank branch, and a drug store. By 2010, they would add offices, a shopping center, another hotel and another restaurant, doubling their previous investment, and between 2015 and 2020, they

hoped to have added enough retail to bring the project's total value to \$44.75 million, with 496 attached jobs.

The Sheltons' initial discussions with the town and county about putting in new infrastructure went well, and each stakeholder agreed that it would be in their interest to get an extension built. Both the town and the developers thought that an annexation arrangement would be in their long-term interest. The town would expand its tax base, permanently add a large piece of land with high potential for development, and develop a deeper relationship with the Sheltons. The Sheltons would receive all municipal services, and they also thought it was more likely that a liquor-by-the-drink referendum would pass in the town (one did in 2008). County officials supported the project not only because of the direct economic development potential, but also because the extension would add to their long-term goals for water and sewer expansion.

The town, which had taken ultimate responsibility for the project but had few financial resources, began to explore options for funding. Early on, it was able to get a preliminary agreement from the Rural Center to provide \$500,000 of funding. In 2005, the town hired Adams-Heath Engineering, the firm that had designed the 2001 20-year capital improvement plan, to conduct a needs assessment, find funding sources, and help plan the project.

The total projected project costs were \$2,150,200. The Sheltons agreed to commit \$200,000, conditional on it being counted as prepayment for assessment, and the town and county each committed to spending \$203,500. The town hoped to cover the gap with non-local funding, but the grants it received from ARC, the Rural Center, and the Golden LEAF Foundation totaled only \$900,000. Not wanting to endanger this funding, the stakeholders made a deal to split the remaining costs. The town and the county each agreed to pay \$411,400 and the Sheltons agreed to pay \$500,000, in exchange for the right to print the name of its development on the new water tower.

Once zoning was in place at the county and the project was approved, a design was finalized, the town hired a construction firm, and the infrastructure project went forward. The construction went relatively smoothly, but there were a few "hiccups." At one point, some of the farmers who opposed the projects were getting ready to sue, but the parties were able to sit down together and defuse the issue. The project was completed in April 2007, slightly over budget, and the hotel was finished just one month later.

#### *6.7.4 Economic and Community Impacts*

The Exit 93 infrastructure project has significantly improved the county's infrastructure, its tourism and wine industries, and its capacity for further economic development. Most directly, it allowed the Sheltons to build the Village at Shelton Vineyards, a development that brought jobs, taxes, and tourists into the area, while adding greatly to its image and its attractiveness as a destination.

The first stage of the Village at Shelton Vineyards was completed basically as planned, though the opening of a restaurant was delayed for several years. The 102-room hotel, a Hampton Inn and Suites owned and operated by the Shelton family, includes a wine bar and other features that serve to promote the region's wineries. A service station, which the Sheltons purchased, was rebuilt and reopened as Village Market at Shelton Village, a complex that includes a gas station, a Dairy Queen franchise, and a unique gift shop and convenience store that sells wine and crafts from the area. In 2011, the Sheltons made a deal with BB&T, which built a branch bank near the other businesses. In 2012, they opened Bello Vino, an Italian fine-dining restaurant associated with the winery.

Due to the recession and the ensuing economic slowdown, the plans for retail businesses, a convention center, and other new investments have not yet gone forward. The Sheltons now expect that future

growth will be at a much slower pace than was originally envisioned, but they continue to look for opportunities to build businesses there that would accord with their vision for the area.

In total, four buildings were built at the Village, and Dobson gained four businesses as a result of the infrastructure project. Private investment in the development totaled \$18.25 million, surpassing ARC's expected outcome for leveraged private investment, which was \$7.5 million. The Village has provided 66 jobs, which exceeds the ARC's projection of 62 jobs created. The access and marketing the hotel provides has also made a major impact on the Sheltons' business, greatly enhancing their ability to bring in new visitors and bring back old visitors. The hotel has allowed the Sheltons to host weddings at their winery and to hold other public and private events, gatherings, and festivals that draw people to the region. This increased demand has led to an additional 11 jobs at the Shelton Vineyards winery and restaurant.

The development has also had a significant effect on the area's tourism and wine industries more generally. About one-third of the hotel's guests are there primarily to visit area wineries and see other attractions. Other guests often come knowing nothing about the area's wineries and other attractions, which make them prime targets for outreach. Since the hotel was built, the number of wineries has almost doubled in both Surry County and the Yadkin Valley as a whole, in spite of the recession. One business that served many of the hotel guests, a restaurant in Dobson, invested in a major renovation and expansion and now hosts weddings and other events. The hotel has also had a catalytic effect in terms of other lodging businesses—it was the first of its kind in Surry County, but since it opened, two similarly sized hotels have opened. Payroll employment in the county's accommodations industry has more than doubled, from 68 jobs in 2006 to 160 jobs in 2011. The Sheltons believe that their entry into the hotel business showed that it could be done in Surry County and convinced others to follow in their footsteps, just as they had done with their winery.

Another important way the project facilitated tourism growth was through the establishment and funding of the Dobson Tourism Development Authority (TDA). Before this project, Dobson did not have occupancy tax revenue or a TDA. Because of the Exit 93 project, the town was able to establish a TDA, and collect a six percent levy on rooms. Each year, the tax brings about \$100,000 to the TDA. The TDA, which is headed by Ed Shelton, has used the funding to beautify the downtown, build a new town website, advertise the town's attractions, and promote local events such as a fiddlers' convention. The TDA also contributes some of its funding to a new county-level tourism board, which promotes the county as a whole, focusing on wine and heritage tourism.

The project has also led to the strengthening of relationships within the county and the improvement of the area's utilities. When the project began, Dobson was somewhat "self-contained," even though it was the county seat. With an independent, isolated utility system, the town's board had no real reason to work with the county or with any of the other municipalities. This has changed in the years since the Exit 93 infrastructure extension was built, and today they have a close working relationship. Dobson has worked with the county on several new water projects, most significantly an extension from the town to an interstate exit northwest of Dobson, which used the interconnection point built by the Exit 93 project. The experience gained by the town and the county during the Exit 93 project, which had been the only one of its kind, has helped them better plan and implement similar shared projects and inter-municipal connections.

Finally, the Exit 93 project has had a major effect on the way the town is perceived, an effect compounded by the recent construction of the Shelton-Badgett Center for Viticulture and Enology at Surry Community College. On the most basic level, it improved the image of the town by cleaning up the Exit 93 area, which had previously consisted of dilapidated low-cost construction. Due in part to the Dobson TDA marketing, Dobson is now thought of as a potential destination, and some have even termed it the "unofficial capital of the Yadkin Valley wine region." This project has shown local residents how

change can be beneficial, and the Sheltons have promoted a vision for the region's future that many of them could get behind.

### 6.7.5 Lessons Learned

- ***Sometimes it pays to wait.*** County and town leaders waited for a good opportunity to come along before they went forward with plans for a water and sewer extension. In addition to the advantage of having attached jobs provided when competing for grants, having some guaranteed new utility customers and an increased tax base ensured that at least some costs could be covered. Also, having private sector partners as funders and allies was crucial to getting the project completed. The Sheltons' funding, influence, and expertise made the project much easier than it would have been otherwise.
- ***Connect projects to strategies built on a region's underlying strengths.*** Surry County has a competitive advantage in tourism and wine production, and over the past few years, county and municipal leaders have begun to recognize that. By focusing on things like winemaking, specialty agriculture, outdoor recreation, and heritage tourism, Surry County has chosen a path that is outward looking, but that would, by necessity, preserve or even enhance its rural, small town character. Because the Village at Shelton Vineyards was part of this broader strategy, the infrastructure extension is having an outsized impact, one that goes far beyond the businesses it directly serves.
- ***Meaningful projects can help a community define its path.*** For more than a century, Surry County was defined by tobacco and textiles. The decline of these industries, particularly the major loss of textile manufacturers in the years since 1990, left the county not only without jobs but also without a strong identity. The push for viticulture and tourism in the past ten years is not just a strategy for bringing dollars into the region by building up certain sectors; it is about a broader vision for the county's future. Perhaps more importantly, it has gotten residents to think of Dobson as an actual destination, part of an interdependent regional tourism economy.
- ***Stakeholders should be truly committed to a project.*** This project was designed through a process that ensured that the town and county governments, the developers, and area residents would all support it. The Sheltons, the city, and the county all took part in the project's planning and contributed significant funding to the project. This helped to ensure that everything went smoothly and that the final outcome would be to each partner's liking. When a grant that the town had expected to receive did not come through, they all contributed money to fill the gap because they considered themselves equal partners. What could have been a major roadblock was just a speed bump because each stakeholder had engaged in the planning process and had something to gain from the final project.
- ***Be realistic about outcomes.*** ARC chose to base its expected outcomes for job creation and private investment only on Phase I of the planned developments. This ended up being a wise decision, because after the economic recession hit, development stalled, and subsequent phases have not been completed. In cases like this where there is a particular development associated with a project, construction timelines should be looked at carefully and developers should be clear about how circumstances might affect their plans. The Dobson project was successful, but if conservative projections had not been used, it might not have been viewed that way.



### 6.7.6 Conclusion

The Exit 93 infrastructure extension allowed a major piece of development to go forward and provided the groundwork for future investment in the new service area. It brought in businesses that provided much needed jobs and tax dollars. More broadly, the project boosted two increasingly important parts of the regional economy – tourism and winemaking – by increasing the area's visibility and flow of tourists. Despite the fact that the highest hopes for the Village at Shelton Vineyards have yet to be realized, this project should be considered a successful example of how highly targeted infrastructure investment can spur growth, create jobs, and help a community suffering from manufacturing decline redefine itself as a 21<sup>st</sup> century tourist destination.

## 6.8 Muscle Shoals Industrial Infrastructure – Muscle Shoals, AL

The City of Muscle Shoals, Alabama, was awarded an ARC grant to construct utilities and road improvements in a new industrial park in order to support construction of a production facility by a large auto parts manufacturer. ARC provided funding of \$500,000, 18 percent of the total project cost of \$2.73 million. The grant was approved in August 2006, and the project was completed in late 2006.

### 6.8.1 Community Profile

Muscle Shoals is located in northwest Alabama, approximately 20 miles south of the Tennessee border. With a population of 13,146 in 2010, it is the largest municipality in largely rural Colbert County. The county's total population in 2010 was 54,428. Colbert and neighboring Lauderdale County comprise the Florence-Muscle Shoals Metropolitan Statistical Area, with a 2010 population of 147,137. Muscle Shoals, along with the adjacent municipalities of Florence, Sheffield, and Tuscumbia, are known collectively as the Quad Cities. Muscle Shoals experienced solid population growth during the 2000-2010 decade, with an increase of 10.2 percent, compared to 7.5 percent statewide and 9.7 percent nationally. At the same time, Colbert County as a whole experienced a slight population decline.

Colbert County has experienced improvement in its economic performance during the past decade. While employment growth has been modest, with an increase of 2.4 percent during the 2001-2011 period, it has still exceeded state and national levels, with declines of 2.2 percent and 0.2 percent, respectively. While unemployment rates significantly exceeded both state and national averages at the beginning of the decade, the gap was erased by the end of the decade. These improvements are reflected in ARC's upgrading of the county's economic status from "at-risk" when the project was approved to "transitional" by 2012. At-risk counties rank between the worst 10 percent and 25 percent of the nation's counties, while transitional counties between the worst 25 percent and the best 25 percent of the nation's counties.

The county has been a strong manufacturing center for decades. Manufacturing employment declined during the 1980s and 1990s with the loss of textile firms and manufacturers of products such as chemicals and metal products for the Tennessee Valley Authority as TVA down-sized. However, manufacturing still comprised almost 20 percent of total county employment in 2011, the greatest share of any industry, and actually experienced modest employment growth between 2001 and 2011. Other important industries are healthcare and social assistance and retail trade, both of which grew between 2001 and 2011, healthcare by almost 75 percent.

The economic well-being of Colbert County residents is, on average, somewhat lower than state and national levels, but the county also has a lower proportion of individuals at the low end of the income scale than the state. Median household income during the 2006-2010 period averaged \$38,610, compared

to \$42,081 statewide and \$51,914 nationally. The poverty rate was 15.7 percentage points, 1.4 percent below the statewide level but 1.9 percentage points above the national level.

### 6.8.2 Project Description

The City of Muscle Shoals constructed utilities and road improvements in a new city-owned industrial park to accommodate the needs of North American Lighting (NAL), a Japanese-headquartered automotive parts supplier, related to the construction of a new 80,000-square-foot manufacturing plant. The improvements to the 440-acre park adjacent to the Northwest Alabama Regional Airport included widening of a two-lane roadway in front of the park, construction of a new one-quarter-mile access road into the property, water lines, sewer lines, and a 500,000-gallon water storage tank. The project was initially estimated to create 320 jobs and leverage \$21 million in private investment. In addition to the \$500,000 ARC grant, funding for the \$2,731,000 project included a U.S. Economic Development Administration (EDA) grant of \$1.33 million, a \$750,000 grant from the Alabama Department of Transportation (ALDOT), and a \$151,000 local contribution.

### 6.8.3 Project Planning and Implementation

Having suffered through significant job losses and rising unemployment in the area through the 1980s and 1990s, local government officials and economic development leaders recognized that they needed to develop a more effective strategy to attract new jobs and diversify the area's economy. While this would require a higher level of regional collaboration, local governments in the area had a history of competing rather than cooperating around economic development.

The first major breakthrough in regional collaboration came when the Alabama Retirement System proposed investing in a new hotel, conference center, and professional-level golf courses in Florence. The local cost share was too much for the City of Florence and Lauderdale County to cover on their own, so the county commissions of Lauderdale and Colbert, along with the mayors of all the two counties' municipalities, agreed to enact a two-cent gasoline tax covering both counties that would stay in place until the municipal bonds issued for the project were paid.

With the successful completion of this project, the local governments were more inclined to work together when in early 2005 North American Lighting approached the Shoals Economic Development Authority (SEDA), which handled industrial recruitment for the two counties, about the possibility of locating its first southeastern plant in the area. Working with SEDA, NAL determined that the best location for the plant would be a large parcel of unimproved industrial land acquired by the City of Muscle Shoals in 2003 for a new 473-acre industrial park at a cost of approximately \$3.3 million. Once NAL had satisfied itself that Muscle Shoals was the right location and negotiated an incentive package with the state, it sat down with the city to discuss its site preparation needs and negotiate a timetable for completing site improvements. The timetable was aggressive – NAL expected to open the plant in late 2006. The city agreed to clear and level the site with its own funds by April 2006 so that plant construction could begin. It did not, however, have the financial capacity to pay for road and utilities improvements.

At this point, the city began to approach potential federal and state funders, including ARC, EDA, and ALDOT, for funding of the site improvements. Each of these agencies agreed to fund part of the estimated \$2.731 million project, leaving the city to provide the remaining \$151,000. In addition to taking responsibility for the site improvements, the city donated the 40-acre site to NAL.

NAL also requested local funding for workforce training through the state's AIDT Program. The city did not have the funds to meet this commitment alone so, working through SEDA, it approached the two



counties and the three adjacent municipalities to request a cost-sharing arrangement. Recognizing the regional importance of the project, all of the other governments agreed to contribute toward the cost. An equitable cost-sharing formula was worked out and the six governments contributed a combined amount of \$1 million.

With NAL's aggressive schedule in mind, city officials worked hard to ensure that they could hold up their end of the bargain. Once the engineering plans were finalized, they let the project out for construction. A working group of the mayor, a representative of the engineering firm, and local public works staff met weekly and sometimes daily to review progress and ensure the project remained on schedule. One serious challenge encountered because of the aggressive completion schedule was to invoice and receive payment from funders to meet the payment schedule of the contractor. While receiving disbursements from funders involved paperwork and delays, ARC and other funders showed the greatest flexibility possible to keep the project moving. The project was completed in late 2006, within the required timeframe and on budget.

#### *6.8.4 Economic and Community Impacts*

The project significantly exceeded expectations. The initial projections of 320 jobs and \$21 million in leveraged private investment were met when the plant scaled up its operations to full capacity. Then, in 2011, NAL doubled the size of the plant and hired hundreds of additional workers, bringing total employment to 800 and leveraged private investment to \$60 million. These jobs are also relatively well-paying.

