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Broadband Technology Opportunities Program
Evaluation Study

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Case Study Report

OneCommunity

Comprehensive Community Infrastructure

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Executive Summary

About BTOP

The American Recovery and Reinvestment Act of 2009 (Recovery Act) appropriated \$4.4 billion in federal funding to the National Telecommunications and Information Administration (NTIA) to implement the Broadband Technology Opportunities Program (BTOP) in order to spur job creation, stimulate economic growth, and increase access to broadband services.¹ BTOP projects are intended to support increased broadband access and adoption, provide broadband training and support through community organizations, and stimulate the demand for broadband. NTIA distributed grant funding to 233 projects, benefiting all 50 states, 5 territories, and the District of Columbia. The types of projects BTOP funded include Public Computer Centers (PCC), Sustainable Broadband Adoption (SBA), and Comprehensive Community Infrastructure (CCI). CCI projects deploy new or improved broadband Internet facilities to connect households, businesses, and community anchor institutions (CAI) such as schools, libraries, hospitals, and public safety facilities.² CCI projects funded by BTOP are predominantly middle mile projects, although a small number of last mile projects were awarded.³

Comprehensive Community Infrastructure projects deploy new or improved broadband Internet facilities to connect households, businesses, and community anchor institutions such as schools, libraries, hospitals, and public safety facilities.

About the Evaluation Study

This case study report is one of twelve case studies performed by ASR Analytics, LLC (ASR) on CCI projects. It is part of a larger mixed-methods evaluation of the social and economic impacts of the BTOP program.

The purpose of this case study is to:⁴

- Identify how the grantee maximized the impact of the BTOP investment.
- Identify successful techniques, tools, materials, and strategies used to implement the project.
- Identify any best practices, and gather evidence from third parties, such as consumers and anchor institutions, as to the impact of the project in the community.

The information presented in this report intends to capture the social and economic impacts of the grant, and is not an evaluation of OneCommunity, its partners, or its subgrantees.

This case study is primarily qualitative. Social and economic impacts are categorized by the five focus areas described in *Interim Report 1*, with the addition of the Government Services focus area.⁵ Section 2 includes the presentation of these impacts by focus area.

The evaluation study team collected information on the social and economic impact of the OneCommunity project during field visits. The evaluation study team met with representatives of OneCommunity and CAIs connected by OneCommunity from October 22 to October 24, 2013. In total, the evaluation study team performed six case study site visit interviews and focus groups. ASR transcribed these discussions and used this information, and other information and reports provided by the grantee, to supplement Quarterly Performance Progress Reports (PPR), Annual Performance Progress Reports (APR), and other publicly available information. The information

presented here is intended to capture the social and economic impacts of the grant, and is not an evaluation of OneCommunity, its partners, or its subgrantees.

About the Grantee



OneCommunity is a nonprofit organization that seeks to accelerate the adoption of information technologies in order to drive economic development and to support health, education, and government services in northeast Ohio. OneCommunity's board members include representatives of

the private sector, higher education, philanthropic foundations, and economic development organizations.⁶ OneCommunity is a partner in the Ohio Middle Mile Consortium (OMMC) with two other BTOP grantees, Com Net in western Ohio and Horizon Telecom, Inc. in southeastern Ohio. OMMC collaborated with Ohio's Office of Information Technology, Department of Administrative Services, and OARnet, the State's Academic and Research network, to integrate its service platform across the eighty-eight counties in the state. Before participating in BTOP, OneCommunity operated a fiber-optic network comprising 500 miles.

The Transforming NE Ohio project estimated a total invested of \$60,046,431 in northeastern Ohio, including \$44,684,852 in federal funds.

On July 1, 2010, NTIA awarded OneCommunity a Round 2 BTOP CCI grant for \$44,794,046 to implement the Transforming NE Ohio project. The project proposed a matching contribution of \$25,188,433, for a total investment of \$69,982,479 in northeastern Ohio.⁷ Since 2010, OneCommunity has revised its match contribution to \$15,738,448, for a total project budget of \$60,532,495.⁸ OneCommunity reported spending \$54,705,008 in project funding as of September 30, 2013.⁹ OneCommunity reported the intention to use remaining funds to pay invoices received after September 30, 2013 for construction services provided before this date and to support allowable costs related to the transition to operations before the project closeout date of December 29, 2013. OneCommunity estimated final project costs, including all pending invoices, at \$60,046,431.¹⁰ OneCommunity provided the evaluation study team with updated CAI data after the award end date, accurate as of December 4, 2013. This report references this dataset unless otherwise noted.

Project Proposal and Status

With BTOP funding, OneCommunity planned to build 900 new miles of fiber and leverage its existing network to connect CAIs throughout 20 counties in northeastern Ohio.¹¹ Over this network, OneCommunity planned to offer last mile services for CAIs and to provide carrier-neutral middle mile services for commercial carriers. OneCommunity proposed the following, with the results shown:

- Deploy 900 miles of new fiber, offering connected CAIs speeds between 100 Mbps and 40 Gbps.¹² As of December 4, 2013, OneCommunity built 993 miles of fiber, offering CAIs the option to purchase speeds between 10 Mbps and 40 Gbps.¹³
- Directly connect 796 community anchor institutions, including 140 public safety entities, 111 health care centers, 241 K-12 schools, 19 higher education institutions, 38 libraries, and 247 government buildings.¹⁴ As of December 4, 2013, OneCommunity provided new or improved connectivity to 871 CAIs

OneCommunity accomplished the following from their proposed goals:

- Installed 993 miles of fiber
- Provided service to 871 CAIs
- Spurred affordable broadband access for local consumers and businesses through the open network

across 33 Ohio counties to its BTOP network, including 8 public safety entities, 194 healthcare facilities, 576 K-12 schools, 40 post-secondary institutions, 2 libraries, and 51 other community support organizations.¹⁵

- Spur affordable broadband access for local consumers and businesses, including as many as 2.1 million households and 210,900 businesses, along with up to an additional 6,400 CAIs, by enabling local Internet Service Providers (ISP) to connect to the project’s open network.¹⁶ As of September 30, 2013, fifteen broadband wholesalers or last mile providers have signed agreements with OneCommunity to use the network for middle mile connectivity for businesses and residential customers.¹⁷ The number of households and businesses served by last mile providers connecting to the network is not publicly available.

As shown in Table 1, two-thirds of the 871 CAIs that received new or improved connectivity by the end of the project are primary and secondary educational institutions. All CAI figures used in this report are derived from data provided to the evaluation study team by OneCommunity on December 4, 2013.¹⁸ The remaining CAIs are mostly Medical or healthcare institutions. CAIs interviewed by the evaluation study team indicated that, while they had broadband connectivity prior to participating in the BTOP grant, they were able to obtain greater bandwidth at lower prices through OneCommunity.

Table 1. Community Anchor Institutions Located in OneCommunity Service Area

Type	Goal		Served by Grantee		Service Area
	#	%	#	%	#
Library	38	5%	2	0%	3,116
Medical/Healthcare	111	14%	194	22%	133
Other Community Support	247	31%	51	6%	7,145
Public Safety	140	18%	8	1%	1,019
School (K-12)	241	30%	576	66%	2,540
University, College, or Other Postsecondary	19	2%	40	5%	51
All	796		871		14,004

The distribution of CAI types receiving new or improved connectivity through the BTOP grant awarded to OneCommunity in Round 2 differed from the distribution of CAI types identified in OneCommunity’s application. Facing time constraints, the grantee leveraged the majority of its rejected Round 1 BTOP application content to complete its Round 2 application. Although OneCommunity altered the scope of the project, it was unable to revise the projected distribution of CAI types before submitting the Round 2 application.

Major Outcomes and Impacts

Through interviews and data collection from a number of sources, the evaluation study team observed qualitative and quantitative outcomes and impacts of the project. The list below highlights these outcomes and impacts, with additional detail provided in Section 2.

- OneCommunity provided new or improved connectivity to 194 healthcare or medical facilities as of December 4, 2013.¹⁹ The upgrade in the broadband service supports the adoption of more efficient internal systems, which improves communication among hospital system employees, patients’ access to information, and the accuracy of care delivered. The OneCommunity

network enables healthcare facilities to use remote hosting options, freeing up resources to support patient care applications.

- The project provided new or improved connectivity to eight public safety institutions and fifty-one community support agencies as of December 4, 2013.²⁰ The use of broadband allows public safety agencies and governmental or community organizations to increase information and resource sharing among communities, and to realize cost savings through the adoption of videoconferencing services.
- OneCommunity provided new or improved connectivity to 40 postsecondary institutions and 576 K-12 schools as of December 4, 2013.²¹ Improved broadband connections enable postsecondary institutions to increase the number of courses offered, to increase the range of certificate and degree programs, and to provide online and distance learning courses to help students complete degree programs. Broadband connectivity also enables K-12 schools to meet state requirements for online standardized testing.
- OneCommunity's expansion of an open access fiber network has encouraged competition among commercial ISPs in the service area. Several CAIs reported that since OneCommunity expanded its network, commercial ISPs have lowered prices to remain competitive in the regional market. Through the BTOP grant, OneCommunity connected and now provides increased capacity to two Cuyahoga County Public Library (CCPL) branches. CCPL obtained 1 Gbps connectivity at a competitive rate for nearly all of its branch locations after a commercial provider reduced its rates based on the OneCommunity rate structure.

Through BTOP, the project achieved the following community impacts:

- Increased educational opportunities for K-12 and post-secondary institutions
- Increased telemedicine opportunities and adoption of efficiency enhancing applications for healthcare providers
- Improve information and resource sharing for public safety entities

Conclusions

Without the BTOP grant, financial limitations would have prohibited OneCommunity from connecting the 871 CAIs to a fiber-optic network offering equivalent speeds or comparable prices. CAIs interviewed by the evaluation study team had broadband access prior to connecting to OneCommunity's BTOP-funded network, although access was limited to lower bandwidths. CAIs indicated that obtaining comparable bandwidth prior to the construction of the OneCommunity network was too expensive.

CAIs interviewed by the evaluation study reported improvements in speed, reliability, and pricing since connecting to the OneCommunity network.

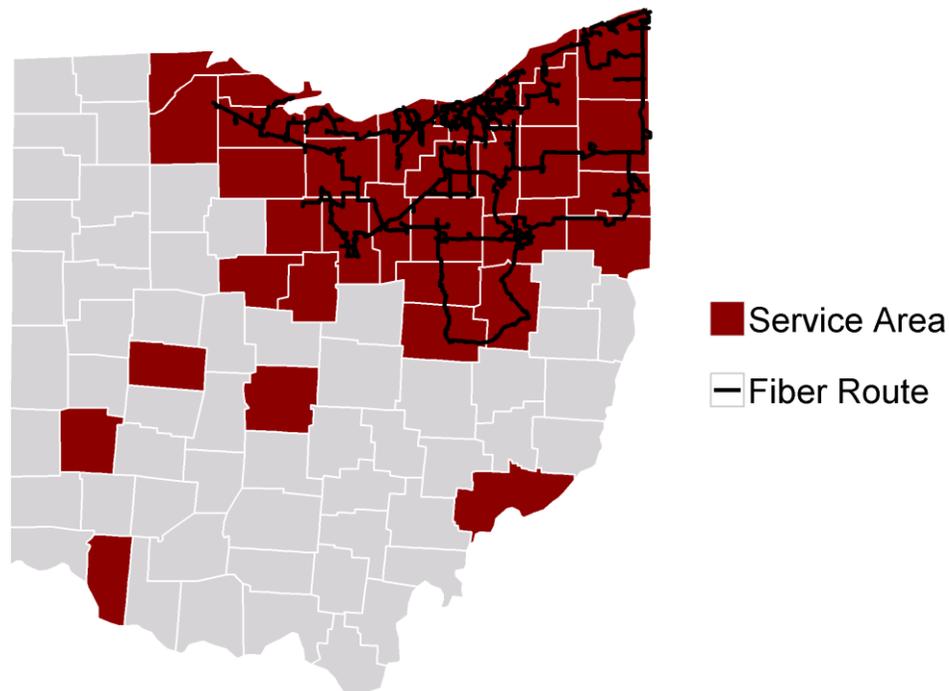
OneCommunity's BTOP-funded network enabled last mile providers to expand the availability of broadband service in northeast Ohio. OneCommunity signed fifteen agreements with third party providers as of September 30, 2013. OneCommunity implemented more than 192 points of interconnection to support last mile providers' in accessing the middle mile network.²²

OneCommunity's Internet pricing ranges from \$6 to \$20 per megabit per month based on the speed and length of term.²³ Customers have the option to purchase Ethernet access ranging from 10 Mbps to 40 Gbps and can sign service agreements for twelve to sixty months. Although the evaluation study team does not have data to determine the speed increase or cost savings realized by all affected CAIs, the CAIs participating in the study indicated that OneCommunity's bandwidth options and pricing were superior to offerings from other providers. For example, the CCPL increased capacity from 10 Mbps to 1 Gbps, and obtained an overall cost reduction of 5,000 percent on a cost-per-megabit per month basis. Similar data are not available for other CAIs interviewed by the evaluation study team.