While the impact of a single plant cannot typically be correlated with improvements in overall economic indicators, the impacts can be discernible in a small county like Colbert. While the growth rate for total wage and salary employment in Colbert lagged both state and national rates between 2001 and 2007, county employment remained stable between 2007 and 2011 while state and national-level employment declined by 7.1 percent and 4.4 percent, respectively. Differences in manufacturing employment trends are even more pronounced. While manufacturing employment declined significantly at the county, state, and national levels between 2001 and 2007, county manufacturing employment increased by 12.3 percent between 2007 and 2011, compared to declines of 19.9 percent and 15.4 percent, respectively, at the state and national levels. The plant may also account, in part, for the relatively strong population growth within Muscle Shoals between 2000 and 2010.

Demonstrating that Colbert County can be a competitive location for automotive industry suppliers has also generated additional automotive industry investment. In September 2012, TASUS, another Japanese automotive supplier, announced plans to build a \$19.1 million facility with 135 jobs in the Florence-Lauderdale Industrial Park. The area has also received inquiries from other automotive suppliers and hopes to attract additional plants. The fact that the area is located within 200 miles of 14 automotive assembly and engine plants positions it well to grow its automotive sector.

The project has solidified collaboration in economic development among the area's two counties and their municipalities. Shortly after the completion of the NAL plant, county and municipal officials unanimously agreed to create an area-wide economic development fund through imposition of a one-half percent increase in the local sales tax. Funding priorities are decided by a board of local officials from the two counties and the four major municipalities, and channeled through SEDA.

The project has also generated less tangible, but still important, benefits. For example, the local community college, working with NAL, has improved its workforce training programs. The increase in relatively high-quality jobs may encourage more young people to stay in school and remain in the community when they reach adulthood. NAL has become a strong partner with the community in

charitable and other civic activities. The community has become more outward looking through its contacts with NAL and its Japanese employees and is seeking to position itself as a location for additional foreign direct investment. In addition, local officials and economic developers believe that the community has gained a more positive view of its future, thus stimulating additional civic engagement and investment.

### 6.8.5 Lessons Learned

A number of important lessons emerged from the project:

- ***Be prepared for a timely response to economic development opportunities.*** While a small community and region with limited economic development capacity, Muscle Shoals and the rest of the Shoals region responded to their economic development challenges proactively. They prepared a Community Economic Development Strategy (CEDS) focusing on economic diversification, purchased industrial land, and prepared preliminary engineering plans for its development. As such, they were well positioned when a major industrial prospect, working under its own tight deadlines, imposed a short timeframe for the preparation of an industrial site for its new plant. Moreover, local officials organized to exercise close oversight of site preparation to ensure that it was completed according to schedule and to work closely with funding sources to ensure that funding delays did not slow the project. Had the region not been well prepared, the NAL plant may well have located in another community.
- ***Collaborate as a region.*** Having competed for industrial prospects in the past, county and municipal officials came to realize that in an era of global competition and international investment, demonstrating unity and collaboration is critical to attracting firms like NAL. Extending the collaborative culture that had begun to gel in the early part of the decade, the communities shared financial burdens and together offered a welcoming and supportive environment for NAL that helped to persuade the firm that Muscle Shoals was the best location for its new plant.
- ***Maintain close communication with the new firm at all stages of the process.*** Local economic development professionals and government officials noted the importance of maintaining close communication with key staff of the new firm, both before the final site selection decision and during the development process. They stressed the importance of developing close relationships, listening to and understanding the firm's needs, and solving any problems quickly as they arise. As underscored by the NAL executive in charge of the project, "Some of the competitors were more intent in telling us how great they were, but didn't listen to what we were looking for and didn't tailor their proposals to our needs. Folks in Alabama did it right."
- ***Work out payment logistics with funders at the outset.*** Muscle Shoals officials noted the difficulty of keeping the project moving on schedule because of delays by funders in processing payment requests. While all funders are bound by certain financial constraints, city officials noted that funders worked as creatively as possible to keep payments flowing. Working out these issues at the outset of the project may help to avoid project delays.

### 6.8.6 Conclusion

The location of the NAL plant in Muscle Shoals greatly contributed to the local and regional economies and significantly exceeded expectations. The project created a large number of relatively well-paying jobs and demonstrated that the region could compete in attracting automotive suppliers in the southeastern

U.S.'s rapidly expanding automotive sector. Key factors in the success of the project were the groundwork laid even before NAL approached the community, the collaborative approach of local governments, and the strong and responsive relationship developed with the firm.

## 6.9 Owingsville/Bath County Industrial Park Wastewater Treatment Plant – Owingsville, KY

The City of Owingsville installed a 300,000-gallon-per-day wastewater treatment plant to meet the expansion needs of Custom Food Products, a producer of value-added meat and poultry products situated in the Bath County Industrial Park. The ARC provided a \$500,000 grant to the project, approximately 17 percent of the total cost of \$3.04 million.

### 6.9.1 Community Profile

Owingsville, Kentucky, is a small city in Bath County, about 50 miles to the east of Lexington. The city, unlike many Appalachian communities, has been fortunate in recent years to experience some population growth – up 2.8 percent to 1,530 between the 2000 and 2010 Censuses, though still below growth rates for the state (7.4 percent) and the nation (9.7 percent) for the same period. Its population is also older and poorer than that of the U.S. as a whole. A full 22 percent of the city's citizens are over the age of 65, nine percentage points higher than the U.S. average. The city's median income, conversely, at \$25,820, is less than half of that of the country (\$51,914) and barely over two-thirds of that of the Kentucky (\$41,576). Its poverty rate, at 28.4 percent, is also over twice that of the nation (13.8 percent) and nearly 11 percentage points higher than the state (17.7 percent).

Bath County has traditionally relied heavily on manufacturing as a source of employment. However, manufacturing employment has declined in recent years, including during the past decade. In 2001, it comprised 25 percent of total county employment; by 2011, its share of employment had declined to nine percent. The loss of manufacturing jobs was the primary factor in an overall decline in county wage and salary employment of 19 percent.

The ARC characterized Bath County, in fiscal year 2012, as being “distressed” or among the “most economically depressed counties” in the country; this is a deterioration in its status from 2007, when ARC listed the county as “at-risk,” or as an area “at risk of becoming economically distressed.” The county's unemployment rate has remained higher than that of the state by anywhere from seven percentage points in 2005 to just over two percentage points in 2012.

At the time of the Owingsville project, interviewees reported that the local area was already “struggling to absorb” the closure of one of three manufacturing plants in the Bath Industrial Park and the loss of 100 jobs. This made proactive job-retention efforts even more critical.

### 6.9.2 Project Description

The City of Owingsville is the water and wastewater service provider for the Bath County Industrial Park. As of 2006, Owingsville's wastewater treatment facilities consisted of a 200,000-gallon-per-day lagoon wastewater treatment plant and 13.5 miles of collection line. Its lagoon treatment plant was at the point of exceeding its design capacity with the inflow of industrial waste from Custom Food Products, even before discussions about the expansion commenced. The lagoon treatment plant was not designed to handle large volumes of industrial wastewater.

To accommodate Custom Food Products, the City of Owingsville constructed a 300,000-gallon-per-day sequencing batch reactor (SBR) type wastewater treatment plant across from the Bath County Industrial Park. The city constructed the plant on land donated by Bath County. Construction included placing collection lines to intercept the existing sanitary sewer system, which transported sewage from the industrial park to the existing lagoon wastewater treatment plant, and to reroute the flow to the proposed new wastewater treatment plant via new sanitary sewer collection lines. The project was to include approximately 3,375 linear feet of 6- and 10-inch diameter PVC sanitary sewer lines. Construction started in August 2008 and was completed in mid-2010.

### 6.9.3 Project Planning and Implementation

In 2007, Owingsville's largest employer, Custom Food Products, situated in the Bath County Industrial Park, notified city officials that it was looking to expand and was not certain that it could do so at its current location. Custom Food Products produces "safe, high quality, value-added meat and poultry products" to food processors across the country.<sup>14</sup> That year, one of Custom Food Products' largest customers, ConAgra Foods, itself a multi-national food producer and distributor, asked Custom Food Products to expand into the ready-made sausage and biscuit market. This expansion would require not only additional space and staff, but also infrastructure that could handle the type of waste generated by such production. Custom Food Products spoke with city and county officials, advising them of the company's plans and of its inability to expand at its current location given the sewage infrastructure improvements that would be required.

Owingsville's wastewater treatment system at the time, a 200,000-gallon-per-day lagoon-style processing facility, was primarily designed to treat residential waste, not the waste generated by Custom Food's expanded plant. It was also already running at capacity.

Owingsville received this news on the backside of several other announcements of local layoffs and was already in the process of absorbing the loss of 100 jobs from another plant closing in the Industrial Park. Local policymakers met and determined that the city needed to find a way to enhance its wastewater collection and treatment system to keep Custom Food Products. The Owingsville mayor and the Bath County executive met with Custom Food Products leaders to ascertain the company's needs, hired consultants to help assess the wastewater capacity and needs, and then traveled across the state to view other similar wastewater treatment facilities until they found a model that would work for Owingsville. A package plant, 300,000-gallon-per-day sequencing batch reactor (SBR) wastewater treatment plant was determined to be the best fit for the city's industrial needs. The cost of the project was estimated at just over \$3 million.

The city then hired Bell Engineering to undertake the engineering work required for the package plant. To meet the expected \$3.04 million cost for the project, city and county officials worked together to apply for and receive \$1.2 million from the federal government through the Community Development Block Grant program; \$1 million from EDA; and \$500,000 from the Appalachian Regional Commission. Another \$338,997 was granted from the Kentucky Infrastructure Authority Revolving Loan Fund B.

Construction started on connecting the package wastewater treatment facility in August 2008 and was completed in mid-2010. Construction was reported to have gone smoothly, with one exception – in May 2010, a significant flooding event caused considerable damage to the plant and the park's facilities. FEMA and contingency funds assisted with clean-up, including the replacement of lab furniture and reworking

---

<sup>14</sup> <http://www.customfoodproducts.com/about.php>



of electrical systems. Even with these added costs, the project ultimately came in under budget, a savings that would have been even greater had the flooding event not occurred.

#### 6.9.4 Economic and Community Impacts

This project directly supported the retention of Custom Food Products' 122 jobs at the Bath County Industrial Park. The firm also created, as promised, 60 new jobs as a result of its expansion, plus an additional 42 jobs in subsequent expansions, 53 of which are reported to have gone to low- to moderate-income individuals. As a whole, investing in the infrastructure to retain an expanding major area employer resulted in 122 jobs retained and over 100 new jobs created. The plant's payroll before the project was at \$3.6 million, and has since increased by another \$2.2 million. Custom Food Products also invested \$26.2 million to expand its physical plant.

The construction of a second wastewater treatment facility also allowed the city's primary sewer line to absorb businesses and residences that did not have service. This included the Bath County Educational and Marketing Center, a \$400,000 United States Department of Agriculture Rural Business Enterprise Grant recipient, designed to give local farmers the ability to produce and market their value-added goods<sup>15</sup> as well as 105 homes just across the county line (though still in the sewer district). Additionally, the new capacity allowed the Ridgeway Nursing and Rehabilitation Facility to expand, increasing its beds from 60 to 99. These new connections added tax revenue to city coffers and benefitted local businesses and individuals who needed proper sewage connections.

While the Custom Food Products facility is currently the only tenant in the Park, Owingsville Mayor Gary Hunt is optimistic about future growth, especially with the newly enhanced infrastructure. "One of the factories is going to sell at auction," he commented. "There has been lots of interest." Having the second sewer plant with lines that can be re-run to easily and effortlessly accommodate such growth, he noted is "great insurance" for the future.

Despite the recent economic hits, Mayor Hunt reported, "The last few years have been very progressive." Beyond the Custom Food Products expansions, Owingsville has "improved its downtown, ...[instituted] a new streetscape program, new sidewalks, new lights," often through other ARC funding. Since it started these revitalization efforts, supported by tax dollars from employers like Custom Food Products, Owingsville has seen several new businesses open in the city's downtown, and it has started to see its population begin to grow, giving the city and the area great hope for additional future development.

#### 6.9.5 Lessons Learned

- *Investing in infrastructure can play a critical role in municipalities retaining large employers.* Municipal investments in infrastructure projects can both retain current jobs and position a community for future economic growth. In the Owingsville case, Custom Food Products required the wastewater infrastructure in order to expand. Without it, the firm would have moved elsewhere. The quick reactions of city and county officials, working together to draw up appropriate plans and find the appropriate financing to pay for the project, resulted in the construction of the necessary infrastructure to retain one of the area's largest employers. Without it, Custom Food Products' 122 jobs would have been lost, and the area would not have benefited from the 100-plus additional jobs the firm has since created through its expansions. Another \$2.2 million has also been added to local payrolls.

---

<sup>15</sup><http://blogs.usda.gov/2010/08/31/new-marketing-center-for-local-producers-opens-in-kentucky-thanks-to-recovery-act-support-from-usda/>

- *Increasing infrastructure capacity can have many indirect benefits.* While Custom Food Products' requirement for increased sewage capacity was the main driver for the addition of the new plant, it was not the only one. According to the city's official project summary, during the period of July 2003 through February 2006, the city's lagoon plant exceeded its design capacity in 17 of the 32 months. Residences and even some local businesses were not able to be connected to the city sewer due to these capacity constraints. With the addition of a second plant, providing excess capacity, 105 new homes and the Bath County Agricultural Complex have been added to the sewer system. Increased sewage capacity also enabled the Ridgeway Nursing and Rehabilitation Facility to increase its beds. Further, as Owingsville's current mayor noted, it also left the Park more attractive to future businesses looking at the area as a possible plant site: "[We were] very appreciative to get the sewer plant. Once you've got it, you've got it. While it's not at full capacity [now, it is] still a good selling point for future growth."
- *Developing systems for tracking funding and ensuring that funds are used appropriately can be an invaluable project management technique.* The project's grant manager from the area's local development district stated that one of the most valuable steps she took through the process was a small, simple one done from the start: tracking the funding sources and their use. "Before we submitted the first application, we invited all funders to the table. We sat down around the table and brainstormed and talked about how we could best approach this," she recalled. "When you're trying to get something done quickly, you cannot afford to make mistakes. For example, if you get half-a-million in CDBG funding...it needs to be used in a particular way. You can't use that for engineers, for instance. [So we tracked] the money. I designed a grid and tracked funding across components. It also saved time, and allowed people [coming in] who weren't [already] familiar with the project to take over, if needed." Funding requirements are often complicated, and become only more confusing when multiple funds are combined in one pool. Having simple processes from the start of a project to clearly depict which funds can be used for which parts of construction can help a project save time and money.

#### 6.9.6 Conclusion

The ARC grant allowed the City of Owingsville to build the infrastructure necessary to retain one of its leading employers in the Bath County Industrial Park and enabled the firm to proceed with its expansion plans. Custom Food Products continues to thrive, and has since nearly doubled its employment to over 200. Bath County and Owingsville have both benefitted from increased employment tax revenues.

Further, the extra capacity from a second sewer line has taken pressure off the city sewer system, allowing other entities that previously did not have service, including 105 homes and an agricultural center, to connect to the infrastructure (and pay related fees). A local nursing home, given the ability to expand its sewer use, was also able to increase the number of beds available.

Bath County and the City of Owingsville have faced considerable challenges over the past decade, including high poverty rates and low median incomes, but local officials' ability to work together to retain businesses, supported by ARC funding, has helped to mitigate jobs losses and set the stage for new economic activity.

#### 6.10 Powdersville Water Storage Tank Project – Powdersville, SC

Powdersville Water District (PWD) received ARC funding in 2008 to construct a one-million-gallon above ground water storage tank to better serve customers in and around the community of

Powdersville, South Carolina. The primary purpose of the project was to support business development and job creation in the area, particularly along a high-growth highway corridor spanning parts of Anderson and Pickens Counties. The ARC awarded the project a \$500,000 grant, 30 percent of the total budget of \$1,687,000.

### *6.10.1 Community Profile*

Powdersville is an unincorporated community in Anderson County near the Pickens County line. Anderson and Pickens Counties are part of the eight-county Greenville-Spartanburg-Anderson Consolidated Statistical Area, located in the northwestern corner of the state on the Georgia border. Powdersville is a fast-growing suburb of Greenville, which lies 10 miles to the northeast. Its population increased 42.1 percent between 2000 and 2010, to 7,618. The combined population of Anderson and Pickens was 306,350 in 2010, an increase of 10.8 percent from 2000. This compares to growth rates of 15.3 percent and 9.7 percent, respectively, at the state and national levels.