Section 1. Introduction

OneCommunity's goal was to connect 796 CAIs and to provide middle mile broadband connectivity in a 20 county area.²⁴ As of December 4, 2013, OneCommunity built 993 miles of fiber and provided new or improved connectivity to 871 CAIs across 33 counties.²⁵ As shown in Figure 1, the area served by the OneCommunity project includes the following counties: Ashland, Ashtabula, Champaign, Clermont, Columbiana, Coshocton, Crawford, Cuyahoga, Erie, Franklin, Geauga, Holmes, Huron, Lake, Lorain, Lucas, Mahoning, Marion, Medina, Montgomery, Morrow, Ottawa, Portage, Richland, Sandusky, Seneca, Stark, Summit, Tuscarawas, Trumbull, Washington, Wayne, and Wood. The fiber route, shown in black, captures route changes made by OneCommunity as of January 16, 2014.²⁶ CAIs in service area counties that the fiber route does not pass through tie into the wide area network (WAN) of CAIs connected to the OneCommunity fiber network.

Figure 1. OneCommunity Service Area Map



The American Community Survey (ACS) Five Year Summary for 2007 to 2011 shows that more than 63 percent of the state's population resides in the thirty-three county service area. Approximately 15 percent of the service area residents are African American, compared to just 8 percent of the population in the rest of Ohio. Service area residents are more likely to speak a language other than English in their homes (8 percent) than the population in the rest of Ohio (4 percent).²⁷ Using publicly available data, the evaluation study team identified 11,723 CAIs in the service area, including 133 libraries, 7,145 medical/healthcare facilities, 1,019 public safety institutions, 3,116 K-12 schools, and 259 universities, colleges, or postsecondary institutions.

Table 2 presents the percentages of the populations in the service area and the rest of Ohio by the number of broadband providers available according to data and speed thresholds defined by the National Broadband Map (NBM).²⁸ Broadband is unavailable for a smaller portion of the service area population (3 percent) than for the population in the rest of Ohio (11 percent). Almost 24

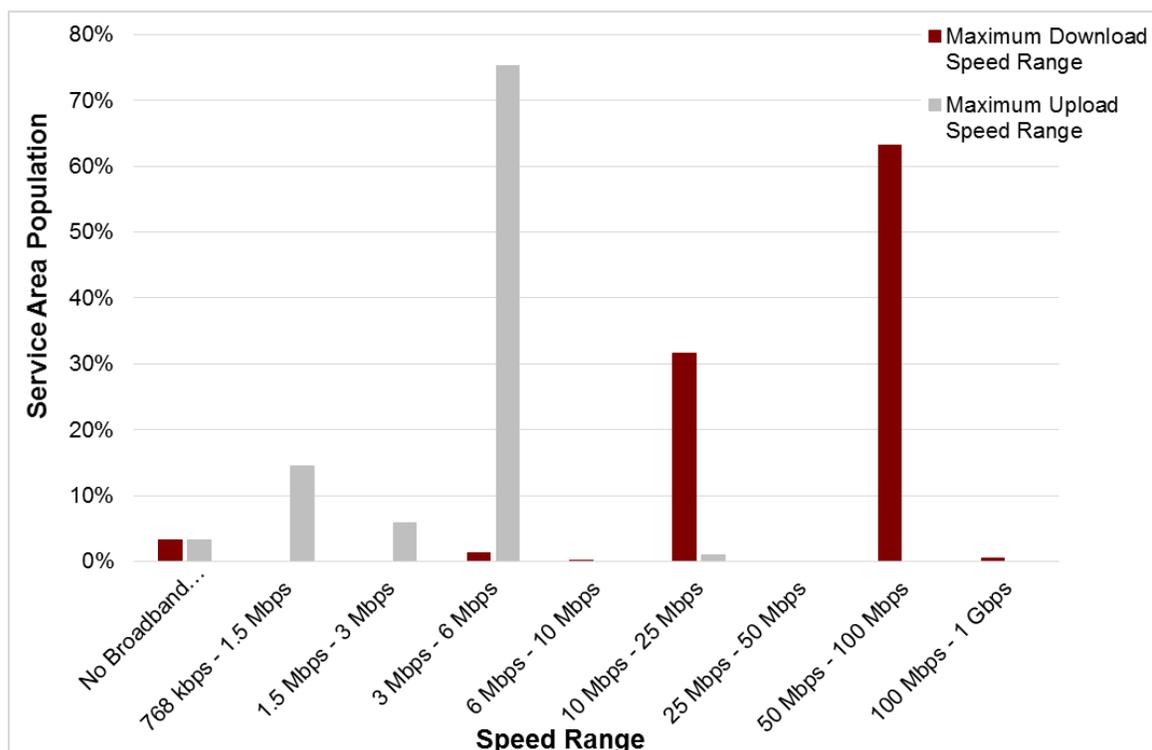
percent of service area residents, compared to 12 percent of the population in the rest of Ohio, have access to three or more broadband providers. All provider statistics use the June 2011 release of the NBM and 2010 population data from GeoLytics.

Table 2. Number of Broadband Providers Available in Ohio

Number of Providers	Service Area	Rest of Ohio
0	3.34%	11.12%
1	18.16%	20.97%
2	54.85%	55.62%
3	19.38%	11.13%
4	4.27%	1.14%
5	0.01%	0.01%

Figure 2 shows the percentages of the service area population with access to the fastest download and upload speed range available.²⁹ According to the NBM, there are thirty-one providers in the service area. Two of the service area providers deliver service in the fastest download speed range of 100 Mbps to 1 Gbps. Maximum available download speeds range from 3 Mbps to 1 Gbps, while maximum upload speeds range from 768 kbps to 25 Mbps.

Figure 2. Maximum Speed Ranges Available for the Service Area Population



Broadband subscribership rates are also higher in the service area than across the state. Federal Communications Commission (FCC) data from 2012 show that 64 percent of service area households subscribe to an Internet service that has at least 768 kbps download speeds and 200 kbps upload speeds.³⁰ Nearly 60 percent of state's households subscribe to an Internet service with the same minimum thresholds.³¹

Figure 3 presents the connection speeds of the 871 CAIs receiving new or improved connectivity through the grant.³² More than 70 percent of CAIs subscribe to service with a connection speed from 100 Mbps to 1 Gbps. The majority of subscribers in this speed tier are K-12 schools.

Figure 3. Subscription Speeds at Connected Community Anchor Institutions

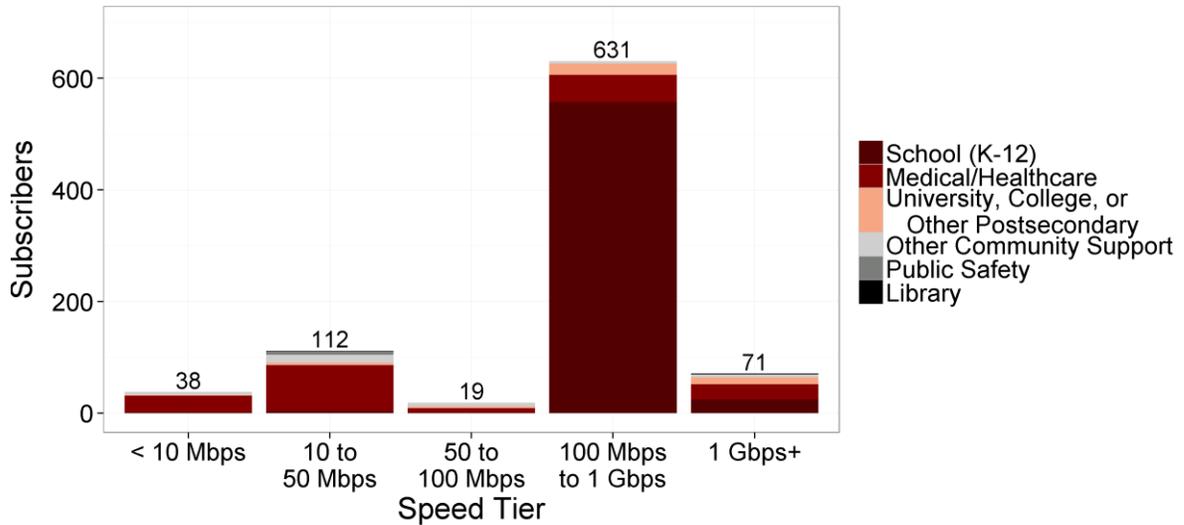
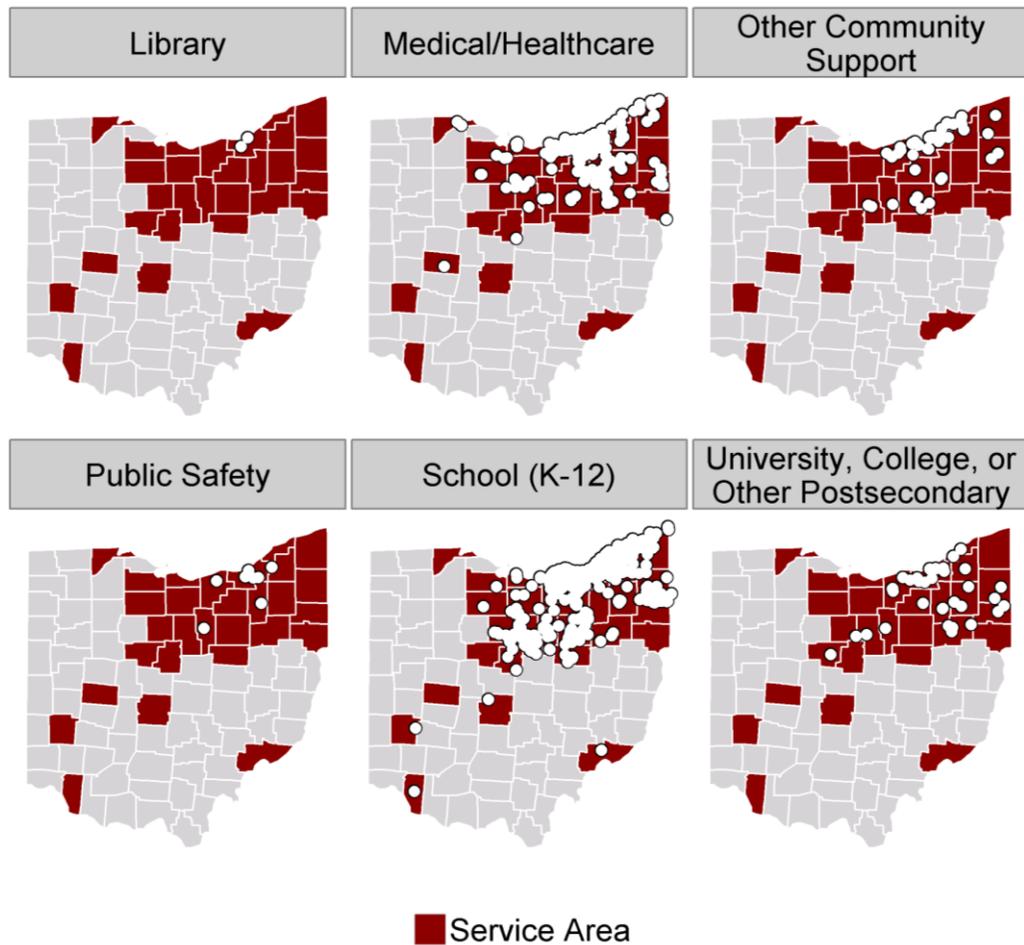


Figure 4 presents the grant's service area and the locations of connected CAIs as of December 4, 2013.³³ Variation in the number of CAI types participating in the grant, as compared to the distribution of CAI types outlined in OneCommunity's application, exists as the grantee used much of the content from its Round 1 BTOP application to complete the Round 2 application because of a tight time constraint. Although OneCommunity modified the scope of its rejected Round 1 BTOP application, time constraints prevented OneCommunity from revising CAI type figures prior to submitting its second application for a BTOP grant.

Figure 4. Locations of Connected Community Anchor Institutions



The evaluation study team met with OneCommunity staff, project partners, and government representatives. These interviews helped the team understand the grantee's approach to project implementation and the strategies used to create demand for the broadband service. Additional interviews with key CAIs and partners focused on describing the impact on CAIs in relation to several factors, including the quality of service of the upgraded network, especially speed, reliability, and cost. The analysis in this report focuses on outcomes and impacts to CAIs. Interviewees provided limited quantitative data related to cost savings and speed increases. Interviews conducted include the following:

- Local Governments
 - **Cuyahoga County** is the most populous county in Ohio with more than 1,200,000 residents.³⁴ OneCommunity is supporting Cuyahoga County's initiative to upgrade networking and broadband services to improve public safety and countywide, shared municipal services.³⁵ This project is expected to save the county \$10 million over five years.³⁶ OneCommunity provided new or improved connectivity to several Cuyahoga County facilities through the BTOP-funded project, and supports mobile wireless access for county employees.³⁷ Through OneCommunity, Cuyahoga County obtained dark fiber connectivity to the Juvenile Justice Center and Administration Building, and seeks to obtain fiber connectivity to the offices of medical examiners.
 - **Mayfield Village** is a municipality in Cuyahoga County, Ohio. According to the 2010 Census, Mayfield had a population of 3,460.³⁸ Mayfield Village stated that in 2005, the

community initiated construction of a fiber-optic network to support the development of a new business park. The fiber ring provides high-capacity connectivity to local businesses, supports economic development, and provides service to municipal locations. OneCommunity constructed the network, which Mayfield Village owns. Mayfield Village has contracted with OneCommunity to operate and maintain the network. OneCommunity's BTOP grant allowed Mayfield Village to extend its fiber network to connect additional municipal facilities, including the Civic Center, the fire station, the police station, and the Service Building.³⁹ The grant also enabled Mayfield Village to connect three commercial properties to the Mayfield Village fiber network and to offer free public Wi-Fi at the town center.⁴⁰ For all connected facilities, Mayfield Village pays \$15,000 per year for a 25 Mbps connection to the OneCommunity BTOP network.⁴¹

- Healthcare

- The **MetroHealth System** comprises seventeen locations throughout Cuyahoga County, Ohio, including its flagship campus, the MetroHealth Medical Center.⁴² More than 400 primary care and specialty care physicians practice within the MetroHealth System.⁴³ Annually, the MetroHealth Medical Center provides care to more than 28,000 inpatients, records nearly 900,000 visits in outpatient centers, and responds to more than 104,000 patient visits to the emergency department.⁴⁴ MetroHealth is a major teaching hospital for Case Western Reserve University (CWRU), with all active staff holding faculty positions at CWRU.⁴⁵ MetroHealth recently completed the transition to the BTOP-funded network. OneCommunity is MetroHealth's primary ISP. Through OneCommunity, MetroHealth received 1 Gbps connectivity for its larger facilities. Smaller, remote locations received a minimum 100 Mbps connection. Before upgrading, most MetroHealth facilities operated with a 10 or 20 Mbps connection.
- **Magruder Hospital** is a twenty-five bed critical access hospital serving Ottawa County, Ohio.⁴⁶ American Hospital Association data compiled through December 2012, shows that Magruder admitted 1,015 patients to the hospital and 16,452 patients visited the hospital's emergency room, while Magruder physicians performed 249 inpatient and 2,146 outpatient surgeries.⁴⁷ Magruder employs fourteen physicians and a medical staff of thirty. Magruder collaborates with medical facilities in Firelands and Sandusky, and with the University Hospital in Cleveland. In the third quarter of 2011, OneCommunity reported providing Magruder with a 1 Gbps connection. Before connecting to the OneCommunity network, Magruder indicated that the hospital paid more for significantly less bandwidth and a less reliable connection. Magruder maintains a 10 Mbps connection for back up through a separate provider.

- Education

- **Lorain County Community College (LCCC)** serves about 15,000 students, with an additional 3,000 students enrolled in its University Partnership (UP) program. Through the UP program, students participate in courses offered by partner universities on LCCC's campus. In addition to its main campus, LCCC operates five Learning Centers in nearby communities.⁴⁸ Before connecting to the BTOP network, LCCC Learning Centers were equipped with several types of connections, including point-to-point wireless, T1s, and point-to-point tunnel connections. Connecting to the OneCommunity network standardized connection types across the centers, helping to alleviate disruptions to connectivity between campuses. By connecting to the OneCommunity network, LCCC realized cost savings through the termination of existing circuits, including four T1 connections and a DS3 backup circuit that supported LCCC campuses prior to the BTOP-funded project. LCCC estimated that its broadband costs are about 50 percent lower since terminating these circuits, while capacity has increased. OneCommunity created a point of presence (POP) at LCCC's data center that enabled LCCC to obtain a 10 Gbps connection between LCCC's main campus and the OARnet POP in Cleveland. LCCC stated they could not have afforded a 10 Gbps connection to the OARnet POP without the BTOP-funded project.
- The **North Central Ohio Computer Cooperative (NCOCC)** is one of twenty-three information technology centers (ITC) in Ohio providing connectivity and services to K-12

school districts. NCOCC's member districts include local, city, exempted village, and community schools as well as chartered nonpublic schools and other educational service providers. Each year, over 28,000 students benefit from NCOCC's services.⁴⁹ OneCommunity provides approximately twenty NCOCC facilities with inter-district connectivity and a connection to OARnet. NCOCC did not have a relationship with OneCommunity prior to participating in this project.

- Public Library
 - **Cuyahoga County Public Library (CCPL)** serves residents of Cuyahoga County and has 500,000 active library cards.⁵⁰ CCPL has twenty-eight branch locations. It has earned the highest rating possible through the Library Journal for five consecutive years. CCPL was also recognized as the top library serving a population more than 500,000 in 2004, 2006, 2009, and 2010.⁵¹ CCPL collectively serves nearly 620,000 patrons from 47 communities.⁵² Before upgrading the branches to 1 Gbps connections, CCPL struggled to meet patrons' bandwidth demands with only 10 Mbps at each branch location. Through its current capital campaign, CCPL is renovating nineteen of twenty-eight locations. The first renovated branch to open was the Warrensville Public Library, which obtained a 1 Gbps connection through OneCommunity. After obtaining the 1 Gbps connection for the Warrensville branch, an incumbent ISP offered a significantly lower the price for a 1 Gbps connection to CCPL. CCPL determined these rates to be so attractive that CCPL elected to purchase 1 Gbps connectivity in all branches through this provider. Upgraded connectivity allows CCPL to provide improved service to patrons, including Wi-Fi service for patrons using personal devices inside and outside of library buildings. Within the first month of upgrading its 10 Mbps connection, CCPL reported that the Warrensville branch was using more than four times its previous capacity.

Section 2 provides a summary of the outcomes and impacts the evaluation study team observed.

Section 2. Impacts

This section describes the outcomes and impacts of the OneCommunity project in relation to the five focus areas described in *Interim Report 1*, with the addition of the Government Services focus area.⁵³ These outcomes and impacts focus on understanding the effect of the BTOP grant on CAIs that received broadband connectivity from OneCommunity. Digital Literacy is not a focus of CCI grants and the evaluation study team did not note significant Digital Literacy impacts due to grant activities other than the outcomes and impacts related to the other focus areas.

CAIs interviewed by the evaluation study team that obtained improved bandwidth through the BTOP grant already had broadband connections, but subscribed to lower bandwidths due to availability or budgetary limitations.

2.1 Education and Training

Impacts within the Education and Training focus area are measured as changes to elements of educational content distribution and instruction. These impacts occur at K-12 institutions, community colleges, four-year institutions, universities, and other education providers. This focus area includes how the broadband Internet connections help the educational CAIs to perform activities that lead to helping students earn a certificate or diploma or receive training that is recognized as valuable for career advancement. Examples of certificates or diplomas include community college degrees, four-year college degrees, advanced degrees, general equivalency degrees, certifications in advanced software technologies such as network engineering, and other licenses or certifications that reflect knowledge of a particular subject at a level that would typically be taught at an educational institution.

When assessing impacts it is important to understand the characteristics and composition of education providers within the service area. Table 3 identifies the school level of public and private schools in the grant service area.⁵⁴ As of December 4, 2013, OneCommunity provided new or improved connectivity to 445 public schools, including 33 charter schools. OneCommunity also reported providing connectivity to 92 private schools and 39 additional educational institutions unidentifiable in public data. OneCommunity provided new or improved connectivity to more public primary schools than any other school level. OneCommunity connected the highest percentage, 24 percent, of public middle schools in the service area.

Table 3. OneCommunity Service Area Schools (K-12) by School Level

Public/Private	School Level	Served by Grantee	Others in Service Area
Public	Primary	228	1,083
	Middle	107	342
	High	100	404
	Other	10	94
	All Public	445	1,923
Private	Elementary	74	447
	Secondary	8	49
	Combined	10	87
	All Private	92	583
Other / Not Available		39	34
All		576	2,540

OneCommunity connected schools that serve nearly 196,000 of the more than 1 million public school students and nearly 28,000 of the more than 145,000 private school students in the service area.⁵⁵ In connected public schools, nearly 30,000 students are minorities and nearly 73,000 qualify for free or reduced lunch.⁵⁶ In connected private schools, nearly 7,000 students are minorities.⁵⁷ Connected public schools employ nearly 12,000 full-time equivalent teachers, while connected private schools employ nearly 1,900.⁵⁸

OneCommunity connected 40 of the 259 higher education institutions in its service area, including 18 private four-year colleges or universities, 11 public two-year colleges, 8 public four-year colleges or universities, and 1 public less-than-two-year institution.⁵⁹ Connected postsecondary institutions serve nearly 250,000 enrollees, which is 37 percent of the enrolled postsecondary students within the service area.⁶⁰ Of the enrolled students served by the grantee, nearly 70,000 are minorities, which accounts for 35 percent of the postsecondary minority students in the service area.⁶¹

This section summarizes the activities observed by the evaluation study team during site visits. The literature review presented in *Interim Report 1* provides evidence that these activities and situations lead to economic and social impacts. This report lists these impacts from the literature along with the evaluation study team’s observational evidence supporting either the realization of impacts or their potential to occur.

- **Distance learning opportunities allow schools to broaden the variety of courses offered. They also represent an educational resource for nontraditional or disabled students, or those living in geographically remote or poor areas.**⁶²
 - Connection to the BTOP-funded network enables LCCC to expand and improve the University Partnership program, which provides students access to more than forty different associate’s, bachelor’s, and master’s degrees offered through participating universities.⁶³ Thirteen four-year institutions offer the courses required for the completion of the bachelor’s and graduate degrees or certificate programs via face-to-face instruction on the LCCC campus or through a network-enabled Interactive Video Distance Learning (IVDL) connection. LCCC recently purchased a “multicast unit” to conduct concurrent video conferencing calls, to increase the frequency of calls, and to improve call quality. OneCommunity network capabilities enable LCCC to use this system to deliver content on campus to Learning Centers and partners that use OARnet as an ISP.