While both Anderson and Pickens Counties experienced population growth during the past decade, employment declined. Between 2001 and 2011, wage and salary employment declined by 9.8 percent in Anderson and by 3.9 percent in Pickens. By comparison, employment at the state and national levels declined by only 0.2 percent and 0.3 percent, respectively. At the same time, unemployment rates during this period averaged only slightly higher in Anderson than statewide and actually lower in Pickens. This likely reflects the fact that many workers in both counties commute to Greenville and elsewhere to find work. Both counties' unemployment rates were still consistently above U.S. rates, as was the state's.

The largest industries in both counties are manufacturing, including many automotive suppliers to the BMW assembly plant in nearby Spartanburg, retail trade, healthcare and social assistance, and accommodation and food services. Industry trends in both counties have been similar, with manufacturing declining dramatically between 2001 and 2011 (by almost one-third in both counties), retail declining slightly, and both healthcare and social assistance and accommodation and food services expanding considerably.

Powdersville is a relatively prosperous community, much more so than the rest of Anderson County or Pickens County. Its median household income during the 2006-2010 period averaged \$60,616, while its poverty rate averaged only 6.4 percent, far better than state and even national levels. In contrast, these indicators for the two counties were about equal to state levels and considerably less favorable than national levels. Both counties were classified by ARC as "transitional" in 2008 when the ARC grant was awarded and again in 2012. A transitional county is defined as economically positioned between the 25 percent most distressed and 25 percent most robust U.S. counties.

### *6.10.2 Project Description*

The project involved the construction of a one-million-gallon water storage tank with appurtenances along a designated "high-growth corridor." The tank was needed to comply with state regulations involving fire flow protection (the amount of water that should be available for providing fire protection at selected locations) for existing residences and businesses. By increasing system capacity, it also enabled the PWD to support planned residential and commercial development and accommodate future development. In addition to the \$500,000 ARC grant, the remaining costs were covered by a \$1.187 million low-interest loan from the South Carolina Department of Health and Environmental Control's State Revolving Loan Fund (SRF).

### 6.10.3 Project Planning and Implementation

The Powdersville Water District has almost 12,000 taps and serves over 30,000 people, mostly in Powdersville and the surrounding area of northeast Anderson County, with approximately 80 percent of its customers. It also serves a small portion of southern Pickens County, with the remaining 20 percent of its customers. PWD played the lead role in the planning process, which began in late 2007.

Two factors primarily drove the decision to undertake the project. First, there were concerns about water pressure differentials in the system. The PWD service area is hilly, resulting in three different pressure zones. One zone had very low pressure at the time, while one had much higher pressure. This resulted in highly uneven pressure in different areas. The region needed more water storage in order to equalize pressure throughout all the zones, increase the reliability of the system, and meet state fire flow regulations. Second, rapid population growth in the area was generating significant increases in water demand. Increasing capacity would enable the PWD to expand water storage capacity to meet the increasing demand associated with new business and residential development. Major development projects were already underway at the time, including a medical facility, a hotel, and two educational facilities – a high school and a middle school.

Dyke Spencer, the PWD's general manager, oversaw the implementation of the project, assisted by Gordon Brush, the director of finance and administration. PWD enlisted BP Barber, an engineering firm based in Columbia, South Carolina, to design the tank. BP Barber had a long history of work with PWD over 25 years and, therefore, had already established a strong working relationship with the district. BP Barber created a model of the area as well as measurements and elevation data taken from the region in order to create a model for designing the project. Dirk Reis, the grant services administrator for the Appalachian Regional Council of Governments, assisted the PWD in preparing funding proposals to ARC and the SRF.

The storage tank was originally designed with a 750,000-gallon capacity, but was increased by 250,000 gallons during the bid process when it became apparent that the recession had significantly depressed material and labor costs, making it possible to build increased capacity to meet future growth needs at a reasonable additional cost. The expansion increased the cost of the project by \$447,000, from \$1.24 million to \$1.687 million. The initial SRF loan of \$740,000 was increased to \$1.87 million to cover the additional project costs. Construction commenced in early 2009 and took 18 months to complete. The tank was put online in August 2010, well ahead of the projected completion date of date March 31, 2011.

### 6.10.4 Economic and Community Impacts

To date, the project has had a significant impact on the community. The increased water supply, speed, and reliability have helped to stimulate growth, particularly along the designated high-growth corridor. Job creation associated with the project has greatly exceeded original projections. Initial job creation estimated in the ARC grant proposal was 80. By the time the final closeout report was submitted, the grantee reported that the project had already created 110 jobs. And since the completion of the project, at least nine more businesses with over 300 employees have opened. The corridor has seen considerable growth since the project was completed, due in large part to the water system's ability to accommodate more businesses. Among the new developments are several gas stations, a pharmacy, a value retail store, a restaurant, an engineering firm, and a manufacturer. Other businesses have expanded.

New business development has also improved the quality of life for area residents by increasing the availability of retail and service businesses to serve the area's rapidly growing population. Before the project was completed, the area lacked a sufficient retail and service base to meet the needs of the



community. The jobs created also enable more area residents to work closer to home rather than having to commute to Greenville or other urban centers to find employment.

More generally, the project may position Anderson and Pickens Counties to capture more regional employment growth. While employment in both counties has declined during the past decade, employment in adjacent Greenville County has increased. With increased water capacity, more regional businesses may consider the parts of Anderson and Pickens Counties served by the PWD more desirable locations to start up or expand.

Overall, the community and those involved directly in the project consider it a success in terms of increased employment opportunities, additional tax revenues, and higher quality of life. Moreover, incorporating additional capacity has created room for additional business and residential development.

### 6.10.5 Lessons Learned

Those involved in the project cite a few lessons learned from their experience:

- ***A long-range perspective is needed to anticipate future infrastructure needs, particularly in growth areas.*** Those involved in the project came away with the understanding that it is important to always look to the future and what will be required to accommodate future growth. By anticipating expansion in the Powdersville area, especially as it has increasingly taken on the character of a bedroom community to the City of Greenville, it only made sense that more water storage capacity would be required to support this growth. Positioning the project to serve an area already designated a high-growth corridor also ensured that growth would be channeled to areas that were equipped to accommodate development.
- ***A larger initial investment may save money in the long run.*** In some instances, it makes sense to design an infrastructure project with spare capacity, even if it is not needed to meet immediate needs. By taking advantage of low construction costs during the recession, the PWD was able to build in the additional capacity that will very likely be needed in the not-too-distant future at a reasonable cost. Waiting to expand the system until economic growth accelerated would likely have cost PWD customers more in the long run.

### 6.10.6 Conclusion

Overall, the Powdersville water storage tank project can be considered a sound investment. Prior to this project, the area did not have a sufficient, reliable water supply to support the commercial development necessary to serve a growing population. The construction of the one-million-gallon water storage tank created over 100 jobs initially by facilitating the development of planned projects such as the expansion of the area high school and middle school, a medical facility, and a hotel. Over time, additional development has occurred, and more jobs have been created. With the expanded water system, Anderson and Pickens Counties, which have been lagging behind adjacent Greenville County in employment growth, have greater capacity to support business development, laying the groundwork for further employment growth and increased quality of life.

## 6.11 Racine Water Treatment Plant and Storage – Racine, OH

The Village of Racine, Ohio, received funding to replace its deteriorating water facilities with a new 300,000-gallon-per-day water treatment plant and a 394,000-gallon ground water storage tank, and in response to flooding during the fall of 2004, to raise the system's wellhead and install new electrical

systems, allowing for uninterrupted water service for residents during such events. The system was designed not only to serve the 315 households in the community, but also to allow shovel-ready investment to occur and to position the village for longer-term economic development. The ARC provided funding of \$457,000, 23 percent of total project costs.

### *6.11.1 Community Profile*

The Village of Racine, Ohio, is a small rural community in Meigs County in southeast Ohio. Located along the Ohio River, just across from West Virginia, it is a community of 675 individuals, mostly lifelong residents. The village's population has declined by 9.6 percent between 2000 and 2010, compared to growth of 1.6 percent statewide and 9.7 percent nationally.

Racine's citizens largely find employment outside the village, traveling north to the University of Ohio, west to two aluminum plants, or to one of several nearby power plants. Locally, many residents find employment within the Southern Local School District, based in Racine. The District, which serves 720 students, includes an elementary school (K-8) and a high school (9-12). The schools are widely considered to be the center of the community, and the school district regularly works with local leaders to make the area more hospitable for growth.

Meigs County was categorized as a "distressed" county by ARC in fiscal year 2013, as it was when initial ARC funding for the water project was approved in 2004, making it among the "most economically depressed counties" in the nation. The county's unemployment rate has consistently exceeded both state and national averages by significant margins during the past decade. Between 2001 and 2011, unemployment averaged 10.7 percent, about four percentage points above both state and national levels. In 2011, it stood at 13.5 percent. The county has also experienced significant job loss during this period. Between 2001 and 2011, total employment declined by 26.1 percent, compared to declines of 8.6 percent and 0.2 percent, respectively, at the state and national levels.

At the village level, median housing income averaged \$31,250 during the 2006-2010 period, only 66 percent of the statewide average and 60 percent of the national average. The village's poverty rate of nearly 35 percent is more than twice that of both Ohio and the U.S.

### *6.11.2 Project Description*

The village constructed a new 300,000-gallon-per-day-water treatment plant and a 394,000-gallon ground water storage tank. With a grant supplement, it was also able to make necessary wellhead improvements, including raising the wellhead and installing a new electrical service. These investments allowed the village to have regular access to clean, treated water, even during floods, with lower long-term maintenance costs. It also gave the village the capacity to handle future growth. The project's final cost of \$1,956,900 was funded by a combination of federal, state, and local dollars, including two ARC grants totaling \$457,000, a \$500,000 grant from the federal Environmental Protection Agency, an \$865,000 State Small Cities Community Development Block Grant (CDBG) grant, and a \$124,900 local match, which combined a local cash contribution with a loan from the Ohio Water Development Authority.

### *6.11.3 Project Planning and Implementation*

In the early 2000s, Racine undertook a master planning process to combat the area's population loss and create a stronger foundation for future economic growth. One of the areas identified as being most in need of investment was the village's water system. Its water plant required extensive and expensive



ongoing maintenance for normal operations, was already operating 23 to 24 hours per day, and had a severely corroded aeration system that did not meet industry standards. In addition, the system did not fully meet the village's water needs, requiring additional water to be purchased from other communities.

When a developer was evaluating the area as a possible site for a new power plant, the village government, led by Mayor Scott Hill, a strong infrastructure advocate, started meeting with various community stakeholders and possible funders to discuss a permanent water solution. Hill believed that investments in infrastructure were essential for the village's future. Beyond the possibility of the power plant being sited near Racine, Mayor Hill also believed that the investment was essential to attracting new residential and commercial growth and to more effectively serving existing users. The elementary school, built in 2000, already needed to have a new pump installed to improve its water pressure, and then had to replace its boilers due to the hardness of the water. With the possibility of a major new investment in the high school, the water project was imperative.

With water rate increases not a feasible option for financing a project expected to cost well over a million dollars, Hill began to seek external funding. Racine had a history of receiving state and federal funds, and of efficiently managing these funds, making Hill's task easier. Understanding a funder's reluctance to commit funding without support from other funders, Hill also brought funders together on several occasions in Racine to see the issues at hand.

From federal, state, and local agencies, Hill was able to raise \$1.76 million for the project, including \$300,000 from ARC, to build the water treatment plant and storage tank. The investment would enable the village to service the needs of the elementary school and other public facilities, existing homes and businesses, and to provide the capacity for future growth in and adjacent to the village.

In September 2004, while the project was in the design phase, serious local flooding caused significant damage to Racine's water supply well and exposed chronic weaknesses in the system that, even with the new investment, would not be alleviated. The existing wellhead on the system was prone to flooding, as often occurs along the Ohio River, leaving residents without service while supplies and treatment facilities are brought back online. Hill once again approached funders and asked for an expansion of the project to address this issue during the planned construction, proposing a raised wellhead and new electrical service. The supplemental investment was expected to allow Racine the use of its water supply during floods, eliminating service disruptions. To the revised proposal, ARC agreed to contribute another \$157,000, and the village increased its contribution by \$40,000, bringing the total project cost to \$1,956,900.

The water treatment plant construction generally proceeded smoothly, although Mayor Hill noted occasional issues with the consulting engineers. He attributed this to the previously locally owned firm being acquired by a larger non-local firm with less of an interest in making the project anything more than a "cookie-cutter" exercise. However, by project's end, Hill believed the community received what was originally promised.

#### *6.11.4 Economic and Community Impacts*

The village has experienced considerable development since the completion of the project. Among the most notable developments:

- The opening of a Dollar General in Racine's downtown, bringing residents a nearby and affordable shopping option;
- The construction of a new shopping center containing several retail establishments;
- Construction of a new \$2 million branch by the local bank; and

- The recent news that a housing developer was planning to build 15 new homes on vacant land, a substantial expansion of the residential stock for a community of 315 households.

These projects would likely not have been undertaken without the improvements to the water system. The improvements also facilitated a \$10 million investment to renovate and expand the local high school, enhancing a major community anchor.

This development activity speaks to a growing confidence in the area's potential, all of which, according to Perry Varnadoe, director of the Meigs County Economic Development Office, would not have been possible without the water system investment. He credits 30 retained and 25 new jobs to the project. He also notes that it has made Racine a growth center within the county. "Small towns are always on the precipice of going one way or the other. Racine is tipping in the right direction."

Another benefit of the project is cost savings for the village government. It is now incurring significantly lower maintenance costs while servicing more customers.

### 6.11.5 Lessons Learned

Racine's investment in its new water system has put the community on sounder footing for growth. Participants in the project took away a number of lessons:

- ***Take advantage of free or low-cost resources when putting together a project proposal.*** Racine, a small community under significant financial limitations, did not have the resources to hire a consultant or engineer to develop a comprehensive project plan to present to potential investors. Instead, Mayor Hill turned to the Rural Community Assistance Partnership (RCAP), a national nonprofit that provides technical assistance to rural communities. It provided Racine with the technical assistance and support its leaders needed to put together a viable and credible proposal. With RCAP's assistance, Racine was able to garner the investments it needed for a system that would suit its needs.
- ***To avoid "first funder" hesitation, where possible, convene a meeting of all potential funders.*** For projects similar to the one undertaken by Racine, finding a first funder willing to commit money to a project is a chronic challenge. In Racine, to overcome this obstacle, Mayor Hill invited all of the funders to the village simultaneously to see the need and to discuss the collective resources they had available to invest. The community was then also able to demonstrate its own buy-in to the project. Racine raised nearly all of the funds it required to fund the water treatment plant and storage facility, including those supplemental funds needed after the 2004 flood.
- ***Community buy-in is essential for success.*** While small communities' investments in projects like that of Racine may comprise a relatively small share of total project costs, they can be quite substantial on a per-person basis. In Racine, the \$124,900 share in loan and local cash contribution amounted to over \$185 per person. With average household income around \$31,000, an investment of this magnitude is not insubstantial, especially when other needs are still left unfulfilled. Recognizing this, Mayor Hill started "knocking on people's doors" to get their thoughts and to make the case for the project. He later also held several information sessions about the plan. According to Tony Deem, superintendent of the Southern Local School District, the mayor "spent a lot of time speaking to a lot of people, as he does with any sort of project. He then focuses on what people think needs to be done, not what he thinks." By proactively approaching the citizens of Racine, Mayor Hill not only was able to get their input, but also their support, a critical ingredient in any successful project.



### 6.11.6 Conclusion

The investment in Racine's water treatment and storage infrastructure gave the area a basic foundation upon which additional growth and investment could occur. Thanks to this project, an estimated 55 jobs have been created or retained, 15 new homes are being built in a community that has seen little investment in new housing stock in decades, the high school is able to undergo a \$10 million renovation and expansion, and commercial development, including the addition of a new Dollar General downtown and a \$2 million bank branch location, has occurred. Paired with another of Mayor Hill's initiatives to move the main business district further from the flood zone, Racine has taken significant steps to position the village for future private-sector investment and employment growth.

## 6.12 Wastewater Treatment Solutions for Small Communities – Canaan Valley Institute, WV

The Canaan Valley Institute received ARC funding to support the development of decentralized wastewater treatment facilities through technical assistance to nonprofit organizations and public entities in small, unincorporated communities in three counties of southern West Virginia's coal region. ARC provided a grant of \$96,811, 55 percent of the total cost of \$176,865. The grant was awarded in October 2008 and the project was completed in September 2010.