- OneCommunity supplies LCCC's main campus with 10 Gbps connectivity to OARnet through a POP located in LCCC's data center. LCCC uses OARnet to connect to partner locations supporting LCCC programming. Through its InnovatEd program, LCCC gives adult career centers, businesses, community colleges, and nonprofits access to its existing academic programs.⁶⁴ This helps to expand the educational opportunities available at these institutions.
- The new network provides connectivity for LCCC's recently established Advanced Digital Forensics Institute (ADFI) at the University Partnership (UP) Ridge Campus, which provides forensic services to local law enforcement agencies. The ADFI workstations will be equipped with the most advanced digital forensic equipment and software available.⁶⁵ The ADFI will provide training and certifications in digital forensics for current professionals and for the next generation of digital forensics investigators.⁶⁶
- CCPL uses its relationship with OneCommunity to facilitate collaboration with U.S. Ignite, a nonprofit designed to foster the creation and deployment of next-generation applications for public benefit, and the Global Environment for Network Innovations (GENI) network, a virtual laboratory for at-scale networking experimentation. OneCommunity is a founding organization and board member of U.S. Ignite.⁶⁷ The CCPL Orange branch is offering coder camps for library patrons, allowing participants to code, create, and test software. CCPL plans to expand these programs to other branch locations, supporting Science, Engineering, Technology, and Math (STEM) learning.
- **Broadband gives teachers a wide range of media through which to facilitate lessons. The integration of technology into classroom activities creates the opportunity for interactive and personalized educational experiences for students.**⁶⁸
 - Through the BTOP grant, OneCommunity connected LCCC's recently established UP Ridge campus to the network. In addition to offering the UP program on site, the center supports LCCC's Business Network curriculum, which includes Cisco classes and Cisco labs with remote access capabilities, allowing students to participate in simulated labs from home. Without a connection to the OneCommunity network, LCCC would have struggled to provide portions of the networking program, including simulation labs and Cisco academy classes. LCCC believes it is likely that budget constraints would have prevented the purchase of a comparable amount of bandwidth from other providers.
 - Through its connection to the OneCommunity network, NCOCC increased connectivity to schools, facilitating the provision of online assessment testing for students. Additionally, NCOCC explained that teachers seek to incorporate video and multimedia content into classroom instruction, requiring increasing amounts of bandwidth. Increased capacity through OneCommunity will help to support teachers' integration of multimedia learning applications in instruction.
- **School administrations leverage broadband infrastructure to carry out internal operations. Broadband represents a rapid, reliable channel of communication to improve interactions among administrators, teachers, parents, and students.**⁶⁹
 - The University of Akron hosts LCCC's enterprise resource planning (ERP) system, including the hardware, operating system, and PeopleSoft application. LCCC uses the OneCommunity network to connect to University of Akron through OARnet to enable this service. Through OneCommunity, LCCC was able to improve the redundancy of its connection. LCCC has two entry points to the network, providing the redundancy to move the ERP and learning management system (LMS) off-site. LCCC is exploring options for shifting e-mail and storage systems off site as well.
 - LCCC provides Internet connectivity and server space for electronics to Ash University. LCCC will use the new network bandwidth to connect to the Ash University campus, connecting voice and data systems. This connection will support improved collaboration and resource sharing between the two universities, and reduce disruptions caused by bandwidth limitations.

2.2 Healthcare

This focus area includes activities intended to increase elements of the provision and administration of healthcare services, including health information technology, e-Care, electronic health records (EHR), telehealth, and mobile health. Impacts in the Healthcare focus area include broadband-enabled activities aimed at improving personal health or that of someone else. This definition includes not only sophisticated tasks, such as viewing medical records online, but also more common activities that might not involve a medical provider at all. Healthcare impacts might be observed at primary care physicians' offices, hospitals, or in areas served by nurse practitioners.

When assessing impacts it is important to understand the characteristics and composition of healthcare providers within the service area. OneCommunity provided new or improved connectivity to 194 healthcare institutions by December 4, 2013.⁷⁰ Table 4 identifies the taxonomy groups of these connected institutions and the taxonomy groups of all healthcare institutions in the service area according to the National Plan and Provider Enumeration System (NPPES).⁷¹ Nearly 90 percent of the healthcare institutions connected by OneCommunity are ambulatory health care facilities or hospitals.

Table 4. OneCommunity Healthcare Institutions by Taxonomy Group

Taxonomy Group	Served by Grantee	Service Area
Agency	2	3,173
Ambulatory Health Care Facilities	134	1,803
Hospital Units	1	72
Hospitals	40	446
Managed Care Organizations	0	94
Nursing & Custodial Care Facilities	4	1,177
Residential Treatment Facilities	1	186
Undefined	12	6,951
All	194	3,173

This section summarizes the activities observed by the evaluation study team during site visits. The literature review presented in *Interim Report 1* provides evidence that these activities and situations lead to economic and social impacts. This report lists these impacts from the literature along with the evaluation study team's observational evidence supporting either the realization of impacts or their potential to occur.

- **Patients obtain improved ongoing care.**⁷²
 - Through the OneCommunity project, during the third quarter of 2011, Magruder Hospital quadrupled its bandwidth at a lower price than it paid under its previous service contract. Eliminating bandwidth constraints enabled Magruder to allocate resources to the successful integration of digital applications into hospital operations. Magruder Hospital attributes its ability to provide excellent patient care to the integration of technology into its processes and the accessibility of patient data to its staff. Obtaining the high capacity fiber connection allowed Magruder to adopt and support the use of electronic systems that positively affect patient experience. As evidence of the high quality of patient care delivered at Magruder, a report by Becker's Hospital Review ranked Magruder 30th in patient satisfaction among non-

specialty acute-care hospitals nationwide, based on Hospital Consumer Assessment of Healthcare Providers and Systems (HCAHPS) survey results from April 2011 through March 2012 as reported by the Centers for Medicare & Medicaid Services (CMS).⁷³

- **Patients save time and money through reduced transportation, telephone calls, and face-to-face visit requirements.**⁷⁴
 - Magruder Hospital uses the broadband connectivity provided by OneCommunity to support six remote sites, including clinical offices for primary care physicians and a physical therapy facility. Providing improved connectivity to remote sites reduces commuting time for physicians, and increases the availability of staff for consultations. Remote physicians are able to log into the Magruder system, review patient data, and provide treatment recommendations. Magruder also allows physicians at remote facilities to log in to the hospital's Picture Archiving and Communication System (PACS) viewer to examine medical images. This enables physicians in remote facilities to increase the number of local patients served and helps to provide patients with more rapid access to care. Before connecting to the OneCommunity network, Magruder would not have had the bandwidth necessary to maintain connections to the six remote locations on site.
 - OneCommunity's grant-funded network capabilities allowed it to apply for a grant through CMS to create an open-care, telemedicine network. The project will install HealthSpot kiosks in CAIs throughout the service area. The kiosks, staffed by nurses or medical technical assistants (MTA), allow patients to communicate with physicians and specialists via videoconference. This benefits patients in rural areas who may need to travel long distances to meet with doctors and for patients in metro areas with limited transportation options. Without the network's capabilities, fewer locations would have been able to receive kiosks. CAIs indicated a willingness to participate in the expansion of the health kiosk project:
 - Cuyahoga County will collaborate with OneCommunity and local hospitals to support the HealthSpot initiative. The county has established a HealthSpot in the Justice Center, which uses the OneCommunity connection to MetroHealth Hospital. The county will establish another HealthSpot in the local jail, eliminating the transportation of inmates in non-emergency situations.
 - MetroHealth nurses or MTAs will support the OneCommunity's HealthSpot initiative by assisting patients using the workstations to communicate with physicians via video conference.
 - CCPL may collaborate with OneCommunity and use the libraries' 1 Gbps capacity to host HealthSpot kiosks at branches. This will enable community residents to access health information and communicate with doctors and specialists at their local CCPL branch.
- **Patients are able to obtain more accurate prescriptions in a shorter amount of time.**⁷⁵
Improved access to patient information reduces the likelihood of drug interactions resulting from multiple prescriptions from different providers.⁷⁶
 - The increased bandwidth provided by OneCommunity supports Magruder Hospital's electronic medical record (EMR) system. EMR systems help Magruder Hospital to improve patient safety and timeliness of treatment. Magruder's Director of Information Technology, reported that the EMR system has improved the functionality of Magruder's prescription system by reducing the time between the issuing of a prescription and the dispensing of medication from two-and-a-half hours to five minutes. Instead of operating two disparate systems, the EMR system now synchronizes with the pharmacy's system and includes automated dispensing cabinets that increase the accuracy of prescriptions. EMRs list patient prescriptions, providing physicians with a view into the full scope of treatment received by a patient, and alert the physician to test results, allergies, or potentially harmful drug interactions. Each of Magruder's remote facilities connect to the hospital's EMR system using the OneCommunity broadband connection.
- **Broadband connectivity allows patients to access written product information related to their treatment more easily.**⁷⁷

- Improved connectivity through the OneCommunity network supports Magruder's smart-room system. In 2010, Magruder Hospital and Fisher Titus Medical Center collaborated with the Cerner Corporation to become two of the first all-digital hospitals in Ohio.⁷⁸ The Cerner Smart Room includes Internet access, a 42-inch television, and a dashboard integrated with EMRs. The dashboard allows patients to access information about their treatment, including prescriptions and care team. Patients are encouraged to conduct Internet research on their medical condition, course of treatment, and the medication prescribed for them.
- **Broadband connectivity enables providers to adopt new technologies and practices that enhance productivity, achieving outcomes such as improved appointment and treatment scheduling and more complete medical records at lower costs.⁷⁹**
 - OneCommunity network connectivity enables Magruder Hospital to support more advanced and efficient technologies. Magruder achieved the Healthcare Information and Management Systems Society (HIMSS) Stage 6 of the EMR Adoption Model, resulting from the adoption of the Cerner Millennium Electronic Medical Record system.⁸⁰ Magruder is the first critical access hospital in the State of Ohio to earn this recognition. In May 2012, Magruder reported that slightly more than 5 percent of hospitals nationwide have reached this level.⁸¹
 - OneCommunity connectivity supports the ambulatory EMR operated by Magruder's fourteen practices. Tangible Solutions in North Carolina hosts Magruder's ambulatory EMR system. Before obtaining connectivity to the OneCommunity network, Magruder hosted ambulatory EMR on site. Increased bandwidth through OneCommunity allowed Magruder to shift these systems off site. Magruder estimates that shifting systems off site will save about \$100,000 over seven years and improve functionality. Additionally, hosting facilities assume responsibility for system maintenance. Magruder also uses OneCommunity connectivity to support the hospital's EMR system, which is hosted in Kansas City. Additionally, bandwidth from OneCommunity supports a backup circuit for the EMR system.
 - Enhanced network capacity enabled Magruder Hospital to adopt Care Learning, a cloud-based system for managing hospital policies and procedures. This allowed Magruder to eliminate a hardcopy policy book that was much more difficult to maintain. The Care Learning system improves Magruder's ability to organize and update internal policies, and facilitates staff members' completion of annual compliance requirements.
- **Broadband access enables providers to rapidly share patient information with other healthcare providers.⁸²**
 - Magruder uses its OneCommunity connection to support direct messaging and transitional care with the University of Toledo Medical Center through the EMR system. This increases the speed with which medical information is available to physicians in Toledo who are anticipating the arrival of a life flight patient.
- **Broadband enables providers to improve the range of health services offered.⁸³**
 - As a critical access hospital, Magruder Hospital is required to support twenty-five or fewer inpatient beds, maintain an average annual acute inpatient length of stay of ninety-six hours or less, and offer 24/7 emergency care.⁸⁴ Size and length of stay limitations encourage Critical Access Hospitals (CAH) to focus on the provision of care for common conditions and refer patients requiring specialist services to large hospitals.⁸⁵ Access to increased bandwidth improves Magruder's ability to deliver emergency services within a rural, underserved area. Magruder recently signed a contract to implement a telestroke program with the University of Toledo Medical Center. Magruder will use the OneCommunity network to connect via virtual private network (VPN) to Toledo, enabling specialists to share patient data through electronic medical record connections. Specialists at the Toledo center will assess patients and determine if the patient requires transport via ambulance or aircraft to the Toledo facility. Magruder intends to expand its roster of remote specialists to increase the scope of services available to patients. Increasing the scope of services via telemedicine could potentially reduce the number of transports and reduce the amount of time required for patients to receive treatment.

2.3 Workforce and Economic Development

Impacts within the Workforce and Economic Development focus area can occur through activities intended to increase overall employment of the target population, or to assist employed members of that population in finding jobs that offer increased salaries, better benefits, or a more attractive career path, including self-employment. This focus area also includes activities to attract new businesses to locate along the fiber path or to expand the economic activity of existing businesses connected to the network. While this focus area primarily describes jobs, it also includes other economic impacts such as wages, property values, and the number of firms in a region.

This section summarizes the activities observed by the evaluation study team during site visits. The literature review presented in *Interim Report 1* provides evidence that these activities and situations lead to economic and social impacts. This report lists these impacts from the literature along with the evaluation study team's observational evidence supporting either the realization of impacts or their potential to occur.