### 6.12.1 Community Profile

The project focused on a rural area of southern West Virginia encompassing McDowell County, western Raleigh County, and Wyoming County. In 2010, the three counties had populations of 22,113, 78,859, and 23,796 respectively.

The area's economy was dominated by the coal mining industry for many decades and has continued to remain highly dependent on coal even as mining employment has declined dramatically. The loss of mining jobs beginning in the mid-20<sup>th</sup> century was accompanied by dramatic population loss as working residents left the area in search of other employment. McDowell County, once the highest coal producer in the U.S., was most severely impacted, losing an extraordinary 78 percent of its population between 1950 and 2010. Wyoming County experienced a lesser but still substantial decline of 37 percent. Raleigh County, more economically diversified and urbanized, experienced a relatively small loss of 18 percent. Population decline in McDowell and Wyoming Counties continued between 2000 and 2010, by 19.1 percent and 14 percent respectively, while the population of Raleigh County remained stable. In contrast, population at the state and national levels grew by 2.5 percent and 9.7 percent respectively.

Economic data underscore the continuing importance of coal mining to the area's economy. In McDowell and Wyoming Counties, mining comprised 37.8 percent and 24.8 percent of total private employment respectively in 2011 and remained the largest single private employer by a wide margin. In more diversified Raleigh County, mining still comprised 7.9 percent of total private employment, behind only retail and health care. Moreover, general employment trends continue to be strongly influenced by the fortunes of the mining industry. Employment growth in McDowell County between 2001 and 2011 was a strong 20.3 percent, driven largely by a more than doubling of mining employment. Even in diversified Raleigh County, total employment growth of 8.1 percent was strongly influenced by mining employment growth, which was second only to health care. In Wyoming County, which experienced a decline in total employment of three percent, mining employment grew relatively modestly, too little to counter declines in most other industry sectors. Both McDowell and Raleigh counties outperformed the state and U.S. in employment growth while Wyoming County underperformed them.

The economic status of area residents varies considerably by county, although all three counties lag national averages in key indicators of economic well-being. McDowell is the most severely distressed while Raleigh is the most prosperous, although the western part of the county included in the project area is less so. In terms of employment status, 2011 unemployment rates range from somewhat higher (McDowell) to somewhat lower (Raleigh) than state and national averages. More significant, however, are labor force participation rates, which show the percentage of adult residents working or actively seeking work. These are extremely low both in McDowell and Wyoming Counties, 31.2 percent and 42.2 percent respectively during the 2006-10 period compared to 55 percent statewide and 65 percent nationally. Even Raleigh, with a rate of 50.6 percent lags state and national averages. This indicates that a disproportionate number of residents have simply dropped out of the labor force.

In terms of income levels, McDowell County again fares most poorly. Its median household income of \$22,154 during the 2006-10 period was only 58 percent of the state average and 43 percent of the national average, and the poverty rate of 32.6 percent was almost twice the state average and more than twice the national average. In Wyoming and Raleigh Counties, median household incomes and poverty rates were roughly on par with state levels but significantly below national levels.

When the project was initiated in 2008, ARC classified McDowell and Wyoming as “distressed,” and Raleigh as “transitional.” In 2012, McDowell and Raleigh held the same classifications while Wyoming had improved to “at-risk.” Distressed counties rank among the worst 10 percent of U.S. counties, at-risk counties between the worst 10 percent and 25 percent, and transitional counties between the worst 25 percent and the best 25 percent.

While mining employment ticked upwards during the 2001-11 period, state and local government officials and economic development professionals have recognized the need to diversify the area's economy to compensate for the long-term decline of coal mining employment, stem population outflows, and create new employment opportunities. Efforts have been underway to increase recreational and cultural tourism through the development of a large network of all-terrain vehicle (ATV) trails and the 187-mile Coal Heritage Trail, improving state park facilities, promoting local artisanship, and other initiatives. Still, the area faces significant barriers to diversification, including poor highway access, limited telecommunications infrastructure, and gaps in water and sewer services, particularly outside larger municipalities.

### *6.12.2 Project Description*

ARC provided funding to the Canaan Valley Institute (CVI) to support the development of decentralized wastewater treatment facilities in small, unincorporated communities in the three counties. Most homes in these areas are not connected to wastewater treatment facilities and are discharging raw sewage into streams, which have become severely impaired by fecal coliform and related contaminants. In many cases, centralized sewage systems remain too expensive and impractical to develop and maintain or extend from existing municipal systems. CVI worked with local non-profit organizations and public entities to support planning and design of non-traditional waste collection and treatment systems, developing management structures, training system installers and operators, and securing funding. In addition to the ARC grant of \$96,811, CVI contributed a local match of \$80,054, for a total project cost of \$176,865.

### *6.12.3 Project Planning and Implementation*

Major flooding that occurred in the area in 2002 created the initial impetus for the project. As rivers and streams overflowed their banks, water contaminated by raw sewage flowed into area homes, compounding water damage and cleanup costs. The damage was particularly severe in the many small,

unincorporated, former mining communities spread throughout the area. Some area residents, searching for ways to reduce the impact of future floods, formed citizens' organizations to explore solutions. One of these groups, the Wastewater Treatment Coalition of McDowell County (WTCMC), identified CVI as a source of technical assistance, and approached it for help in 2003.

CVI is a nonprofit organization that assists small communities throughout West Virginia and western Maryland to address wastewater treatment and wetlands restoration needs. Its areas of expertise include engineering, project development, grants management, training, and GIS services. Its initial work involved assisting WTCMC and another citizens' organization, the Upper Guyandotte Watershed Association (UGWA), to prepare wastewater treatment plans for their areas. The plans identified where wastewater treatment was needed and what types of solutions were possible, developed action steps, and established priorities. Because many small communities were too far from larger communities with municipal wastewater treatment systems to make extension of these systems financially feasible, and they were located in narrow valleys with insufficient or unsuitable land area for septic systems, the plans focused heavily on the use of self-contained "package" wastewater treatment systems designed to serve small clusters of users.

CVI also assisted the UGWA to develop its first pilot project in Helen, a town of about 200 residents in Raleigh County. Its role included assisting in selecting the most appropriate treatment system, customizing the design of the system, community outreach efforts, engaging with county government and state regulatory agencies to obtain necessary funding support and regulatory approvals, and working with the area's public service district (PSD) to enlist its participation in developing and managing the system. Eighty-four residences in the community were ultimately connected to the new system.

In West Virginia, PSDs are autonomous public agencies appointed by county governments and responsible for providing water and sewer services outside communities with municipal systems. The PSDs in the project area had typically focused primarily on improving water service and were largely unfamiliar with package wastewater treatment system technologies. CVI's role in educating the PSDs about package systems and demonstrating the feasibility of installing systems in particular locations was therefore critically important.

This initial work laid the groundwork for the ARC-funded project. Working with the UGWA and the WTCMC, CVI targeted six communities across the three counties for design, funding and installation of self-contained wastewater treatment systems, and planned to assist at least 20 homeowners in selected areas to install individual septic systems. While the goal was to have all of these projects completed within five years, individual milestones to be achieved by the end of the grant period were established for each community and for the septic tank component.

The initial grant period was one year. However, CVI's work progressed more slowly than first anticipated, and it requested and received from ARC a one-year no-cost extension. A number of factors contributed to the delay, primarily related to the unconventional nature of the package systems. These included the challenge of identifying suitable sites and tailoring the design of each system to the unique geological and topographical conditions of the site, overcoming reluctance of some PSDs to participate in projects, working with regulatory agencies to ensure that the systems met regulatory standards, and obtaining needed funds for project design and construction.

By the end of extended grant period, a new system had been installed in one of the six communities, systems were in various stages of development in the five others, and 46 septic tanks had been installed, meeting or exceeding all of the established milestones. In addition, CVI assisted in initiating projects in three other communities that were not included in the project work plan.

#### 6.12.4 Economic and Community Impacts

CVI, working with its local partners, achieved the following outcomes related to its initial work plan. Some of these outcomes reflect progress since the end of the grant period:

- Installed wastewater collection and treatment systems serving a total of 27 homes and one business in the communities of Ashland and Ury.
- Helped 50 homeowners install residential septic systems with loans from a state low-interest loan program.
- Completed design and obtained project funding for extension of the City of War's municipal water and sewer systems to the communities of Shop Hollow and Centerville, serving 56 homes. As of late 2012, these projects were ready to bid.
- Completed detailed engineering design for a wastewater collection and treatment system serving 42 homes in the community of Amigo. Partial funding had been obtained for the project as of late 2012.
- Completed project plans and a preliminary engineering report for a wastewater treatment and collection system serving 129 homes in the community of Crumpler.

When completed, these projects will serve a total of 304 homes and one business, 29 more homes than projected in the ARC grant agreement. UGWA and WTCMC members acknowledge that CVI's assistance has been critical in moving these projects forward.

Other projects that CVI supported during the grant period are also progressing. These include wastewater treatment and collection systems serving a total of over 670 homes in the communities of Coalwood, Iaeger, and McDowell. CVI is also working with the UGWA to expand Wyoming County's wastewater treatment plan to cover the entire county.

In addition to improving the quality of life for area residents, these initiatives are beginning to yield significant economic impacts that will grow as more of them are completed. First, they are supporting tourism development. As streams that used to receive untreated sewage experience reductions in coliform bacteria levels, they are again becoming suitable for fishing. In Ashland, a few homes have been remodeled into tourist cabins for ATV visitors. And the reduction of odor from raw sewage has made communities with Coal Heritage Trail sites more appealing to visitors, potentially promoting the development of tourism-related businesses such as restaurants and artisan shops.

Second, these initiatives are helping to strengthen the area's housing market. Without sewage service, homes cannot legally be sold, contributing to housing disinvestment and abandonment. As homes are connected to new sewage systems, homeowners are now able to sell them legally, increasing their value, encouraging better upkeep, and enabling new residents to move into the communities as others leave.

UGWA and WTCMC members observe that these improvements are contributing to a greater sense of pride and hope in residents who, having experienced the seemingly relentless decline of their communities, now see the potential for stabilization and even revitalization.

To be sure, the projects in themselves, even when completed, will only make a small dent in the area's wastewater problems. Scores of small, unincorporated communities throughout the area continue to lack treatment systems. However, CVI and local citizens groups view the projects as models that can increase awareness of the problem and demonstrate to PSDs, local governments, regulators and area residents that solutions are technically and financially feasible through the application of innovative technologies. They believe that a small number of successful projects will increase the knowledge and capacity of PSDs, working with local citizens, to apply new treatment technologies and generate more widespread efforts to extend wastewater services throughout the area.



In the long run, improving wastewater treatment on a large scale can, along with other economic development investments, better position the area for economic diversification by providing modern infrastructure and improving the quality of life, important factors in business investment decisions.

### 6.12.5 Lessons Learned

As a whole, the project met or exceeded its milestones and is on course to achieve its goals for new wastewater treatment infrastructure, albeit at a slower pace than originally anticipated. CVI's partner organizations, UGWA and WTCMC are highly satisfied with the assistance it provided. The project yielded a number of important lessons:

- ***Grassroots citizen activism can play a key role in infrastructure development.*** ARC typically works with public agencies to support local infrastructure development. In this case, however, the public agencies responsible for infrastructure development needed prodding from an active local citizenry to begin to address a critical infrastructure problem. Community residents organized to establish the UGWA and WTCMC, then engaged with their public service districts and county governments to promote solutions. While these groups were not ultimately responsible for building and managing wastewater treatment systems, they played key roles in educating PSDs about new technologies, securing their involvement, determining project priorities, gaining public support, guiding project design, and obtaining funding.
- ***Outside organizational and technical support can play a catalytic role in resource-poor communities.*** UGWA and WTCMC would have been much less effective without CVI's support. With its extensive specialized knowledge of small-scale wastewater treatment, CVI played a critical role in community education, planning, systems design, funding, and construction oversight. CVI's role was particularly important in supplementing the limited capacity of PSDs to undertake new projects using unfamiliar technologies. As such, ARC's small investment in technical assistance resulted in millions of dollars of new infrastructure investment.
- ***New approaches need time to take hold.*** Several years of ground-laying work occurred prior to ARC's two-year grant, and more time will be needed for the efforts it supported to come to fruition. The introduction of innovative technology to address wastewater treatment needs encountered institutional, funding, regulatory, and technical challenges that take time to address. Projects of this nature must be viewed over a relatively long timeframe to measure their results.

### 6.12.6 Conclusion

With ARC's support, CVI's work has helped to move several projects forward that have or will result in the provision of new wastewater treatment services in a number of small communities. The project met or exceeded all of the milestones established at the outset of the ARC grant and is considered a great success by CVI's community partners. The project demonstrates the role citizen activism can play in promoting needed infrastructure investments, the high "value-added" of expert technical assistance, particularly in resource poor communities, and the need to apply a long-term timeframe when assessing the impacts of projects involving new approaches and innovative technologies.

## 6.13 Water Valley Sewer and Water Improvements – Water Valley, MS

The City of Water Valley received ARC funding to repair deteriorated sewer lines in a residential area and a part of its downtown, and to extend water and sewer service to a small residential area just outside the city limits. The amount of the ARC grant was \$152,547, accounting for 25 percent of the total project cost of \$602,547. Work on the project began in March 2005 and was completed in January 2007.

### 6.13.1 Community Profile

The City of Water Valley, situated in north central Mississippi, is the largest municipality in Yalobusha County, with a population of 3,392 in 2010, about one-quarter of the county's total population of 12,678. The city lies approximately 20 miles southwest of the City of Oxford, home of the University of Mississippi.

The city's population declined by 7.8 percent between 2000 and 2010 compared to increases of 7.3 percent statewide and 9.7 percent nationally. Despite this decline, city officials indicate that the city's population has remained roughly stable during the past half century.

Yalobusha County's employment trends roughly paralleled state and national averages during the past decade. Between 2001 and 2011, total wage and salary employment declined by 1.2 percent, less than the statewide decline of 3.1 percent but greater than the national decline of 0.2 percent. However, the county has continued to suffer from relatively high unemployment. During the past decade, its unemployment rate exceeded state and national levels by averages of 0.8 and 1.7 percentage points respectively. In 2011, unemployment stood at 11.9 percent compared to 10.7 percent statewide and 8.9 percent nationally. Moreover, the county's labor force participation rate, the number of workers employed or actively searching for work, was low – only 52.1 percent compared to 59.8 percent statewide and 65 percent nationally in 2010. While the county has a slightly lower percentage of working-age population than state and national averages, this is not the major factor in this disparity.

The county's industry structure has been shifting from manufacturing to services in recent years. It remains dominated by the manufacturing and retail sectors, which together accounted for about 54 percent of total employment in 2011. However, both of these industries declined significantly between 2001 and 2011, with these declines being largely offset by growth in other industries, notably health and social assistance, administrative services (primarily building services), and transportation and warehousing.

The economic well-being of city residents is far below state and national averages. Median household income averaged \$22,816 during the 2006-10 period, only 58.9 percent of the state average and 43.9 percent of the national average. The poverty rate of 34.7 percent was 15.8 percentage points above the state average and 23.6 percentage points above the national average.

The county was categorized by ARC as distressed in 2004, when the ARC grant was awarded, and continued to be categorized as such through 2012. Distressed counties rank among the worst 10 percent of counties in the nation.

There are a few bright spots in the city's economic picture. Its historic housing stock, constructed during a period of prosperity and growth from the early 1900s to the 1930s, has attracted University of Mississippi faculty and staff from nearby Oxford, as well as professionals from Oxford and beyond. These homes can be purchased at a fraction of the price of similar homes in Oxford. New home purchases and renovation have sparked somewhat of a revival in some of the city's older neighborhoods. With the leadership of an active Main Streets organization, the city's previously moribund downtown has come to life with new business investment and public realm improvements. Additionally, the BorgWarner



transmission plant, the city's largest employer, once thought to be in danger of closing, employed over 400 workers at the end of 2012.

### *6.13.2 Project Description*

The project had two components. The first was to repair or replace about one half mile of damaged sewer lines in one of the city's older residential areas and in part of its downtown business district. Existing sewer lines were more than 50 years old, and some had collapsed. This had the effect of slowing wastewater flows, resulting in periodic backups of sewage into homes and businesses, particularly during periods of heavy rain when rainwater leaked into sewer lines, overwhelming the system's flow capacity. The second component involved connecting 20 households located just outside the city limits to public water and sewer service, requiring the extension of water and sewer lines about 2,000 feet. In addition to the ARC funding of \$152,547, the project received a \$450,000 Small Cities Community Development Block Grant (CDBG) grant from the Mississippi Development Authority.