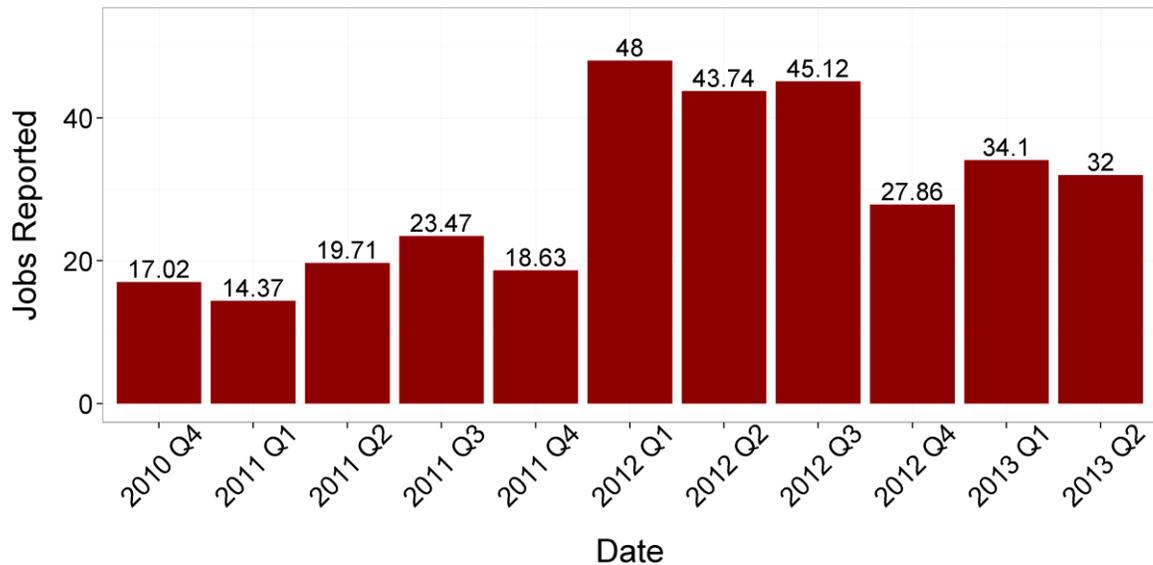
- **The availability of infrastructure in a community enables firms reliant on broadband services to relocate or open additional locations. Local businesses are able to obtain improved access to inputs and markets.⁸⁶ Broadband access improves the ability of rural communities to compete for low- and high-end service jobs, the area of highest economic growth.⁸⁷ Workforce and Economic Development activities supported by broadband infrastructure strengthen job and population growth.⁸⁸**
 - The BTOP-funded expansion of broadband infrastructure helps to attract and retain businesses in Mayfield Village by offering competitive broadband rates. OneCommunity maintains Mayfield Village's fiber network and constructs laterals to customers. The network includes direct laterals exclusively serving some customers, and laterals to large commercial properties, which distribute wireless technology to tenants. A Mayfield Village representative provided an example of three medical imaging companies that recently connected to the community's network. Additionally, OneCommunity provides Mayfield Village with broadband service, which Mayfield Village sells to commercial customers at competitive rates. Mayfield Village deposits revenue from Internet service sales into an account with OneCommunity, which can be used to pay Internet service bills and fund future network construction to connect additional businesses.
 - The BTOP-funded network allows LCCC's SMART Commercialization Center to connect to the Ohio Supercomputer in Cleveland and other statewide research and development resources at higher speeds. Located on LCCC's main campus, the SMART Commercialization Center for Microsystems allows the university and industry partners to access state-of-the-market equipment and commercialization support in sensor packaging, testing/reliability, and advanced life simulation.
 - The grant provided a 10 Gbps connection from the OARnet POP to LCCC's main campus, which supports the provision of business incubation services. LCCC's main campus hosts the Great Lakes Innovation and Development Enterprise (GLIDE) Center, a comprehensive regional innovation center that supports all facets of the start-up, development, and growth of enterprises. The GLIDE Center has assisted more than 2,600 entrepreneurs, mentored 105 portfolio companies, and housed 50 companies.⁸⁹ The GLIDE Center's portfolio of companies has achieved \$65 million in revenue growth, obtained \$90 million in follow-on funding, and created 700 jobs.⁹⁰ Additionally, the Blackstone LaunchPad, opened in August 2012, provides free business support for student and alumni entrepreneurs.⁹¹ Improved connectivity to OARnet and other resources helps to ensure the growth and success of LCCC's entrepreneurial services.
- **New or enhanced connectivity benefits businesses by enabling the use of applications and processes that increase productivity and efficiency.⁹²**
 - Obtaining 1 Gbps connectivity through OneCommunity for its Warrensville branch location provided CCPL with negotiating leverage to obtain equivalent connectivity to other branch

locations at a competitive price. With increased capacity, CCPL has converted telephony at all branches to Voice over Internet Protocol (VoIP) systems, replacing forty telephone lines. Increased capacity allowed CCPL to shift building systems controls for heating, ventilation, and air conditioning (HVAC) on to the network without straining bandwidth. The increased bandwidth also improved CCPL's security camera system by enabling cameras to record at higher definition and allowing staff access to cameras across the network.

- LCCC connects its main campus to its outreach centers within Lorain County via BTOP-funded fiber. Without the grant-funded network, LCCC would have lower bandwidth connectivity to its smaller Learning Centers. The structure of the network facilitates LCCC's ability to extend internal systems to serve all campus locations. For example, LCCC uses a VoIP system rather than purchasing telephone service through multiple companies, to support various school facilities. Without the BTOP grant, LCCC would have had to purchase contracts through multiple providers to ensure the provision of voice, data, and cable to support Learning Centers, an alternative that was both more expensive and more difficult to manage.
- Under the BTOP sub-recipient agreement, OneCommunity manages LCCC's broadband infrastructure. Previously, LCCC purchased network management services through multiple carriers. Centralizing management services into a single contract with OneCommunity reduces the administrative burden for LCCC.

As required by the Recovery Act, OneCommunity reported the number of jobs created quarterly as a direct result of the project. Figure 5 shows the number of direct jobs created by OneCommunity over the grant period.⁹³ OneCommunity's highest period of job creation was the first three quarters of 2012 when OneCommunity funded an average of nearly 46 full-time jobs.⁹⁴

Figure 5. Direct Jobs Created by OneCommunity



Job creation resulting from the grant appears to have occurred mostly within OneCommunity itself, where employment expanded to support the network growth and increase in customers. Interviewees did not report increases in employment that resulted from receiving improved broadband service. Many respondents reported increases in the operational efficiency of their CAI, but none had quantitative measures that could describe the extent of these gains. There are no studies available that illustrate the effect of the OneCommunity project on job growth within the service area.

2.4 Government Services

One of the five core purposes established by the Recovery Act was to “improve access to, and use of, broadband service by public safety agencies.”⁹⁵ The Government Services focus area identifies how broadband improves services provided by government organizations to the public and includes both the provision and administration of public safety activities. Examples of public safety agencies include law enforcement agencies, fire departments, and emergency medical services (EMS). Some potential government service impacts include enhanced government efficiency, improved ability to save lives and reduce injuries, prevention of criminal activity, and improved information sharing between citizens and public safety entities.

When assessing impacts it is important to understand the characteristics and composition of government service entities within the service area. OneCommunity provided new or improved connectivity to 8 of 1,019 public safety institutions in the service area by December 4, 2013.⁹⁶ Four of the connected institutions are police departments and two are Sheriff’s offices. Police departments served by OneCommunity employ 464 full-time sworn officers and 1,025 full-time civilians.⁹⁷

This section summarizes the activities observed by the evaluation study team during site visits. This report lists impacts from the literature along with the evaluation study team’s observational evidence supporting either the realization of impacts or their potential to occur.

- **The use of broadband at all levels of government allows government entities to deliver services more efficiently. Intranet systems enable the secure and rapid exchange of information among government agencies. Governments are also able to store and safeguard massive quantities of data. By streamlining in-house operations with the use of broadband-supported tools, governments realize greater internal efficiency and productivity.**⁹⁸
 - Cuyahoga County owns its own fiber, supplemented by the OneCommunity network. OneCommunity provides secure connectivity for remote sites on the network, including municipal facilities such as child and family services, employment services, juvenile court, and probation offices. Through OneCommunity, Cuyahoga County obtained leased dark fiber connectivity to the Juvenile Justice Center and is looking to obtain two additional strands of fiber to connect the offices of medical examiners. Purchasing a dark fiber connection enables Cuyahoga County to access to OneCommunity’s team of engineers for maintenance and support services. Cuyahoga County, which does not have an engineering team, indicated that OneCommunity provides more reliable maintenance service than other providers. If OneCommunity had not implemented the BTOP project, a similar network solution would likely be cost prohibitive for the county.
 - Cuyahoga County will use its connection to the OneCommunity network to enhance shared services among municipal entities. The county is examining options to provide connectivity, back up service, data processing, and other support services to smaller cities’ IT and police departments. Cities often operate with limited budgets, and thus supporting IT departments can be particularly cost-intensive. Connecting to the county’s network would enable the county’s IT staff to supplement individual cities’ IT departments, supporting adequate personnel resources within cities’ budgets. For example, Mayfield Village connects to Cuyahoga County through the OneCommunity network. Through this connection, the County provides Mayfield Village hosted phone service, generating cost savings for the community.
 - The expansion of its fiber network enabled OneCommunity to collaborate with surrounding communities to secure two grants through the Local Government Innovation Fund program. The Network Readiness Assessment grant evaluates each community partner’s broadband network infrastructure, helping to ensure that each is prepared to offer and receive shared services.⁹⁹ OneCommunity also received a grant for an Enterprise Geographic Information Systems (GIS), enabling Enterprise GIS to be offered as a shared service to any municipality

within Cuyahoga County. The systems provide data and information including pavement conditions, speed limits, sewer lines, and housing patterns to government and community organizations.¹⁰⁰

- **Law enforcement, investigative, and intelligence agencies may also use broadband for preventative purposes. Security and surveillance activities enabled by broadband, such as those that use global positioning system (GPS) technologies, reduce costs, counteract crime and acts of terror, save lives, and avoid injuries.¹⁰¹ Communication supported by broadband allows for greater information sharing between public safety entities and citizens.¹⁰²**
 - Cuyahoga County uses its fiber network and the affordability of service through OneCommunity to provide connectivity to support emergency services including police headquarters, dispatchers, the Federal Bureau of Investigation (FBI), Cleveland Regional Transit Authority (RTA) policy, and police vehicles. The Cuyahoga Regional Information Services (CRIS) emergency system equips public safety vehicles with PCs and license plate scanners, enabling law enforcement officers to access criminal records while on patrol.
 - Cuyahoga County uses its OneCommunity connection for a video conferencing system to support Justice Department services. The county uses video conferencing for arraignments, prisoner bookings, and for inmates to testify in court, saving the county the cost of transporting prisoners in such scenarios. The county connects its video bridge to the State of Ohio's video bridge to enable conferences. Cuyahoga County allows cities without video capabilities to use the county's facilities for arraignments. The county also provides network capacity to support the Sheriff's Department video camera system.
 - Cuyahoga County uses the OneCommunity network to improve information and resource sharing with public safety institutions. Over the network, the county transmits and receives requests for information from the Bureau of Criminal Investigation (BCI), Naval Criminal Investigative Service (NCIS), and National Crime Information Center (NCIC). Cuyahoga County also uses the OneCommunity network to connect crime labs and an Automated Fingerprint Identification System (AFIS). Cuyahoga County connects with neighboring counties to share data within these systems. When a suspect is booked, AFIS ensures information is accurate and the proper person is in custody. Cuyahoga County is looking into using its fiber network to establish a central dispatching system for local communities. This would ensure that if one county's dispatch system were disrupted, another could take over.
 - The OneCommunity network enables the sharing of public safety services across communities. For example, Mansfield, Ohio implemented a next generation 9-1-1 system, which receives phone calls, e-mails, and text messages. The county can host this service for other communities on the OneCommunity network, offering a shared service model to lower costs for other communities. There are several cities already on the network, and OneCommunity can build to other locations on or near the network, enabling participation in the shared service.