### *6.13.3 Project Planning and Implementation*

By the early 2000s, Water Valley city officials were becoming acutely aware that the city's municipally-owned water and sewer system, suffering from years of deferred maintenance, was in dire need of repair. The need to repair or replace many of the city's older sewer lines was particularly acute. Many lines were cracked and some were near collapse. The condition of the lines, which slowed wastewater flows, was causing sewage backups into residences and businesses with increasing frequency. The system was particularly prone to backups during heavy rains, when rainwater runoff leaked into sewer pipes, further reducing wastewater flows. These backups were, at the least, unpleasant, and sometimes resulted in property damage. The sight of a Water and Sewer Department truck pumping blocked sewage from sewage cleanouts (capped pipes that provide access to sewer lines) was becoming increasingly common. However, the small city, did not have the fiscal capacity to make needed repairs with its own limited revenues.

By 2002, city officials concluded that they had to begin addressing the problem before it reached a crisis stage. The Water and Sewer Department staff identified the system's most problematic areas, and the city's consulting engineer prepared plans and cost estimates for improvements. One of the city's older residential areas and part of its downtown business district were identified as in most immediate need of repair.

As its next step, the city embarked on a search for funding. City officials approached the North Central Mississippi Planning and Development District, which helped local communities in the region obtain and administer state and federal grants, to identify and prepare grant applications to appropriate funding sources. The P&DD identified ARC and the Mississippi Development Agency's State Small Cities CDBG program as the most likely funding sources, prepared grant applications, and received funding from both agencies by March 2005. The city was ready to move forward with the project.

According to city officials and P&DD staff, the planning process proceeded smoothly. Final designs were drawn up by the city's consulting engineer. A public hearing was held, and citizens expressed broad support for the project. The project was put out to bid, a contractor was selected, and construction began in October 2005 with oversight by the consulting engineering.

The project proceeded at a somewhat slower pace than initially anticipated. While not unexpected, the repair and replacement of old sewer lines involved certain complications. Some lines had to be rerouted, in some cases requiring easements to be negotiated with property owners. Others were difficult to reach because they were under buildings, and had to be repaired using a relatively new process involving

forcing a waterproof sealant through the pipes to seal cracks. Lines were sometimes in close proximity to other infrastructure, requiring extra caution. Rain and flooding during the construction period also caused delays. In the end, while it was initially expected to be completed in one year, the project was completed in late January 2007, 22 months after it began. It was, however, completed within budget.

The project was followed by a second phase, also funded by ARC and State Small Cities CDBG funds, focusing on other older residential areas and the rest of the central business district. As of late 2012, engineering plans for this second phase were being finalized.

#### 6.13.4 Economic and Community Impacts

The project achieved its projected outcomes. It served 354 households and 15 businesses, helping to retain 100 jobs, mostly in the retail sector. The sewer system is functioning well in the area where repairs were made, and back-ups have been eliminated. It also extended new water and sewer service to 20 households.

The project has had two important impacts. First, it has strengthened the city's residential real estate market. With reliable sewer service, homes in the area where the improvements were made are now more marketable. Economic development professionals note an acceleration of the already growing trend of University of Mississippi faculty and staff, and professionals from Oxford and even outside the region, purchasing homes in the area. This has generated more demand for local business services, increased incomes, and more residential property tax revenues for the city.

The second important impact has been on the city's downtown business district. As with residential properties, more reliable sewer service has created a more secure environment for commercial property and business investment. The improvements complement efforts to revitalize the previously declining downtown led by the city's Main Streets Program. Main Streets has undertaken an aggressive agenda to promote additional investment in commercial properties, attract a diverse and interesting mix of businesses, expand downtown programming, improve the public realm, and market the district. Some of these efforts have received ARC funding. The result has been a downtown renaissance. According to the Main Streets executive director, the period between 2007 and 2012 saw the opening of 20 new businesses with 52 employees, including an "anchor" grocery store, restaurants, and art galleries, occupancy of 75,000 square feet of previously vacant space, \$1.8 million in private property investment, and the reduction of vacant properties from 18 to four. While the sewer project was not primarily responsible for these developments, it did create conditions under which they were more likely to occur. Moreover, without the completed and planned sewer improvements, sewage services would inevitably worsen, potentially reversing the gains the downtown has recently achieved.

#### 6.13.5 Lessons Learned

Overall, the project met the expectations of city officials and local and regional economic development professionals. It successfully restored a section of the sewer system to good working order and established a more favorable environment for residential and business investment. A number of lessons can be drawn from the project:

- *Even when undertaken to address a specific, immediate problem, infrastructure projects can yield broader, longer-term economic benefits.* The purpose of the project was primarily to maintain well-functioning sewer service to a defined set of residences and businesses. It addressed a public health issue and, indirectly, a business retention issue. But by ensuring adequate sewer service, it also enhanced the appeal of residential and commercial properties, promoted additional property investment, and supported downtown revitalization. These

developments, in turn, helped to improve the community's self image and optimism, perhaps laying the groundwork for additional community improvements. This suggests that communities should think creatively about how they can leverage the benefits of infrastructure improvements.

- ***Maintain close, ongoing communications with key stakeholders.*** Those involved in the project credit good communications, both internal and external, with making the project proceed smoothly. This included: communications among those involved in planning and implementing the project, including city staff, the consulting engineer, and the P&DD staff; communication with the public to inform it about the project and enlist support; and communication with funders to keep them up-to-date, resolve any issues expeditiously, and keep funding disbursements on schedule.
- ***Have a solid plan developed before approaching funders.*** Water Valley's mayor partly credits the planning process undertaken before approaching funders with the city's success in obtaining grant funding. The city defined a clear need, targeted the most problematic parts of the sewer system for improvements, and conducted engineering studies to develop a detailed construction plan and cost estimate.
- ***Plan for ongoing maintenance and repair to avoid pushing infrastructure systems to the breaking point.*** While the project achieved its objective, the city waited to address its sewer problem until the system had already seriously deteriorated. By anticipating inevitable maintenance and repair needs earlier, the city would have been better positioned to keep the system in good repair by applying for funding support and perhaps establishing its own maintenance reserve before the system literally began to collapse. This would likely have reduced the ultimate costs and minimized community disruptions.

### 6.13.6 Conclusion

The Water Valley Water and Sewer Improvements project met its objectives of making sewer system improvements that ensured reliable service to 354 residences and 15 businesses, and of extending new water and sewer service to 20 residences. More broadly, it helped to generate additional residential and business property investment and supported downtown revitalization. Key factors in the project's successful completion were sound planning and effective communications. At the same time, the city may have been able to avert the severe deterioration of the system and its attendant consequences through timelier forward planning for system maintenance and repair.

## 6.14 Case Study Summary Findings and Recommendations

The case studies revealed key performance metrics and other impacts generated by the ARC Investments. These findings led to a series of key lessons learned that can be found in Section 6.14.3.

### 6.14.1 Key Performance Measures

Each of the case study projects achieved one or more of ARC's key performance measures: leveraging of financial or technical support; jobs; employability; and increasing or improving infrastructure services to residents.

## Jobs and Leveraged Investment

Almost every project leveraged public investment from grantees or other federal and state agencies. Notable examples of leveraged private investment and job creation include the following:

- The **Barton Business Park Sewage Treatment Plant Project** attracted a \$12 million investment in a new plant by a wooden cabinet manufacturer, creating 364 jobs.
- The **Muscle Shoals Industrial Infrastructure** project attracted a \$60 million private investment in a new plant by an automotive supplier, creating 800 jobs.
- The **Dobson I-77 Infrastructure** project attracted an \$18.25 million private investment in a hotel/restaurant/retail complex, creating 66 jobs.
- The **Clinton I-75 Industrial Park Sewer Line** project attracted a \$63 million investment by an automotive supplier as well as additional investment by several other new industrial park occupants. A total of approximately 1,500 jobs were created.

## Employability

The automotive supplier attracted by the **Muscle Shoals Industrial Infrastructure** project made a significant investment in a job training program at the local community college. In addition, at least three projects, the **Big Caney Water** project, the **Owingsville/Bath County Industrial Park Wastewater Treatment Plant** project, and the **Racine Water Treatment Plant and Storage Facility** project, supported the development of education and training facilities through the provision of water or wastewater treatment services.

## Infrastructure Services

Several projects provided new or improved water or wastewater treatment services to local residents including the following:

- The **Big Caney Water** project provided improved water service to 453 households, and other phases of the project served hundreds more households. Additional system capacity will also accommodate significant new residential development.
- The **Canaseraga Wastewater Collection and Treatment System** project provided new service to 215 households, many of which had been faced with the cost of replacing failing septic systems.
- The **Water Valley Sewer and Water Improvements** project repaired failing sewer lines serving 354 households and extended new water and sewer service to an additional 20 households.

### 6.14.2 Other Project Impacts

Projects had a number of other impacts that have contributed or promise to contribute to strengthening the local economic environment.

#### Increased Residential Property Values and Investment

Communities with inadequate or compromised water or sewer service or lacking such service altogether are at a distinct economic disadvantage. Homes are more difficult or impossible to sell, lessening



incentives for property investment and contributing to declines in the quality of the housing stock. Investment in new housing development is also deterred. When considering locations for their businesses, business owners are unlikely to select locations that do not provide suitable housing for their employees. While residential property investment and improvements in the residential real estate market are long-term processes, several communities where residential water and sewer projects have been completed have benefited or see the opportunity to benefit from improvements in the housing environment.

After completion of the **Water Valley Sewer and Water Improvements** project, homes in the area where the improvements were made are now more marketable. Economic development professionals note an acceleration of the already growing trend of University of Mississippi faculty and staff, and professionals from Oxford and even outside the region, purchasing homes in the area.

Completion of the **Big Caney Water** project has resulted in increased investment in existing housing as well as increased construction of new housing. County officials and economic development professionals believe that improved housing quality and availability is helping to stem the population outflow, convincing more young adults to remain in the area and attracting new residents such as retirees who earlier left the area to find work.

After completion of the **Racine Water Treatment Plant and Storage Facility** project, a housing developer announced plans to build 15 new homes on vacant land, a substantial expansion of the residential stock for a community of 315 households.

### Enhanced Environmental Quality

Two projects, the **Wastewater Treatment for Small Communities** project, the **Canaseraga Wastewater Collection and Treatment** project, stopped flows of raw sewage into waterways. Another, the **Water Valley Sewer and Water Improvements** project, stopped periodic sewage backups into residences and businesses. These projects not only improved environmental and health conditions, but generated additional economic benefits by making homes more marketable and supporting recreational tourism.

### Fiscal Benefits

A number of projects had positive fiscal implications for their communities. These included: reducing costly water losses from leaky water systems, putting water system operators on a sounder financial footing, and reducing or eliminating the need for tax subsidies to keep the systems solvent; increasing property tax revenues from new and expanding businesses and rising residential real estate values; and the opportunity to sell increased water supplies to additional users.

After completion of the **Owingsville/Bath County Industrial Park Wastewater Treatment Plant**, additional tax revenue generated by expansion of a food processing plant in the industrial park enabled the City of Owingsville to improve its downtown with a new streetscape program, which has contributed to the startup of several new downtown businesses.

After completion of the **Dobson I-77 Infrastructure** project, occupancy tax revenue from the new hotel enabled the community to establish a Tourism Development Authority. Each year, the tax brings about \$100,000 to the TDA, which has been used to beautify the downtown, build a new town website, advertise the town's attractions, and promote local events.

Completion of the **Big Caney Water** improvements has drastically reduced water loss, resulting in significant cost savings for the Public Service Authority and reducing the possibility that the PSA will

ever require a county subsidy. In addition, new home construction and increases in property values have generated new tax revenues for the county.

The **Canton Water System Improvements** reduced water loss from nearly 65 percent to less than 20 percent, enabling the Canton Borough Authority to sell water that had been previously lost through leakage to shale gas producers. The sale of the water has generated an additional \$1 million in annual revenue over two years.

### Corporate Citizenship

The **Muscle Shoals Industrial Infrastructure** and **Clinton I-75 Industrial Park Sewer Line** projects, by bringing major employers into their communities, have gained corporate “citizens” that are all too often missing from smaller communities. These firms have shown a commitment to their communities through their civic engagement and charitable activities.

### Positioning for Longer-term Economic Development

Whether or not they resulted in significant immediate private investment and job creation, many of these projects have positioned their communities for longer-term economic development. While not measurable in the short-term, these impacts can yield significant economic benefits in the years to come.

The **Wastewater Treatment Solutions for Small Communities** project has begun to have an impact on tourism development in southern West Virginia's highly distressed coal counties. As streams that used to receive untreated sewage experience reductions in coliform bacteria levels, they are again becoming suitable for fishing. A few homes have been remodeled into tourist cabins for ATV visitors. The reduction of odor from raw sewage has made communities with Coal Heritage Trail sites more appealing to visitors, potentially promoting the development of tourism-related businesses such as restaurants and artisan shops.

The **Burson Center**, in addition to its direct services to its tenants and other local entrepreneurs, has had a significant impact on the perception and reality of the community as a supportive entrepreneurial environment. Business and community leaders note that the center, with its wide range of business resources, has become the “go-to” place for budding entrepreneurs and has played a significant role in encouraging the growth of entrepreneurship within the region. This, in turn, has increased confidence within the community in its ability to shape its economic future.

The completion of the **Dobson I-77 Infrastructure** project has improved the town's self-image and demonstrated the potential of economic diversification. The town is now thought of as a tourism destination, and some have even termed it the “unofficial capital of the Yadkin Valley wine region.” This project has shown local residents how change can be beneficial and has helped to create a vision for the area's future that residents can support.

### *6.14.3 Key Lessons from the Case Studies*

The case studies yield important lessons that can be useful for other communities undertaking similar projects.

#### Consider the Project in the Context of a Broader Strategic Vision

While an infrastructure project is typically undertaken to meet an immediate community need, its impact can be magnified if it is tied to a broader community economic development strategy.



The development of the **Burson Center** was not pursued in isolation, but rather as part of a broader community strategy that placed a strong emphasis on entrepreneurship development. The foundation of a comprehensive strategic plan with strong community support increased the likelihood that the project would gain support of key stakeholders and complement other efforts to promote local entrepreneurship.

Surry County leaders have begun to recognize that the county, the location of the **Dobson I-77 Infrastructure Project**, has a competitive advantage in tourism and wine production. By focusing on winemaking, specialty agriculture, outdoor recreation, and heritage tourism, Surry County has chosen a path that is outward looking, but that would, by necessity, preserve or even enhance its rural, small town character. Because the Village at Shelton Vineyards, developed as a result of the project, was part of this broader strategy, the infrastructure extension is having an outsized impact, one that goes far beyond the businesses it directly serves.

### Think and Plan Ahead

The case studies demonstrate a number of ways that thinking and planning ahead can improve the chances for a successful project or avoid unanticipated challenges.

First, communities can benefit by making foundational investments that enable them to move quickly when economic development opportunities arise.

**Muscle Shoals** and the rest of the Shoals region responded to their economic development challenges proactively. They prepared a CEDS focusing on economic diversification, purchased industrial land, and prepared preliminary engineering plans for its development. As such, they were well positioned when a major industrial prospect, automotive supplier North American Lighting, imposed a short timeframe for the preparation of an industrial site for its new plant. Had the region not been well prepared, the NAL plant may well have located in another community.

Having already drawn up plans for a water and sewer extension, Surry County and Dobson town leaders waited for a good opportunity to come along before they went forward with the **Dobson I-77 Infrastructure** project. In addition to the advantage of having a planned job-creating project to show when competing for grants, having some guaranteed new utility customers and an increased tax base ensured that at least some costs could be recovered. Also, having private sector partners as funders and allies was crucial to getting the project completed.

Second, project planning can benefit from research about similar projects and what approaches have been most successful.

The **Burson Center** project participants engaged in a thorough planning process before proceeding with the project. This included engaging professional assistance to conduct a feasibility study, exploring models and best practices, and thoroughly considering such issues as size, design, financial structure, tenant services and resources, and operations. While observing other successful incubators, they took pains to customize the project to meet local needs and conditions.

As part of the planning process for the **Canton Water System Improvements** project, different types of water main materials were evaluated to compare advantages and disadvantages. Polyethylene pipes were selected due to unique physical characteristics: low weight, corrosion resistance, high-impact resistance, and flexibility. Leaks were substantially reduced, increasing the efficiency of the system.