2.5 Quality of Life/Civic Engagement

The Quality of Life/Civic Engagement focus area includes activities that create stronger and more integrated communities through broadband. Impacts within this focus area are measures of broadband capacity for local institutions that provide public access and training in technology, such as libraries and other community centers.¹⁰³ These institutions provide support for individuals to participate in activities that benefit their communities and society, access information about government, participate in communities and civic associations, engage in education and training, seek employment, and establish or support small businesses. For some residents, this public access provides their only means of Internet connectivity. For others, it provides a place to seek assistance, to learn, and to share ideas and information with others. Support of public broadband access is therefore a means of enhancing the civic commons and the quality of life in the community. There is growing evidence that while libraries are beginning to offer more services to

support quality of life and civic engagement, over 75 percent of public libraries are falling behind in having adequate broadband speeds to meet the needs of the public.¹⁰⁴

OneCommunity connected two of the 115 library institutions in its service area.¹⁰⁵ Both of the connected libraries are located in suburbs. This section summarizes the activities observed by the evaluation study team during site visits. The literature review presented in *Interim Report 1* provides evidence that these activities and situations lead to economic and social impacts. This report lists these impacts from the literature along with the evaluation study team's observational evidence supporting either the realization of impacts or their potential to occur.

After obtaining the 1 Gbps connection for the Warrensville branch, an incumbent ISP offered significantly lower pricing to CCPL. The improvement in affordability enabled CCPL to purchase 1 Gbps connectivity for all branches through this provider. Obtaining increased network capacity enables CCPL to offer additional public services to the community. The 1 Gbps connectivity supports passport services at all branch locations, including photos and processing. CCPL branch hours extend beyond the post office's hours of operation, and include Saturdays and Sundays, offering residents greater flexibility in their scheduling. CCPL also uses its 1 Gbps capacity to offer free fax service for patrons. The data travels over the network, and thereby does not require CCPL to support additional phone lines.

Increased capacity supports the growth of CCPL's e-book circulation. Although e-book and digital collections account for a small percentage of circulation, that percentage continues to grow by more than 100 percent each year.¹⁰⁶ Additionally, CCPL will use expanded capacity to incorporate new digital applications into other existing services and to expand their range of programming.

- CCPL is collaborating with the Cleveland Plain Dealer, Cleveland's daily newspaper, to facilitate its transition to an e-edition. Rather than solely providing the print edition, the Parma branch will provide "touch tables" in the café area, allowing patrons to read the e-edition. Patrons can also access the e-edition on library computers. CCPL plans to leverage its partnership with the Cleveland Plain Dealer to develop a course around civic engagement and technology.
- CCPL will introduce the Dialogue Café program that enables patrons to use Cisco telepresence technology to connect to other users around the world for face-to-face discussions. As part of building renovations, CCPL installed technology in conference rooms and "story-time" rooms, allowing branches to Skype with an author or a class in another location. Before upgrading to 1 Gbps connectivity, branches would need to ensure other bandwidth-intensive activities were not scheduled at the same time as the Skype sessions due to bandwidth constraints.
- CCPL intends to use its 1 Gbps connectivity to share video and recording studio equipment with branch locations that do not have an onsite studio, and use the network connection to allow all patrons to access the same applications and programs.

Section 3. Grant Implementation

This section presents OneCommunity's strategy to maximize the social and economic impacts of the BTOP grant. The following subsections describe OneCommunity's implementation strategies; OneCommunity's approach to open access; major results of OneCommunity's implementation strategy; an overview of sustainability efforts; and successful tools, techniques, and strategies identified during interviews with the grantee.

3.1 Implementation

OneCommunity is a nonprofit with a mission to expand broadband and technology into northeast Ohio communities. OneCommunity is an open broadband network provider that offers subscribers a wide range of service options, including custom network solutions. Before receiving the BTOP grant, OneCommunity owned and operated a nearly 500-mile network comprising owned fiber and fiber leased through IRUs. The BTOP award funded the addition of 993 miles of fiber and provided new or greatly improved service to 871 CAIs in a 33 county area in northeast Ohio. Through the BTOP grant, OneCommunity's network infrastructure nearly doubled in size.

OneCommunity built the majority of its pre-BTOP network infrastructure using an \$11,228,000 award from the FCC Rural Health Care Pilot Program (RHCPP) in 2007. This project connected nineteen hospitals in medically underserved areas at speeds of up to 40 Gbps. Through this project, OneCommunity developed a group of vetted and experienced vendors. To construct the BTOP network, OneCommunity divided construction tasks among six different Ohio-based contractors. Cisco and Juniper assisted in the design phase for several larger CAIs and contributed in-kind engineering expertise and equipment to the project.

LCCC and OARnet are the grant's primary sub-recipients. As a sub-recipient, LCCC pledged \$462,202 in matching funds and fifteen miles of IRU fiber as an in-kind match.¹⁰⁷ LCCC was in the middle of an independent application process with funding committed when approached by OneCommunity, whose BTOP grant application covered LCCC's service area. LCCC already identified potential CAIs within Lorain County during its initial grant application process. These CAIs were included in the OneCommunity BTOP application. OARnet provided matching funds for portions of the build to augment its ability to deliver services to K-12 schools, community colleges, and universities across the state. LCCC and OARnet obtained fiber IRUs and equipment to provide direct inter-institutional connectivity over a unified network. Medina County Port Authority originally participated as a sub-recipient of the grant. However, grant requirements caused OneCommunity to remove the Medina County Port Authority as a sub-recipient and establish an IRU to use the county's fiber network to achieve project goals.

As part of the network construction, OneCommunity completed two fiber swaps. The smaller of the two agreements was with Excel, swapping fiber within the downtown Cleveland area. The larger fiber swap agreement provided dark fiber to OARnet running from Akron to Worcester, enabling OARnet to connect customer campuses via a redundant path. In exchange, OARnet provided wave services between Cleveland-based Ideasteam public radio and Columbus. OneCommunity may engage in additional fiber swaps in the future.

OneCommunity's BTOP-funded network is a combination of approximately 91 percent aerial fiber and 9 percent underground fiber. OneCommunity selected aerial fiber for the majority of the network, as it is easier to install and repair in metropolitan areas. OneCommunity used underground fiber for portions of the service area with limited pole availability.

The OneCommunity network uses a high-capacity Dense Wavelength Division Multiplexing (DWDM) system and Multiprotocol Label Switching (MPLS). Fiber-ring architecture forms the network core, providing diversity and reliability with multiple interconnected gateways.¹⁰⁸ The network supports robust and secure voice, video, and data services at speeds from 10 Mbps to 40 Gbps.

OneCommunity opted to use a single set of technologies for both its existing network and the newly constructed BTOP-funded network. OneCommunity was in the middle of a platform migration when it received the BTOP grant, which helped to facilitate the technology transition. The network backbone core is Fujitsu, which supports long haul traffic and DWDM. A Juniper Networks platform supports regional traffic and powers the network. The network operates on a 24x7x365 basis with carrier-grade reliability.¹⁰⁹ The continuation of existing technologies coupled with a backbone refresh enabled OneCommunity to improve the network's redundancy while limiting the risk of service disruptions.

3.2 Open Access Policies

CCI projects funded by BTOP are predominantly middle mile projects, although a small number of last mile projects were awarded. These grants are intended to improve available broadband capabilities for CAIs, to facilitate the development of last mile services in unserved and underserved areas, and to promote economic growth. This investment through the BTOP grant is intended to “lay the foundation for the ultimate provision of reasonably priced end-user broadband services” through open and nondiscriminatory interconnection strategies to enable last mile providers to have open access to the network.¹¹⁰

There is considerable debate on the impact of open access policies on the competitiveness of the broadband market.¹¹¹ Open access is implemented through a wide variety of strategies. “These can range from commercial or voluntary arrangements, between communication operators and third-parties, through to regulatory intervention aimed at promoting certain policy objectives, such as expanding broadband availability, increasing competition, or promoting investment that may otherwise not be economic, such as in the case of enabling the establishment and treatment of shared facilities.¹¹² The impact of open access will be dependent upon how well the practices and policies help to reduce the time, cost, and difficulty for last mile providers to interconnect to the network.¹¹³ The impact also depends on how well the policy mechanisms ensure competitive pricing for wholesale services in the event of the presence of a middle mile provider that may also be a last mile provider.¹¹⁴

OneCommunity has always offered an open, neutral network. OneCommunity developed its statement of commitment to providing an open network based on FCC guidelines. This statement, coupled with OneCommunity's Master Services Agreement (MSA), informs customers of the service price structure. Wholesale pricing depends on the build requirements associated with customer location. Customers not already on the network incur a non-recurring charge (NRC) to support a connection build. OneCommunity negotiates agreements extending beyond the standard service contracts on an individual case basis (ICB). OneCommunity will distribute this cost across the entire service contract, rather than charging one lump sum.

OneCommunity constructed 192 interconnection points to facilitate connections to the fiber network. As part of the BTOP-funded project, OneCommunity upgraded five existing hub sites on the network and built thirteen additional sites primarily within commercially available colocation space, facilitating interconnection with other carriers.¹¹⁵ Interconnection with other carriers enables OneCommunity to share transport services. Level 3 Communications and OARnet serve as Internet transit peers. OneCommunity also connects to other carriers exclusively for transport within the region.

Through pre-existing wholesale arrangements, OneCommunity offers Ethernet access to wholesale partners on primarily a "lit" service basis from 10 Mbps up to 40 Gbps. OneCommunity offers Ethernet Access and Internet services on a wholesale basis, under an MSA on file with the State of Ohio. Pricing includes Network Operations Center (NOC) services and 24x7x365 support, which customers receive regardless of the level of service purchased. Internet pricing for CAIs ranges from \$6 to \$20 per megabit per month based on the speed and length of term for Ethernet access purchased.¹¹⁶

OneCommunity initially anticipated completing more dark fiber sales, but found customers preferred to purchase lit services. OneCommunity noted that aside from local carriers, dark fiber sales had declined in recent years as many customers prefer their network to be managed by a third party, rather than dedicating resources to manage in-house. Higher speed and increased capacity available over the network enable customers to shift systems to cloud-based and other hosted services without the responsibility of maintaining fiber. Though OneCommunity collects monthly revenue for lit services, the shift in customer preference was challenging in the beginning of the award period, as OneCommunity did not receive anticipated lump sum payments from dark fiber sales.

As a nonprofit, OneCommunity's business model emphasizes CAIs, although the sale of wholesale transport and dark fiber IRUs to other providers supports sustainability. OneCommunity will provide last mile transport for other providers looking to serve for-profit businesses and will sell wholesale circuits to for-profit entities in instances where it makes business sense to do so.

The OneCommunity BTOP grant was part of a larger, coordinated effort to improve open access to middle mile infrastructure in Ohio. The OneCommunity, Horizon Telecom, and Com Net, Inc. BTOP CCI projects formed the Ohio Middle Mile Consortium (OMMC).¹¹⁷ The three OMMC projects received awards with Round 2 BTOP funds. The participants in OMMC designed a comprehensive open and neutral network that provides middle mile services for the entire State of Ohio. Com Net is a consortium of twenty-one independent local exchange companies that serves the western portion the state.¹¹⁸ Horizon is a telephone company serving the southeast corner of the state. OARnet, run by Ohio State University, participates as a sub-recipient on all three projects and connects them to each other. OMMC partners meet at Shears Court, a cross-connect facility in Columbus that offers carriers free entry. This interconnection model enables the providers to access transport service across approximately 75 percent of the state, excluding several counties in the southwest corner.

3.3 Results

Major results of the OneCommunity project observed by the evaluation study team include:

As of September 30, 2013, OneCommunity had signed agreements with fifteen wholesale and last mile providers. These providers either had an existing or established a new relationship with OneCommunity.¹¹⁹ OneCommunity reported that one provider purchased a 1 Gbps circuit, four providers purchased five IRUs for 10 Gbps or greater of dark fiber, and ten providers purchased wholesale Ethernet access at different levels, averaging 250 Mbps across a range of 10 Mbps to 1 Gbps. Since connecting to OneCommunity's network, many wholesale or last mile providers invested in technologies to upgrade interfaces to 10 Gbps, or multiple 10 Gbps interfaces, in different locations.

Wholesale and last mile providers with signed agreements serve residential and commercial customers, and in some cases CAIs. OneCommunity did not have data to quantify the number of residential, commercial, or municipal customers served using the BTOP-funded network backbone. As a result, OneCommunity does not include any CAIs connected to the backbone via a wholesale or last mile provider in the list of CAIs served by the grant.

OneCommunity's expansion of an open access fiber network has encouraged competition among commercial providers in the service area. Several CAIs reported that since OneCommunity expanded its network, commercial providers have lowered prices in the regional market.

- CCPL reported that OneCommunity's BTOP-funded project fostered competition. After obtaining 1 Gbps connectivity for the Warrensville branch through OneCommunity, a competitor offered significantly lower pricing to CCPL for other branches. These rates were considered so attractive that CCPL elected to stay with the other provider, and to purchase 1 Gbps connectivity in all branches. CCPL indicated that this level of price reduction would likely not have taken place without the alternative provided by the OneCommunity network.
- OneCommunity reported commercial providers outbidding OneCommunity for larger-scale CAI contracts. For example, OneCommunity had been the service provider for a local county for five years. A commercial provider significantly lowered its price, acquiring the county as a customer. Although OneCommunity lost this particular customer, the county benefitted by obtaining a more affordable service contract, a result that aligns with OneCommunity's mission.

3.4 Sustainability

The BTOP grant accelerated OneCommunity's progress towards its mission, enabling expansion of the fiber network and extension of services to 871 CAIs. OneCommunity intends to continue connecting CAIs and expanding the provision of services to support northeast Ohio. OneCommunity's nonprofit business model enables competitive pricing. Profits are necessary to support network sustainability. However, OneCommunity does not need to earn additional profits to support corporate overhead or to pay shareholders, thus is able to keep service prices competitive.

The longer-term impact of the OneCommunity project will depend on several factors:

- The longer-term financial viability of the network will depend on continued revenues from agreements with CAIs and with third-party providers. Given the large number of third-party agreements that are already in place, and the larger-than-expected number of CAIs that have received connectivity, there is a strong customer base to support revenue into the future. OneCommunity has already begun to plan investments in customer service and training in order to maintain customer satisfaction, while at the same time continuing its nonprofit status. In part, these efforts might include extensions of digital literacy activities funded under other grant awards.
- OneCommunity must continue to maintain the network at high levels of availability, especially considering the healthcare and public safety uses of the network. OneCommunity's NOC provides 24x7x365 network monitoring and OneCommunity technicians provide network maintenance. OneCommunity, as part of the OMMC partnership, has access to the technical expertise of OMMC grant participants, which provides additional support to ongoing technology development.
- The price that OneCommunity can obtain for connectivity and transport must be sufficient to support the ongoing activities of the organization. There has already been some evidence that OneCommunity might have challenges in the future. Some carriers appear to be cutting prices to make their offerings more competitive with those of OneCommunity, which has resulted in OneCommunity losing sales in some cases. OneCommunity's nonprofit business model could help maintain its position in the market because OneCommunity only needs to achieve a breakeven pricing structure to continue its operations.

3.5 Successful Tools, Techniques, and Strategies

This subsection describes successful techniques, tools, and strategies identified by the grantee and interviewees. Successes and challenges described in earlier sections are not repeated here.

- OneCommunity colocates with the majority of data centers in northeast Ohio, allowing customers to select the data center that best fits their needs. Connectivity to a range of data centers affords OneCommunity greater flexibility in customers' network design. OneCommunity assists customers in determining network configuration strategies. Customers previously connected via T1s, especially in rural communities, may be unfamiliar with services offered over the new network, such as hosted voice and transport services. OneCommunity recommends services and strategies to help customers maximize the benefit of network connectivity.
- OneCommunity used public rights of way to build the network rather than negotiating access agreements, which might have entailed scheduling disruptions. Some facilities connected through the project required certain rights of entry, obtained via a signed agreement, rather than by purchase. In general, this helped to maintain the project schedule as planned.

3.6 Challenges

- Delays were mostly caused by the quantity of pole permits for which OneCommunity applied and the planning and make ready work the project entailed. The utilities that owned the poles were in some cases understaffed for the volume of requests made by OneCommunity. In response, utility pole owners gave OneCommunity the autonomy to approve a pole for make ready. Due to the backlog of approvals, pole companies are still in the process of completing make ready improvements, resulting in a continuous stream of invoices to OneCommunity, well past the deadline for grant closeout. This presents a financial burden to OneCommunity, which can no longer use BTOP funds to pay for these activities.
- OneCommunity did not initially have a firm list of CAIs, but rather targeted all CAIs within proximity to the network route. OneCommunity submitted an environmental assessment (EA) based on a five-mile swath of the fiber network's projected location. Before construction could commence, OneCommunity was required to complete an initial engineering assessment of the entire network's footprint for the EA, and then conduct a second engineering assessment for permit application. In instances where a permit was not granted, OneCommunity would alter the route and submit revisions to the environmental assessment. OneCommunity indicated that this process incurred additional expenses and delays.
- Davis-Bacon compliance required careful management. Variations in union-scale wages across service area counties required close monitoring of project activities to ensure that workers were paid wages in compliance with the Davis-Bacon Act, as wage requirements for the same position differed depending on the segment of the network on which contractors were working. This required increased reporting and integration of geographic information on network build, which increased the effort required to manage the project.

Section 4. Conclusions

The American Recovery and Reinvestment Act of 2009 (Recovery Act) instructed NTIA to implement BTOP to promote five core purposes:¹²⁰

1. Provide access to broadband service to consumers residing in unserved areas of the country.
2. Provide improved access to broadband service to consumers residing in underserved areas of the country.
3. Provide broadband education, awareness, training, access, equipment, and support to:
 - a. Schools, libraries, medical and healthcare providers, community colleges and other institutions of higher learning, and other community support organizations.
 - b. Organizations and agencies that provide outreach, access, equipment, and support services to facilitate greater use of broadband services by vulnerable populations (e.g., low-income, unemployed, seniors).
 - c. Job-creating strategic facilities located in state- or federally designated economic development zones.
4. Improve access to, and use of, broadband service by public safety agencies.
5. Stimulate the demand for broadband, economic growth, and job creation.

This section summarizes how OneCommunity's implementation of BTOP has encouraged the fulfillment of the Recovery Act's goals.

4.1 Improve Access to Unserved and Underserved Areas of the Country

The first two goals of the Recovery Act encourage improved access for unserved and underserved areas:

- Provide access to broadband service to consumers residing in unserved areas of the country.
- Provide improved access to broadband service to consumers residing in underserved areas of the country.

Although FCC data show that almost 66 percent of service area households subscribe to broadband, according to the June 2011 release of the NBM, just two of the thirty-one broadband providers in the service area deliver the fastest download speed range of 100 Mbps to 1 Gbps.¹²¹

The OneCommunity network improved access to broadband within the service area. As of December 4, 2013, OneCommunity provided new or improved connectivity to 871 CAIs within the service area, offering increased broadband speeds and competitive pricing. CAIs realized cost savings and improvements in network reliability and functionality since connecting to OneCommunity's network. OneCommunity offers 192 points of interconnection throughout the open network's 993-mile expansion, offering last mile providers the opportunity to expand services throughout the region.

OneCommunity reported that CAIs in rural areas connected through the grant would not have been able to obtain equivalent bandwidth for a comparable rate through a commercial provider. Limited competition in rural communities resulted in high prices and limited service options. OneCommunity found that the majority of CAIs it approached were receptive towards participating in the project. Additionally, by September 30, 2013, OneCommunity interconnected fifteen last-mile providers to the network, enabling the delivery of better services to residents.

4.2 Broadband Education, Awareness, Training, Access, Equipment, and Support

Most closely aligned with PCC and SBA grants, the next Recovery Act goal is for grantees to provide broadband education, awareness, training, access, equipment, and support to:

1. Schools, libraries, medical and healthcare providers, community colleges and other institutions of higher learning, and other community support organizations.
2. Organizations and agencies that provide outreach, access, equipment, and support services to facilitate greater use of broadband services by vulnerable populations (e.g., low-income, unemployed, seniors).
3. Job-creating strategic facilities located in state- or federally designated economic development zones.

OneCommunity provides customer support and network design services. Although these services do not account for a large portion of revenues, OneCommunity offers fully engineered solutions to ensure customers are able to achieve the maximum benefit of subscribing to the network. Clients without the necessary resource in house contract with OneCommunity at standard hourly rates, which range from \$70 to \$130 per hour depending on staff position.¹²² OneCommunity's NOC offers subscribers a fully managed network supported by a team comprised of certified, experienced engineering professionals. NOC engineers monitor network performance 24x7x365.¹²³ CAIs indicated that access to OneCommunity's technicians and maintenance services increases the value of subscription through OneCommunity.

OneCommunity received an \$18,700,000 Sustainable Broadband Adoption (SBA) grant awarded during Round 1 of BTOP funding. This grant aimed to accelerate the adoption of broadband in communities across five states through the provision of training, equipment, and support services. Through the SBA grant, OneCommunity developed and delivered community solutions related to digital literacy, government, healthcare, and education. OneCommunity is exploring the possibility of using revenues generated through provision of services over the BTOP network to provide digital literacy training similar to that offered through the SBA grant. OneCommunity emphasizes the importance of digital literacy to ensure residents have the skills necessary to obtain positions in the area's large medical community. There was no overlap in funds or staffing between OneCommunity's two BTOP projects.¹²⁴

CCPL also participated in a BTOP SBA grant with Connected Nation's subsidiary, Connect Ohio. Participation in the grant enabled CCPL to expand its digital literacy training resources. CCPL reported that more than 9,000 patrons at thirteen locations participated in basic technology training.¹²⁵ CCPL intends to identify a way to provide digital literacy training, similar to that provided through the SBA grant, in 2014. CCPL hopes that the services and programs improve patrons' awareness of broadband's capabilities and influence their adoption.

4.3 Public Safety Agencies

The fourth goal of the Recovery Act is to improve access to, and use of, broadband service by public safety agencies.

In addition to the services described in Section 2.4, Agile Networks, which signed an agreement with OneCommunity, uses the BTOP network to support Multi-Agency Radio Communication System (MARCS) towers. MARCS comprises a 700/800 MHz radio and data network that provides statewide interoperability in digital clarity to subscribers throughout Ohio and within a ten-mile radius of Ohio.¹²⁶ The MARCS system provides secure and reliable wireless communication for public safety and first responders statewide.¹²⁷

4.4 Demand for Broadband, Economic Growth, and Job Creation

The final Recovery Act goal is to stimulate the demand for broadband, economic growth, and job creation. The project enabled OneCommunity to achieve greater penetration among CAI subscribers and increase revenue streams. OneCommunity implements the same business model, targets the same CAI customer base, and follows the same nonprofit charter as it did before the BTOP award, but has since expanded its service area. OneCommunity's completion of the BTOP-funded network will help to ensure future economic development for the region. Examples include the following:

- OneCommunity's network capabilities help to support the demands of healthcare institutions and technology firms in the service area. OneCommunity's network expansion supports the Cleveland Health Tech Corridor, a three-mile 1600-acre corridor in proximity to healthcare institutions including the Cleveland Clinic and University Hospitals, business incubators, universities, and high-tech companies.¹²⁸ The premise of the corridor is to attract and grow healthcare and technology businesses by providing infrastructure conducive to research and development, and to enable collaboration via geographic proximity. OneCommunity provides 10 Gbps fiber access to the Global Center for Health Innovation (GCHI) and the adjacent Cleveland Convention Center, a one-million square foot site in Cleveland.¹²⁹ OneCommunity provided the circuit, and conducted the design and build of the HIMSS intranet around its location within the GCHI, formerly known as the Cleveland Medical Mart. Providing advanced network capabilities to healthcare groups and technology firms contributes to the economic development of the region.
- While OneCommunity primarily serves nonprofits, the group intends to foster growth within the region by offering increased bandwidth at more competitive rates to local businesses. OneCommunity estimated serving approximately seventy for-profit locations either directly or through the sale of wholesale capacity to third-party providers.
- The BTOP grant enabled OneCommunity to expand its network and support the addition of more than thirty new employees. OneCommunity believes it would not have expanded its fiber-optic network as extensively within the given timeframe without the grant, nor would OneCommunity have been able to serve nearly 900 CAIs with the resources available before the grant.