Third, some of the case study communities delayed addressing their infrastructure problems until these problems had reached a crisis stage. These communities would have been better served by seeking assistance earlier, limiting environmental damage and possibly reducing the cost and complexity of their projects.

In the **Village of Canaseraga**, residential septic systems were already failing and, with homeowners unable to afford the cost of repairs, untreated sewage was increasingly diverted into storm drains or the local river. This created significant environmental and health problems and also affected the village economy as property values dropped and recreational hunting and fishing declined. It was only when the local USDA Rural Development office director approached village officials after becoming aware of the problem that they began to explore a solution.

While the **Water Valley Water and Sewer Improvements** project achieved its objective, the city waited to address its sewer problem until the system had already seriously deteriorated. By anticipating inevitable maintenance and repair needs earlier, the city would have been better positioned to keep the system in good repair by applying for funding support and perhaps establishing its own maintenance reserve before the system literally began to collapse. This would likely have reduced the ultimate costs and minimized community disruptions.

Finally, infrastructure projects, like all construction projects, can encounter unexpected problems that can slow progress or increase costs. Thinking at the outset about what problems might occur and how they might be addressed can mitigate their impacts should they arise.

Planning for the **Barton Business Park** did not anticipate that the proposed sewer outfall would lie on archaeological sites. The fact that the park was located near the Potomac River, with its many historical sites, made this a distinct possibility. Careful investigation of potential obstacles and risks may have avoided project delays and accounted for the additional cost of archeological data recovery.

The cost of the **Canton Water System Improvements** project increased by \$500,000 as a result of unexpected events and an estimating error by the engineering consultant. Although the engineering firm provided \$100,000, the Canton Borough Authority had to make an additional loan to cover the overrun. It recommends that communities undertaking infrastructure projects establish a contingency fund or secure access to credit markets for additional loans to cover unexpected expenses.

### Right-size Your Project

When designing projects, communities should think about how they relate to current and potential market demand. This could lead to downsizing a project or completing it in phases.

The projected outcomes for job creation and private investment established for the **Dobson I-77 Infrastructure** project were based solely on Phase I of the planned development. This ended up being a wise decision, because when the recession hit, development stalled, and subsequent phases have not been completed. In cases like this where there is a particular development associated with a project, construction timelines should be looked at carefully and developers should be clear about how circumstances might affect their plans. The Dobson project was successful, but if conservative projections had not been used, it may not have been viewed that way.

The **Barton Business Park** project anticipated the creation of 800 to 1,000 jobs. Six years after the project's completion, only one company had located at the business park and only 364 jobs had been created. Project planners must differentiate between the potential for site development and real interest in site development. A sound marketing strategy at the time of project completion may have helped drive industrial interest.

On the other hand, a larger initial investment may save money in long run.

The **Powdersville Water District Water Storage Tank** was designed with more capacity than was needed to meet immediate needs. By taking advantage of low construction costs during the recession, the Water District was able to build in the additional capacity that will very likely be needed in the not-too-



distant future at a reasonable cost. Waiting to expand the system until economic growth accelerated would likely have cost PWD customers more in the long run.

The **Owingsville/Bath County Industrial Park Wastewater Treatment Plant** project was undertaken primarily for one large industrial user, but building in additional capacity enabled the city to serve 105 new homes, a new agricultural education and marketing center, and the expansion of a nursing and rehabilitation facility, with additional capacity left for new businesses locating in the industrial park.

### Consider How to Fully Leverage Your Investment

An infrastructure project can be a catalyst for development beyond its immediate objectives. Communities should think about how to maximize these ancillary benefits.

The purpose of the **Water Valley Sewer and Water Improvements** project was primarily to maintain well-functioning sewer service to a defined set of residences and businesses. It addressed a public health issue and, indirectly, a business retention issue. But by ensuring adequate sewer service, it also enhanced the appeal of residential and commercial properties, promoted additional property investment, and supported downtown revitalization. These developments, in turn, helped to improve the community's self image and optimism, perhaps laying the groundwork for additional community improvements.

While the **Big Caney Water** project was primarily intended to improve the quality and reliability of water service to existing residential customers, it has also provided a foundation for economic diversification. It has already supported tourism development through improved water service to Breaks Interstate Park and will enable the development of more lodging facilities and second homes. The county is also better positioned for business recruitment since employers give careful consideration to quality of life for their employees, and the availability of good-quality housing is an important factor in that calculation.

In addition to improving the quality of life for area residents, the **Wastewater Treatment Solutions for Small Communities** project in southern West Virginia's coal country is helping to strengthen the area's housing market. Without sewage service, homes cannot legally be sold, contributing to housing disinvestment and abandonment. As homes are connected to new sewage systems, homeowners are now able to sell them legally, increasing their value, encouraging better upkeep, and enabling new residents to move into the communities as others leave. Local residents observe that these improvements are contributing to a greater sense of pride and hope in residents who, having experienced the seemingly relentless decline of their communities, now see the potential for stabilization and even revitalization.

The **Canaseraga Wastewater Collection and Treatment System** addressed environmental and health issues created by failing septic systems by connecting existing households and businesses to a new municipal sewer system. It also positioned the community for additional commercial, industrial and residential development, including capturing spin-offs from the development of the nearby Swain ski area through lodging and second home development.

### Develop Strong Working Relationships with Funders

A key element of success is the ability to develop relationships with funders and manage those relationships over the long term. This has a number of dimensions.

*First, be able to demonstrate a compelling need and a credible plan.*

The mayor of Water Valley partly credits the planning process undertaken for the **Water Valley Sewer and Water Improvements** project before approaching funders with the city's success in obtaining grant

funding. The city defined a clear need, targeted the most problematic parts of the sewer system for improvements, and conducted engineering studies to develop a detailed construction plan and cost estimate.

The plan to rebuild the **Big Caney Water System** and extend water service throughout the county was ambitious and costly, particularly for economically depressed Dickenson County. The Public Service Agency and its partners developed a long-term vision for the project, and were able to convey to funders its importance to the county's future. At the same time, they recognized that the project could not be taken on all at once and would have to be broken into phases. This enabled funders to understand the project's overall funding needs and at the same time see that it could be sequenced to meet their funding restrictions.

*Second, take care to effectively coordinate grants among multiple funders and to manage grants in ways that fully meet funder requirements.* Having a clear, detailed understanding of the restrictions and parameters of the funding from all partners from the start of the project can allow for a smoother transaction process.

Finding a first funder willing to commit money to a project is a chronic challenge. The Mayor of Racine invited all potential funders of the **Racine Water Treatment Plant & Storage Facility** to the village simultaneously to see the need and to discuss the collective resources they had available to invest. The community was then also able to demonstrate its own buy-in to the project. Racine raised nearly all of the funds it required to fund the water treatment plant and storage facility, including supplemental funds needed after a flood.

The grant manager for the **Owingsville/Bath County Industrial Park Wastewater Treatment Plant** project noted that one of the most valuable steps she took through the process was a small, simple one done from the start: tracking funding sources and uses. "Before we submitted the first application, we invited all funders to the table. We sat down around the table and brainstormed and talked about how we could best approach this," she recalled. "When you're trying to get something done quickly, you cannot afford to make mistakes. For example, if you get half-a-million in CDBG funding...it needs to be used in a particular way. You can't use that for engineers, for instance. So we tracked the money. I designed a grid and tracked funding across components. It also saved time, and allowed people coming in who weren't already familiar with the project to take over, if needed." Funding requirements are often complicated, and become only more confusing when multiple funds are combined in one pool. Having simple processes from the start of a project to clearly depict which funds can be used for which parts of construction can save time and money.

Funding for the City of Clinton's **I-77 Industrial Park Sewer Line** project came from five different funding sources. Each funder had its own standard set of use restrictions and payment methods. Some funders only paid for certain expenses, while others required the grantee to absorb costs upfront and then get reimbursed. It ended up costing the project money to deal with the complexity and detail required.

#### Develop Strong Collaborative Relationships and Effective Communication among All Key Local Actors

Successful initiation and completion of projects requires the participation of many key actors. The case studies yield numerous examples of how collaborative relationships were developed and maintained among key actors to ensure alignment, needed resource commitments from various parties, and effective coordination.

The leaders of the **Burson Center** project recognized early on that a wide variety of stakeholders would need to be engaged and relied upon for material support if the project were to succeed. Great pains were



taken to reach out to city and county government, business and civic leadership, and higher education institutions to involve them in the process and gain their support.

Those involved in the **Water Valley Sewer and Water Improvements** project credit good communications, both internal and external, with making the project proceed smoothly. This included: communications among those involved in planning and implementing the project, including city staff, the consulting engineer, and the Planning and Development District staff.

In Dickenson County, the Public Service Authority's collaborative approach extended back to its merger with the Big Caney Water Corporation, which was carefully negotiated to achieve a positive outcome for both parties. During the **Big Caney Water** project, the PSA worked closely with the county, municipalities, local development district, and state health officials to bring all ideas and perspectives to the table and distill them into a plan on which all stakeholders could agree. This collaborative approach continued through all phases of the project.

Having competed for industrial prospects in the past, county and municipal officials involved in the **Muscle Shoals Industrial Infrastructure** project came to realize that in an era of global competition and international investment, demonstrating unity and collaboration is critical to attracting firms like North American Lighting. Extending the collaborative culture that had begun to gel in the early part of the decade, the communities shared financial burdens and together offered a welcoming and supportive environment for NAL that helped to persuade the firm that Muscle Shoals was the best location for its new plant.

The **Dobson I-77 Infrastructure** project was designed through a process that ensured that the town and county governments, the developers, and area residents would all support it. The developers, the city, and the county all took part in the project's planning and contributed significant funding to the project. This helped to ensure that everything went smoothly and that the final outcome would be to each partner's liking. When a grant that the town had expected to receive did not come through, all the parties contributed money to fill the gap because they considered themselves equal partners. What could have been a major roadblock was just a speed bump because each stakeholder had engaged in the planning process and had something to gain from the final project.

### Tap into Outside Expertise and Resources

Small communities often lack the expertise needed to plan and implement projects. Tapping into free or low-cost sources of technical assistance can help to ensure that a project is well designed and effectively managed.

Citizens groups working on the **Wastewater Treatment Solutions for Small Communities** project would have been much less effective without the support of the Canaan Valley Institute. With its extensive specialized knowledge of small-scale wastewater treatment, CVI played a critical role in community education, planning, systems design, funding, and construction oversight. CVI's role was particularly important in supplementing the limited capacity of Public Service Districts to undertake new projects using unfamiliar technologies. As such, ARC's small investment in technical assistance resulted in millions of dollars of new infrastructure investment.

As a small community with significant financial limitations, the Village of Racine did not have the resources to hire a consultant or engineer to develop a comprehensive plan to present to potential funders of **Racine's Water Treatment Plant & Storage Facility** project. Instead, the village turned to the Rural Community Assistance Partnership (RCAP), a national nonprofit that provides technical assistance to rural communities. It provided Racine with the technical assistance and support its leaders

needed to put together a viable and credible proposal. With RCAP's assistance, Racine was able to obtain the funding it needed for a system that suited its needs.

### Be Prepared to Meet Business Timelines

In the case of the **Owingsville/Bath County Industrial Park Wastewater Treatment Plant** project, the quick reactions of city and county officials, working together to draw up appropriate plans and find the appropriate financing to pay for the project, was critical to retaining one of the area's largest employers. Without this timely action, the plant was in danger of relocating. Instead it has expanded, retaining 122 jobs and adding over 100 new ones.

### Take a Hands-on Approach during the Construction Phase

The case study projects demonstrate the importance of paying close attention to the construction process and taking timely actions to minimize delays and disruptions. This has a number of dimensions.

*First, businesses constructing a new plant or expanding an existing plant can have inflexible timelines in order to meet production goals.* Communities developing projects to accommodate new plants or expansions must organize themselves to complete projects on the same timeline.

Local officials in **Muscle Shoals** organized to exercise close oversight of site preparation to ensure that it was completed according to North American Lighting's tight schedule and to work closely with funding sources to ensure that funding delays did not slow the project.

*Second, diligent oversight of the construction contractor is critical.*

The construction phase of the **Canton Water System Improvements** project proceeded smoothly due in large part to the diligent coordination between Canton Borough Authority and the project engineer. Daily inspections conducted by the project engineer ensured that the construction was carried out according to the plans and specifications. Canton Borough Authority also assisted the construction team in locating existing mains and service lines to reduce errors.

For the **Clinton I-75 Industrial Park Sewer Line** project, the Utilities Board had a local wastewater specialist on staff who proved invaluable throughout the construction process. He consistently conducted quality checks on the materials and construction, and was able to make field adjustments as needed.

*Finally, it is important to keep residents and businesses informed about construction activities and help homeowners and businesses handle any service disruptions.*

The **Big Caney Water** project involved water line construction along roadways, and potential service disruptions. The Public Service Authority made extensive efforts to keep local leaders and the public informed about construction impacts and, as a result, encountered few complaints.

The Canton Borough Authority recognized, in retrospect, the need to make a greater effort to keep downtown businesses affected by the construction of the **Canton Water System Improvements** project informed about the impacts on their operations and to help them mitigate these impacts. Businesses received several water advisories from CBA, but they were still not prepared for the project.

### Take a Long-term View

Many grantees noted that, for small communities, undertaking even relatively straightforward infrastructure projects can pose difficult institutional, financial, and logistical challenges. Maintaining a



strong commitment to the project throughout the process and responding to challenges with creativity and determination is often necessary to achieve a successful outcome.

Several years of ground-laying work occurred prior to ARC's grant for the **Wastewater Treatment Solutions for Small Communities** project, and more time will be needed for the efforts it supported to come to fruition. The introduction of innovative technology to address wastewater treatment needs encountered institutional, funding, regulatory, and technical challenges that take time to address. Projects of this nature must be viewed over a relatively long timeframe to measure their results.

The **Canaseraga Wastewater Collection & Treatment System** project took over six years from initial conception to completion. It took two years for the village to obtain its first financial commitment from USDA Rural Development. Once the first funder committed, successive financing became more easily available. By the time the project came to fruition, leaders had achieved a high level of local buy-in, developed a sound, well thought out plan, and honed an effective case for why the project was necessary. It was all accomplished by having a process through which stakeholders learned from failure and did not get discouraged in the pursuit of their goals.

Those involved in the **Burson Center** project recognized that developing and growing a local entrepreneurial base is a long-term process. They had the patience to take the time needed to ensure that the incubator was well-designed and professionally managed and, while they are rigorous in measuring the progress of incubator tenants, recognize that the larger economic changes they are seeking to promote will take more than a few years to materialize.

The director of the Public Service Authority managing the **Big Caney Water** project acknowledged that the technical and financial challenges presented by the project sometimes appeared insurmountable, but the strong commitment of the PSA and its partners would eventually yield solutions. He advised, "Never go into a project and throw up your arms and say it can't be done. There are always bumps, but stay focused, develop good relationships, and keep strong people around you." At the same time, he noted the importance of adjusting plans to align with funding limitations, stating, "You look at your funding sources, you look at your priority list, and you have to cater the project to the funding."

## 7 FINDINGS AND RECOMMENDATIONS

The Appalachian Regional Commission has four main goals, as laid out in the 2011-2016 Strategic Plan:

1. Increase job opportunities and per capita income in Appalachia to reach parity with the nation.
2. Strengthen the capacity of the people of Appalachia to compete in the global economy.
3. Develop and improve Appalachia's infrastructure to make the Region economically competitive.
4. Build the Appalachian Development Highway System to reduce Appalachia's isolation.

The performance of the ARC's infrastructure investment program is closely related to these goals, and the intent of this program evaluation was to assess the performance and economic impacts of ARC infrastructure investments between 2004 and 2010. In addition, the evaluation was to shed light on ways that the ARC can enhance its ability to document and report program impacts.

### 7.1 Key Findings

The team's infrastructure program evaluation work examined the impact of a particular investment on income, employment opportunities, job creation and retention, as well as the number of households and businesses served by the project. The evaluation considered both quantitative and qualitative outcomes of the investments in order to gauge the overall performance of the projects.

Water and sewer projects were the most frequent uses of grants, as well as the most heavily funded project types, based on survey results and the ARCnet database. These projects also generated the most benefit in terms of jobs created or retained, businesses served, and households served, according to the survey. Statistically, every million dollars spent on water or sewer projects generated approximately 30 new jobs between 2004 and 2010.

Based on the survey responses and case study findings, grant recipients seemed to underestimate the job and business impacts that the investment would have on their area. In many cases, the anticipated outcome per dollar spent was actually less than the actual outcome per dollar spent – a benefit to the ARC. Qualitatively, survey and case study respondents thought that the funding they received contributed to attracting new businesses and jobs to the community, as well as improving the efficiency of business operations. According to respondents, approximately 35 percent of the projects would not have occurred without the contributions from the ARC, indicating the importance of the program toward achieving the Commission's goals.

Overall, the evaluation found mixed results in terms of outcomes and outputs, though there are many factors contributing to these results. The varied feedback and success of the projects, as identified through the online survey results and case study evaluations, has led the team to create a series of recommendations for future program funding prioritization. This list of recommendations is not meant to be a total assessment of the program or its priorities, but rather is intended to support future success while achieving the goals of the ARC.

The team observed several important "lessons learned" through the questionnaire and case study process that may help the Commission and future grant recipients best leverage ARC funding to achieve maximum economic development outcomes:

- Consider the project in the context of a broader strategic vision.
- Think and plan ahead.
- Right-size your project, but know that sometimes a larger initial investment may save money in the long run.

- Consider how to fully leverage your investment and develop strong working relationships with funders.
- Develop strong collaborative relationships and effective communications among all key local actors.
- Tap into outside expertise and resources.
- Be prepared to meet business timelines and take a hands-on approach during the construction phase.
- Take a long-term view.

## 7.2 Recommendations

The recommendations provided below are intended to both improve the quality of the data utilized in ARC program evaluation and also the data collection process itself.

*Require tracking of outputs and outcomes as a stipulation of receiving the grant.* Several respondents noted that they were only required to keep records for five years and thus did not have any information on the project in question. Others simply did not have the information because they did not track the outputs or outcomes. This led to a lower than desirable response rate to the questionnaire and the possibility of skewed results. Given the high priority of tangible improvements to job opportunities and other competitiveness measures, it would be in the best interest of the ARC to require tracking simply for reporting and analysis purposes. This does not mean that a lack of the anticipated success in a particular case would be penalized, but would simply allow for better future prioritization of funding investments. One suggestion to achieve this is to develop a letter directed to the Local Development Districts indicating the importance of collecting this information.

*Consider new types of infrastructure investment to increase competitiveness.* Water and sewer infrastructure projects accounted for the largest share of ARC spending during the evaluation period, and these projects are essential in providing basic services to underserved areas. As the region's most basic needs are met, it is important to invest in additional infrastructure. For example, a strong fiber optic and broadband infrastructure could help increase Appalachia's competitiveness with other regions of the country.

*Clarification of Project Categories.* There may be some disconnect in the classification of projects for funding purposes and the project type as viewed by the grant recipients. When comparing the project type from the ARCnet database to the project type as identified by the survey respondent, there were multiple cases of discrepancies between the two. For example, in one case a project was classified as an access road in the ARCnet database, though it is actually an airport runway. Clarity on project type will aid in tracking performance metrics in the future.

*Collection of Additional Information Related to Funding Sources.* It is not always the case that ARC funds are the only sources of capital for specific infrastructure projects. Better understanding of all the funding required to bring a project to fruition, as well as the sources of these funds, would provide useful insight to ARC. It would be interesting to know, for example, whether greater success in terms of job retention and creation occurs when there are many parties involved in funding the project. A better understanding of the leveraging power of ARC investments, as well as the non-ARC incentives that are being provided to support specific projects, may be informative to ARC as they consider future investment.

## APPENDICES

Appendix A: Appalachian Regional Commission Program Evaluation of Infrastructure and Public Works Questionnaire

Appendix B: Sample Letter to Grant Recipients

Appendix C: Full Database Distribution by Project Type and State

Appendix D: Survey Response Project Types and Responses

Appendix E: Outlier Detection and Removal

Appendix F: Regression Analysis Predictive Ability



## APPENDIX A: APPALACHIAN REGIONAL COMMISSION PROGRAM EVALUATION OF INFRASTRUCTURE AND PUBLIC WORKS QUESTIONNAIRE

### Appalachian Regional Commission

#### Program Evaluation of Infrastructure and Public Works Projects Questionnaire

April 2012

This short questionnaire should not take more than 20 minutes to complete. All your responses will be kept confidential.

The results of this questionnaire will help the Appalachian Regional Commission fulfill its mission to promote economic development in the region, and assist current and future grantees with improving project performance measurement. Thank you very much for participating.

#### SECTION A: Background Information

**1. The answers you give in this survey will be held confidential. In order to track responses and enable us to follow-up with you, we ask that you provide your contact information.**

- Name of person completing this questionnaire
- Organization
- Address
- City
- State
- Zip
- Phone
- Email
- Website

**2. What was the ARC project title?**

**3. What was the ARC project ID (for example, AL-12345)?**

**4. In what month and year was the ARC-funded portion of this project closed out? (Indicate N/A if the project is still open)**

**5. What type of infrastructure project was it? (Choose one of the following)**

Water system, Sewer system, Access road, Industrial site development, Telecommunications, Gas line, Intermodal facility, Rail, Airport, Highway

**6. This project primarily benefited:**

- Households
- Businesses
- Downtown District
- Public Services
- Other (please specify)

**7. Where was the project primarily implemented?**

- City:
- State:
- County:
- LDD (Local Development District):
- Congressional District(s):
- If the project covered multiple jurisdictions, list them here:

**Section B: Project Outputs**

What specific results (outputs) were actually achieved by this project? These questions attempt to capture the characteristics, capacity and direct outputs of the infrastructure project. Depending on your project timeframe, include cumulative outputs up to 3 years after project closeout.

In the Output column, please provide a numerical estimate. If you did not track information for a specific output, please enter “DNT” in the corresponding box in the Output column (e.g., you do not have information about the number of households served). If an output is not applicable to your project, please enter “NA” in the corresponding box in the Output column (e.g., your project did not provide services to households).

Use the definitions provided below to determine how a given output should be expressed.

**8. Group Outputs:**

	Output
Households served	<input type="text"/>
Businesses served	<input type="text"/>
Organizations served	<input type="text"/>
Communities served	<input type="text"/>

**9a. Infrastructure Outputs: Water system**

- Linear feet of pipe
- System capacity (millions of gallons or millions of gallons per day – indicate which)
- Previous capacity in MG or MGD (if applicable)
- Percent of water supply losses (difference between “production” from plant and “consumption” by users)
- Number of water main failures per year

**9b. Infrastructure Outputs: Sewer system**

- Linear feet of sewer pipe
- System capacity (millions of gallons or millions of gallons per day)
- Previous capacity (MG or MGD if applicable)
- Percent of sewer system overflows (volumes of untreated water released into streams)
- Number of sewer main failures per year

**9c. Infrastructure Outputs: Access Road**

- Miles of access road
- Number of business sites served
- Annual average daily automobile traffic (AADT)



Annual average daily truck traffic (AADTT)

**9d. Infrastructure Outputs: Industrial Site Development**

- Number of business sites served
- Square feet of developed commercial or industrial space
- Acreage improved

**9e. Infrastructure Outputs: Telecommunications**

- Number of telecommunications sites developed
- Number of businesses sites developed
- Linear feet of cable/fiber
- Speed (mega-bytes per second)
- Giga-bytes

**9f. Infrastructure Outputs: Gas Line**

- Linear feet of gas line
- Volume of gas (cubic feet or therms – specify)

**9g. Infrastructure Outputs: Intermodal Facility**

- Acreage improved
- Number of trucks loaded/unloaded (annual)
- Facility capacity for throughput – annual carloads
- Facility capacity for throughput – annual containers
- Facility capacity for throughput – annual tons

**9h. Infrastructure Outputs: Rail**

- Mileage of track
- Carloads served (annual)
- Containers served (annual)
- Tonnage (annual)

**9i. Infrastructure Outputs: Airport**

- Number of planes annually
- Number of passengers annually
- Number of cargo shipments annually

**9j. Infrastructure Outputs: Highway**

- Mileage of highway constructed
- Number of communities served
- Annual average daily automobile traffic (AADT)
- Annual average daily truck traffic (AADTT)

10. List any other outputs that were measured or evaluated: \_\_\_\_\_

11. Please use this box to provide any additional information, including: data sources; estimation methods; whether or not outputs vary over time; or anything else that may be relevant.

**DEFINITIONS:**

**Households Served:** The cumulative total number of households that are served by your ARC project, from project inception until now.

**Businesses Served:** The cumulative total number of businesses that are served by your ARC project, from project inception until now.

**Organizations Served:** The cumulative total number of organizations that are served by your ARC project, from project inception until now.

**Communities Served:** The cumulative total number of communities that are served by your ARC project, from inception until now.

**Section C: Project Outcomes**

Please provide the following information about final project achievements and results.

What specific results (outcomes) were actually achieved by this project? These questions attempt to capture the direct outcomes of the infrastructure project. Depending on your project timeframe, include cumulative outcomes up to 3 years after project closeout.

In the Outcomes column, please provide a numerical estimate. If you did not track information for a specific outcome, please enter "DNT" in the corresponding box in the Outcomes Column (e.g., you do not have information about the number of jobs created). If an outcome measure is not applicable to your project, please enter "NA" in the corresponding box in the Outcomes column (e.g., your project did not create any jobs).

In the Year(s) column, please indicate the number of years for which the outcome measure was tracked.

Use the definitions provided below to determine how a given outcome should be expressed.

**12. Group Outcomes:**

	Outcomes	Year(s)
Households improved	<input type="text"/>	
Businesses improved	<input type="text"/>	
Organizations improved	<input type="text"/>	
Communities improved	<input type="text"/>	

**13. Economic Outcomes:**

Jobs created	<input type="text"/>
Jobs retained	<input type="text"/>
Businesses created	<input type="text"/>
Businesses retained	<input type="text"/>
Leveraged private investment	<input type="text"/>
Revenues increased (non-export, \$)	<input type="text"/>
Revenues increased (export, \$)	<input type="text"/>
Costs reduced (\$)	<input type="text"/>



14. In what industries were the jobs created or retained? Please quantify number for each industry.

- Agriculture
- Mining
- Construction
- Manufacturing
- Transportation Utilities
- Wholesale
- Retail
- Finance, Insurance or Real Estate
- Services
- Other

14. List any other outcomes that were measured or evaluated: \_\_\_\_\_

16. Please provide relevant information about how the outcome measures were calculated such as data sources used or key assumptions.

**DEFINITIONS:**

**Households improved:** the cumulative total number of households that directly benefited from the ARC project.

**Businesses improved:** the cumulative total number of businesses that directly benefited from the ARC project

**Organizations improved:** the cumulative total number of organizations that directly benefited from the ARC project.

**Communities improved:** the cumulative total number of communities that directly benefited from the ARC project.

**Jobs created:** the total number of (1) direct hires made as a result of the project's operation (e.g. teachers, public safety, information service, etc.); and (2) direct private sector jobs created following the delivery of ARC-funded services or project completion. This does **NOT** include construction jobs to build the ARC funded project. In the case of part-time jobs, please convert these to full-time equivalent and round up to report whole numbers.

**Jobs retained:** the total number of jobs that were retained because of an ARC investment that was needed to keep the business and jobs in continued operation in the area.

**Businesses created:** the total number of businesses that located in the region as a direct result of the ARC-supported project.

**Businesses retained:** the total number of existing businesses that remained in the region due to the ARC-supported infrastructure project.

**Leveraged private investment:** the total dollar amount of private sector financial commitments and investment that were not part of the project funding, but followed as a result of the completion of your ARC project.

**Revenues increased (non-export):** the total dollar amount of any increase in non-export (domestic) sales that occurred among businesses improved as a result of your ARC project.

**Revenues increased (export):** the total dollar amount of any increase in export (international) sales that occurred among businesses improved as a result of your ARC project.

**Costs reduced:** the total dollar amount of any cost reductions (savings) that occurred among organizations and businesses improved as a result of your ARC project.

## Section D: Long-Range Impacts

Using the textual scale defined below, how would you rate the long-range impacts of your project on the economy, the environment, and the quality of life in your community?

**None:** Project had little to no impact on trend

**Slight:** Project impact was not large enough to reverse or stabilize trend

**Moderate:** Project impact contributed to the stabilization or reversal of trend

**High:** Project impact was responsible for significant improvement in trend

### 17. Economic Measures

**None Slight Moderate High**

Attracting new residents or stabilizing the area's population

Attracting new jobs or increasing employment at existing businesses

Creating new sources of income or increasing income for local residents

Increasing local business sales or the value of business assets (such as equipment, real estate)

Increasing the value of household assets (such as homes, land, farms) for local residents

Increasing the value of community assets (such as community buildings, schools, infrastructure, parks)

Other economic measures (please specify)

### 18. Competitiveness Measures

**None Slight Moderate High**

Improving the stability and sustainability of the local economy

Improving the efficiency of business operations or public services

Improving the productivity of students, employees, businesses, land, or other assets

Improving the skill level of the workforce

Increasing the viability of local businesses

Improving access to markets for local products, businesses, artisans, and entrepreneurs

Reducing the cost of doing business

Other competitiveness measures (please specify)

## Section E: Other Questions

**19. Aside from the direct jobs and investment associated with the project, were there any other positive or negative economic impacts on the community? If so, please explain and quantify if possible.**

**20. Did the project help attract any additional government or philanthropic funding? Please describe.**

**21. To what extent are the estimated outcomes attributable to the ARC intervention and funding? Entirely, mostly, somewhat, slightly, or too difficult to determine.**

**22. What do you think would have happened to the project if ARC funding had not been available?**

Would have been completed with other funds in approximately the same time period

Would have been delayed for up to a year

Would have been delayed for a year or more

Would have been completed on a smaller scale

Would not have been undertaken

**23. Please describe any private investment not directly related to the project (i.e., not included in your response to Question 12) that occurred as a result of the project.**

**24. Please provide any additional comments on the project in terms of accomplishments, challenges, or other relevant information to help with the program evaluation.**



## APPENDIX B: SAMPLE LETTER TO GRANT RECIPIENTS

[This Page Intentionally Blank]

April 25, 2012

<<Name>>  
<<Organization>>  
<<Street Address>>  
<<City>>, <<State>> <<Zip>>

Dear <<Name>>,

I am contacting you on behalf of the Appalachian Regional Commission (ARC). The ARC has contracted with HDR Decision Economics, an independent research firm, to conduct an external evaluation of its Infrastructure and Public Works projects. The purpose of the evaluation is to collect information on the outcomes and long-term impact of infrastructure projects so that ARC may improve future project performance.

HDR is conducting an online questionnaire of all ARC Infrastructure and Public Works projects funded between 2004 and 2010. Participation in the survey is encouraged but voluntary. Your responses will help provide valuable information that will assist ARC in making decisions about future program efforts to improve infrastructure and public works initiatives. We anticipate that the questionnaire will take approximately 20 minutes to complete for each project for which you received ARC funding.

<<Project Name>>

<<Project ID>>

The questionnaire can be completed at: <https://www.surveymonkey.com/s/ARCInfrastructureEvaluation>

The questionnaire for a give project must be completed on one computer from one location. It is best to complete the questionnaire in one sitting. Please also note the following:

- The due date for the questionnaire is **May 18, 2012**
- Please complete a questionnaire for each of the projects listed above.

All components of this program evaluation have been reviewed and approved by **Kostas Skordas** of the Appalachian Regional Commission. If you have any questions, please feel free to contact him or **Marissa Witkowski** ([marissa.witkowski@hdrinc.com](mailto:marissa.witkowski@hdrinc.com) or 1-617-357-7763).

On behalf of the ARC, we thank you in advance for your cooperation.

Best regards,

Marissa Witkowski  
*HDR Survey Manager for ARC*

## APPENDIX C: FULL DATABASE DISTRIBUTION BY PROJECT TYPE AND STATE

	AL	GA	KY	MD	MS	NC	NY	OH	PA	SC	TN	VA	WV	Total
Access Road	1	12	2	19	23	2	2	20	30	1	0	4	0	116
Airport	0	0	0	0	0	0	0	1	0	0	0	0	0	1
Gas Line	1	0	1	0	1	0	0	0	0	0	1	0	0	4
Highway	0	0	0	0	0	0	1	0	0	0	0	0	0	1
Industrial Site Development	12	9	4	4	25	2	1	2	16	2	6	1	2	86
Intermodal	0	0	1	0	0	0	0	0	2	0	0	0	0	3
Rail	0	0	0	0	1	0	1	0	0	0	1	0	0	3
Sewer System	19	17	24	8	27	14	12	37	11	11	15	6	16	217
Telecommunications	15	3	2	6	4	2	10	6	5	1	2	5	4	65
Water System	31	26	48	7	39	31	8	26	10	17	40	10	22	315
<b>Total</b>	<b>79</b>	<b>67</b>	<b>82</b>	<b>44</b>	<b>120</b>	<b>51</b>	<b>35</b>	<b>92</b>	<b>74</b>	<b>32</b>	<b>65</b>	<b>26</b>	<b>44</b>	<b>811</b>

## APPENDIX D: SURVEY RESPONSE PROJECT TYPES AND RESPONSES

Access Road	Count
<b># with Actual # Value Miles of Road</b>	20
# with DNT/NA	6
# Blank	4
<b># with Actual # Value Businesses Served</b>	20
# with DNT/NA	5
# Blank	5
<b># with Actual # Value AADT</b>	10
# with DNT/NA	13
# Blank	7
<b># with Actual # Value AADTT</b>	11
# with DNT/NA	13
# Blank	6
<b># Responses (Total)</b>	<b>30</b>

Airport	Count
<b># with Actual # Value Planes</b>	1
# with DNT/NA	0
# Blank	0
<b># with Actual # Value Passengers</b>	1
# with DNT/NA	0
# Blank	0
<b># with Actual # Value Cargo Shipments</b>	0
# with DNT/NA	0
# Blank	1
<b># Responses (Total)</b>	<b>1</b>



Gas Line	Count
<b># with Actual # Value Linear Feet</b>	0
# with DNT/NA	0
# Blank	1
<b># with Actual # Value Volume</b>	0
# with DNT/NA	0
# Blank	1
<b># Responses (Total)</b>	<b>1</b>

Highway	Count
<b># with Actual # Value Miles of Road</b>	3
# with DNT/NA	0
# Blank	0
<b># with Actual # Value AADT</b>	2
# with DNT/NA	1
# Blank	0
<b># with Actual # Value AADTT</b>	2
# with DNT/NA	1
# Blank	0
<b># with Actual # Value Communities Served</b>	3
# with DNT/NA	0
# Blank	0
<b># Responses (Total)</b>	<b>3</b>

Industrial Site Development	Count
<b># with Actual # Value Businesses Served</b>	11
# with DNT/NA	3
# Blank	3
<b># with Actual # Value Sq. Ft. Development</b>	7
# with DNT/NA	8
# Blank	2
<b># with Actual # Value Acreage</b>	6
# with DNT/NA	10
# Blank	1
<b># Responses (Total)</b>	<b>17</b>

Intermodal Facility	Count
<b># with Actual # Value Acreage</b>	1
# with DNT/NA	0
# Blank	1
<b># with Actual # Value Trucks Loaded</b>	0
# with DNT/NA	1
# Blank	1
<b># with Actual # Value Capacity Carloads</b>	1
# with DNT/NA	0
# Blank	1
<b># with Actual # Value Capacity Containers</b>	0
# with DNT/NA	1
# Blank	1
<b># with Actual # Value Capacity Tons</b>	0
# with DNT/NA	1
# Blank	1
<b># Responses (Total)</b>	<b>2</b>

Rail	Count
<b># with Actual # Value Capacity Carloads</b>	1
# with DNT/NA	1
# Blank	0
<b># with Actual # Value Capacity Containers</b>	1
# with DNT/NA	1
# Blank	0
<b># with Actual # Value Capacity Tons</b>	1
# with DNT/NA	1
# Blank	0
<b># with Actual # Value Miles of Track</b>	2
# with DNT/NA	0
# Blank	0
<b># Responses (Total)</b>	<b>2</b>



Sewer System	Count
<b># with Actual # Value Linear Feet</b>	28
# with DNT/NA	17
# Blank	7
<b># with Actual # Value Capacity</b>	17
# with DNT/NA	22
# Blank	13
<b># with Actual # Value Previous Capacity</b>	9
# with DNT/NA	29
# Blank	14
<b># with Actual # Value Water Supply Loss</b>	0
# with DNT/NA	0
# Blank	52
<b># with Actual # Value Failures per Year</b>	8
# with DNT/NA	30
# Blank	14
<b># Responses (Total)</b>	<b>52</b>

Telecommunications	Count
<b># with Actual # Value Sites Developed</b>	13
# with DNT/NA	5
# Blank	1
<b># with Actual # Value Businesses Served</b>	9
# with DNT/NA	7
# Blank	3
<b># with Actual # Value Linear Feet</b>	8
# with DNT/NA	8
# Blank	3
<b># with Actual # Value Speed</b>	6
# with DNT/NA	8
# Blank	5
<b># with Actual # Value Gigabytes</b>	5
# with DNT/NA	10
# Blank	4
<b># Responses (Total)</b>	<b>19</b>

<b>Water System</b>	<b>Count</b>
<b># with Actual # Value Linear Feet</b>	47
# with DNT/NA	17
# Blank	6
<b># with Actual # Value Capacity</b>	33
# with DNT/NA	23
# Blank	14
<b># with Actual # Value Previous Capacity</b>	21
# with DNT/NA	30
# Blank	19
<b># with Actual # Value Water Supply Loss</b>	21
# with DNT/NA	32
# Blank	17
<b># with Actual # Value Failures per Year</b>	18
# with DNT/NA	35
# Blank	17
<b># Responses (Total)</b>	<b>70</b>

## APPENDIX E: OUTLIER DETECTION AND REMOVAL

Outliers removed from the group of access road and industrial site development projects<sup>16</sup> were identified through the following multi-step process, which was primarily, though not always, followed in this order:

1. A scatterplot was generated for the dependent variable compared to each of the explanatory variables in the regression equations to identify, at a cursory glance, any projects that should be analyzed with greater suspicion in subsequent steps.
2. Various types of residuals were generated and plotted using a histogram in order to assess both their unstandardized and standardized deviations from the mean. Residuals generated and analyzed included standardized residuals, deleted residuals, studentized residuals, and studentized deleted residuals. The reason for comparing the distribution of various types of residuals is because deleted residuals, in particular, can vary greatly from other residuals if certain projects are exhibiting unusually high leverage, or pull, in the regression.
3. In order to look more closely at a project's influence on the regression,
  - a. differences between the various residuals generated in the previous step were calculated for each residual;
  - b. leverage values were generated; and
  - c. Cook's D values were generated.

Standard thresholds<sup>17</sup> were then used to identify projects with excessive influence that should be flagged as possible outliers.

4. Residual values were plotted against predicted values in order to confirm that there was no relationship (correlation). The mean of residuals was also calculated in order to confirm that it equaled zero. Projects exhibiting a non-random distribution or skewing the average of residuals were flagged as potential outliers.
5. Finally, Q-Q and P-P plots were generated in order to inspect for deviations from normality among the residuals. The reason for generating both plots is because P-P plots are generally better for assessing deviations from the middle of the normal distribution and Q-Q plots are generally better for assessing deviations from the tails of the normal distribution.

The decision to label a project as an outlier did not rest on the determination of one step alone, but rather a combination of steps that collectively heightened the level of suspicion for the influence of a particular project on the final regression model and its ability to predict variance in job creation or intermediate outcomes. Care was taken to preserve as many projects as possible as to both preserve the degrees of freedom in the equation and to create a model that best represents the full set of projects in the ARCnet database. A replication of Table 12, the set of regression equations presented in the text, is provided below, this time including outliers except for water/sewer projects where no outliers were identified.

---

<sup>16</sup> Note that no outlying water/sewer projects were identified.

<sup>17</sup> Leverage values exceeding  $\frac{2k+2}{n}$ , where k is the number of explanatory variables and n is the number of projects, were flagged as potential outliers. Cook's D values exceeding  $\frac{4}{n}$  where n is the number of projects were flagged as potential outliers.

Explanatory Variable	Coefficient by Project Type		
	Access Road	Industrial Site	Water/Sewer
Total Spending (\$1 million)	272.4	83.1	51.9**
Density (10 persons/square mile)	11.03***	-.81	.51
Density*Total Spending (\$1 million)	-.167	.271*	.049**
Distress (10 units)	2.95	6.79***	5.50***
Distress*Total Spending (\$1 million)	-1.69	-.636	-.310**
Percent Explained	$R^2 = .410$	$R^2 = .405$	$R^2 = .486$
Model Significance (F-score)	***	***	***
N	86	72	161

Note: Linear regression through the origin: Dependent (predicted) variable is "jobs created." The constant term was suppressed so that there would be no jobs predicted if no spending occurred.

\*Significant at 90% confidence level; \*\*Significant at 95% confidence level; \*\*\*Significant at 99% confidence level

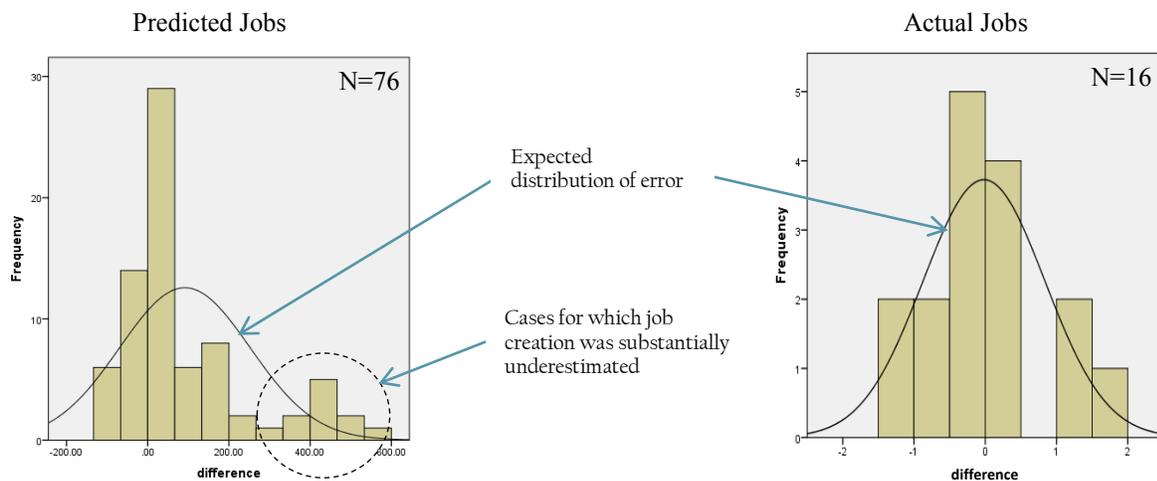


## APPENDIX F: REGRESSION ANALYSIS PREDICTIVE ABILITY

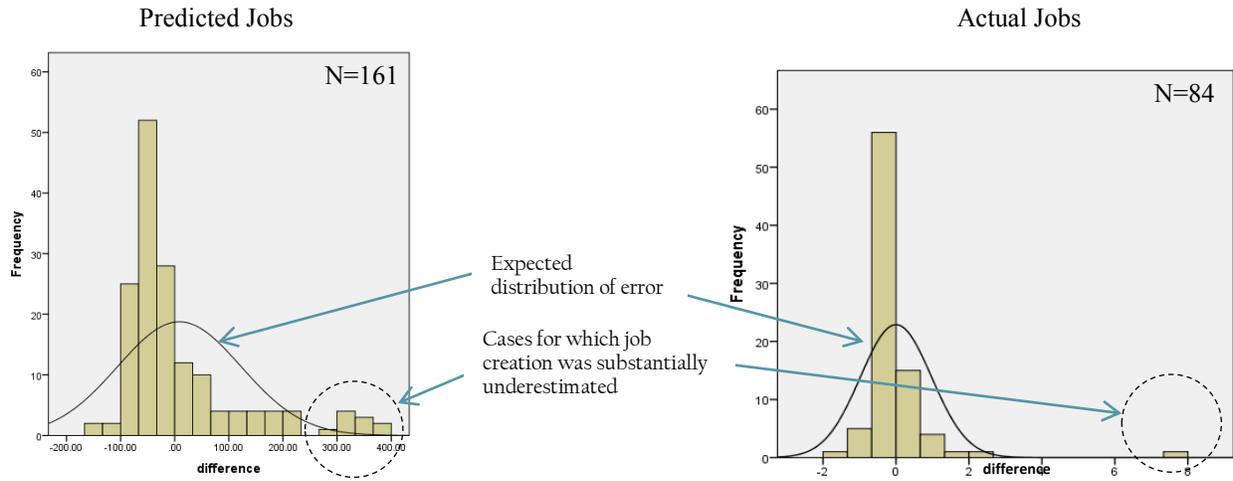
To better illustrate the predictive ability of the regression equations, an analysis of residuals was performed using results from both the full set of ARCnet projects and the subset of those projects that had survey responses. Residuals represent the **difference between job creation values observed in both datasets and the values estimated by the regression equations**. The results, shown in Figure 15 through 17, reflect the level of difference (horizontal axis, labeled at the bottom) and frequency of occurrence (vertical axis, labeled at the left). Largely consistent among all project types, these results indicate that estimated values are very close to observed values for the great majority of cases, though there was a small group for which the regressions consistently under-estimated job creation. This is represented by a dotted circle in each graph. There was no corresponding group for which the regressions over-estimated job creation. And while apparent in the case of both predicted and actual job creation values, **the under-estimation was more common among the full set of ARCnet projects than among the survey responses**.

The presence of this phenomenon, occurring for every project type, indicates that some of these projects must have had non-observed factors causing them to generate significantly larger-than-expected job impacts. The most logical explanation, which is supported by some case studies, is that some of the ARC-funded infrastructure projects were bundled with other (non-infrastructure) economic development actions (e.g., grants, loans, tax abatements, job training, etc.) to create a comprehensive package. Any such non-infrastructure actions would not be captured in either the ARCnet dataset or the survey dataset, yet they would tend to increase job impacts beyond what would otherwise be expected from the single project alone. This bundling can involve multiple grantors at multiple levels of government, each collecting grantee data separately. In the absence of coordination, impacts reported by projects receiving significant amounts of support from multiple agencies could thus appear larger than expected.

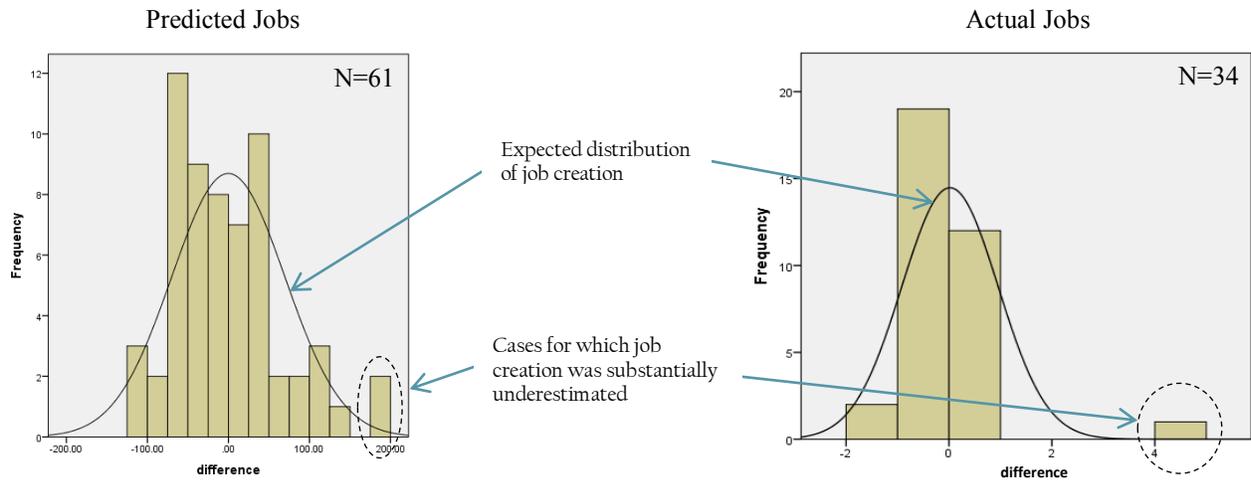
**Figure 15: Access Road Projects – Difference between Estimated and Observed Job Creation**



**Figure 16: Water/Sewer Projects – Difference between Estimated and Observed Job Creation**



**Figure 17: Industrial Site Projects – Difference between Estimated and Observed Job Creation**



If these special cases are removed from the analysis of the ARCnet dataset, the explanatory precision of the regression estimates improves drastically. With the secondary cluster removed, regressions on the ARCnet dataset – which provides more observations and much higher significance – estimate job impacts within ten percent of the actual impact for over three-quarters of the projects. This finding indicates the potential value of predictive tools, but also the need for further research to improve the process for evaluating economic development programs.