There are no studies available that illustrate the effect of the OneCommunity project on job growth within the service area counties. Section 2.3 presents a summary of other Workforce and Economic Development impacts.

In addition to using OneCommunity's network to achieve operational efficiencies and the expansions of programs and services, CAIs described activities expected to stimulate the demand for broadband and economic growth:

- Mayfield Village, which expanded its fiber network through the BTOP grant, purchases and resells Internet service from OneCommunity to commercial subscribers. Mayfield provides quotes for services reflecting any costs associated with building infrastructure to connect facilities. Businesses may ultimately select a commercial provider for Internet solutions, although Mayfield Village's provision of service helps to ensure rates are competitive. Competitive broadband pricing and reliability, coupled with high-capacity access help to attract and retain businesses in the Mayfield Village community.
- LCCC intends to use the OneCommunity network to increase the demand for broadband and economic development within the community. LCCC is in the final stages of executing contracts to provide commodity Internet traffic for county commissioners, Lorain County administration, and potentially the local ITC. LCCC is also negotiating a contract that would allow it to use the BTOP network to provide point-to-point connectivity between county buildings. LCCC intends to

establish partnerships to develop and foster shared services among community organizations, local government, K-12 schools, and higher education.

Section 5. Next Steps for the Evaluation Study

In early 2014, ASR will deliver *Interim Report 2* to NTIA. This report will include a summary of the site visits to twelve CCI projects. It will also include a summary of the second round of site visits to the fifteen PCC and SBA grants.

For the CCI projects, *Interim Report 2* will summarize the activities underway by twelve CCI grantees and the social and economic impacts of these projects. For the PCC and SBA projects, *Interim Report 2* will provide an update to and refinement of the analysis presented in *Interim Report 1*.

In September 2014, ASR will deliver a *Final Report* that quantitatively and qualitatively assesses the economic and social impact of BTOP grants (including CCI, PCC, and SBA grants). The centerpiece of the *Final Report* will be an assessment of how and to what extent BTOP grant awards have achieved economic and social benefits in areas served by the grantees. To the extent that such information is available, ASR will use results from studies performed by the grantees to round out the conclusions presented.

Notes

¹ National Telecommunications and Information Administration, *Broadband Technology Opportunities Program (BTOP) 16th Quarterly Program Status Report*, 2013, http://www.ntia.doc.gov/files/ntia/publications/ntia_btop_16th_quarterly_report.pdf.

² National Telecommunications and Information Administration, "About," *BroadbandUSA: Connecting America's Communities* (Washington, DC, June 11, 2012), <http://www2.ntia.doc.gov/about>.

³ The Notice of Funds Availability (NOFA) includes the following definitions:

- Last mile project – any infrastructure project the predominant purpose of which is to provide broadband service to end users or enduser devices (including households, businesses, community anchor institutions, public safety entities, and critical community facilities).
- Middle mile project – a broadband infrastructure project that does not predominantly provide broadband service to end users or to end-user devices, and may include interoffice transport, backhaul, Internet connectivity, or special access.

National Telecommunications and Information Administration, "Broadband Initiatives Program; Broadband Technology Opportunities Program Notice" (Washington, D.C., 2009), http://www.ntia.doc.gov/files/ntia/publications/fr_bbnofa_090709.pdf.

⁴ National Telecommunications and Information Administration, "Statement of Work for Broadband Technology Opportunities Program (BTOP) Evaluation Study," July 26, 2010, 6.

⁵ ASR Analytics, *Progress towards BTOP Goals: Interim Report on PCC and SBA Case Studies, Broadband Technology Opportunities Program Evaluation Study (Order Number D10PD18645)* (Potomac, MD, 2012), <http://www.ntia.doc.gov/report/2012/progress-towards-btop-goals-interim-report-pcc-and-sba-case-studies>.

⁶ National Telecommunications and Information Administration, *OneCommunity Transforming NE Ohio Fact Sheet, BroadbandUSA: Connecting America's Communities*, August 2010, http://www2.ntia.doc.gov/files/grantees/fact_sheet_-_onecommunity.pdf.

⁷ U.S. Department of Commerce, *OneCommunity Financial Assistance Award (Form CD-450)*, September 17, 2010, http://www2.ntia.doc.gov/files/grantees/onecommunity-neohio_infrastructure_cd-450.pdf.

⁸ National Telecommunications and Information Administration, "Post-Award Monitoring (PAM) Database 2013-12-13" (Washington, D.C.: Distributed by National Telecommunications and Information Administration, 2013).

⁹ National Telecommunications and Information Administration, "Post-Award Monitoring (PAM) Database 2013-12-13."

¹⁰ National Telecommunications and Information Administration, "Post-Award Monitoring (PAM) Database 2013-12-13."

¹¹ National Telecommunications and Information Administration, *OneCommunity Transforming NE Ohio Fact Sheet*.

¹² National Telecommunications and Information Administration, *OneCommunity Transforming NE Ohio Fact Sheet*.

¹³ Centers for Medicare & Medicaid Studies, “National Plan and Provider Enumeration System (NPPES)” (Washington, DC, July 2013), http://nppes.viva-it.com/NPI_Files.html; National Center for Education Statistics, “Elementary/Secondary Information System (ELSi)” (Washington, DC, August 15, 2013), <https://nces.ed.gov/ccd/elsi/>; National Center for Education Statistics, “Integrated Postsecondary Education Data System (IPEDS)” (Washington, DC, August 15, 2013), <https://nces.ed.gov/ipeds/>; National Uniform Claim Committee, *Health Care Provider Taxonomy*, July 2013, http://www.nucc.org/index.php?option=com_content&view=article&id=14&Itemid=125; United States Department of Justice. Office of Justice Programs. Bureau of Justice Statistics, “Census of State and Local Law Enforcement Agencies (CSLLEA), 2008,” *Directory of Law Enforcement Agencies Series* (Ann Arbor, MI: Inter-university Consortium for Political and Social Research, August 03, 2011), doi:10.3886/ICPSR27681.v1; United States Fire Administration, “National Fire Department Census Database,” August 08, 2013, <http://apps.usfa.fema.gov/census/>; Jim Hay, “E-Mail Communication,” December 04, 2013.

¹⁴ National Telecommunications and Information Administration, *OneCommunity Transforming NE Ohio Fact Sheet*.

¹⁵ Centers for Medicare & Medicaid Studies, “National Plan and Provider Enumeration System (NPPES)””; National Center for Education Statistics, “Elementary/Secondary Information System (ELSi)””; National Center for Education Statistics, “Integrated Postsecondary Education Data System (IPEDS)””; National Uniform Claim Committee, *Health Care Provider Taxonomy*; United States Department of Justice. Office of Justice Programs. Bureau of Justice Statistics, “Census of State and Local Law Enforcement Agencies (CSLLEA), 2008””; United States Fire Administration, “National Fire Department Census Database””; Hay, “E-Mail Communication,” December 04, 2013.

Jim Hay, “E-Mail Communication,” January 16, 2014.

¹⁶ National Telecommunications and Information Administration, *OneCommunity Transforming NE Ohio Fact Sheet*.

¹⁷ National Telecommunications and Information Administration, “Post-Award Monitoring (PAM) Database 2013-09-12” (Washington, DC: Distributed by National Telecommunications and Information Administration, 2013).

¹⁸ The grantee provided the evaluation study team a list of 877 connected CAIs: 2 Library, 195 Medical/Healthcare, 37 Other Community Support, 7 Public Safety, 595 School (K-12), and 41 University, College, or Other Postsecondary. The evaluation study team reviewed all CAIs and, where possible, attempted to match them to a publicly available data set. After review, the evaluation study team made several deletions, additions, and reclassifications. The details of these actions are provided in notes for individual CAI anchor types throughout Section 2.

Centers for Medicare & Medicaid Studies, “National Plan and Provider Enumeration System (NPPES)””; National Center for Education Statistics, “Elementary/Secondary Information System (ELSi)””; National Center for Education Statistics, “Integrated Postsecondary Education Data System (IPEDS)””; National Uniform Claim Committee, *Health Care Provider Taxonomy*; United States Department of Justice. Office of Justice Programs. Bureau of Justice Statistics, “Census of State and Local Law Enforcement Agencies (CSLLEA), 2008””; United States Fire Administration, “National Fire Department Census Database””; Hay, “E-Mail Communication,” December 04, 2013.

¹⁹ Hay, “E-Mail Communication,” December 04, 2013.

²⁰ Hay, “E-Mail Communication,” December 04, 2013.

²¹ Hay, “E-Mail Communication,” December 04, 2013.

²² National Telecommunications and Information Administration, “Post-Award Monitoring (PAM) Database 2013-09-12.”

²³ Jim Hay, “E-Mail Communication,” November 13, 2013.

- ²⁴ National Telecommunications and Information Administration, *OneCommunity Transforming NE Ohio Fact Sheet*.
- ²⁵ Hay, "E-Mail Communication," January 16, 2014.
- Hay, "E-Mail Communication," December 04, 2013.
- ²⁶ Hay, "E-Mail Communication," January 16, 2014.
- ²⁷ United States Census Bureau, "2007-2011 ACS 5-Year Summary File," *American Community Survey* (Washington, DC, December 06, 2012), http://www.census.gov/acs/www/data_documentation/2011_release/.
- ²⁸ National Telecommunications and Information Administration, "State Broadband Initiative June 30, 2011" (Washington, D.C.: United States Department of Commerce, 2011), <http://www2.ntia.doc.gov/Jun-2011-datasets>.
- ²⁹ National Telecommunications and Information Administration, "State Broadband Initiative June 30, 2011."
- ³⁰ FCC Form 477 data includes information at the census tract level on the population that subscribes to broadband using the following speed thresholds: at least 768 kbps download speed and at least 200 kbps upload speed. Because of this limitation, ASR is not able to filter for subscribers with download speeds of at least 3 Mbps and upload speeds of at least 768 kbps.
- ³¹ Federal Communications Commission, "Local Telephone Competition and Broadband Deployment Form 477," June 2012, <http://transition.fcc.gov/wcb/iatd/comp.html>.
- ³² Hay, "E-Mail Communication," December 04, 2013.
- ³³ Hay, "E-Mail Communication," December 04, 2013.
- ³⁴ United States Census Bureau, "Cuyahoga County QuickFacts," 2013, <http://quickfacts.census.gov/qfd/states/39/39035.html>.
- ³⁵ OneCommunity, "Government Broadband Services," accessed December 02, 2013, <http://www.onecommunity.org/community-technology-programs/government-broadband-services/>.
- ³⁶ OneCommunity, "Government Broadband Services."
- ³⁷ OneCommunity, "Government Broadband Services."
- ³⁸ United States Census Bureau, "Community Facts," *American FactFinder*, 2010, http://factfinder2.census.gov/faces/nav/jsf/pages/community_facts.xhtml.
- ³⁹ Representative of Mayfield Village, "E-Mail Communication," November 21, 2013.
- ⁴⁰ Representative of Mayfield Village, "E-Mail Communication."
- ⁴¹ Representative of Mayfield Village, "E-Mail Communication."
- ⁴² MetroHealth, "About Us," accessed November 25, 2013, <http://www.metrohealth.org/about>.
- ⁴³ MetroHealth, "About Us."
- ⁴⁴ MetroHealth, "About Us."
- ⁴⁵ MetroHealth, "About Us."
- ⁴⁶ U.S. News and World Report, "H B Magruder Memorial Hospital Stats & Services," 2013, <http://health.usnews.com/best-hospitals/area/oh/h-b-magruder-memorial-hospital-6411900/details>.
- ⁴⁷ U.S. News and World Report, "H B Magruder Memorial Hospital Stats & Services."
- ⁴⁸ Lorain County Community College, "LCCC Learning Centers," 2013, <http://www.lorainccc.edu/LCCC+Learning+Centers/>.

⁴⁹ North Central Ohio Computer Cooperative, "About Us," accessed November 25, 2013, <http://www.ncocc-k12.org/index.php/about-us#sthash.DPUUESK8.dpbs>.

⁵⁰ Cuyahoga County Public Library, "Library Cards," 2013, <http://www.cuyahogalibrary.org/Services/Library-Cards.aspx>.

⁵¹ Cuyahoga County Public Library, "Cuyahoga County Public Library Named a 5-Star Library," 2010, <http://cuyahogalibrary.net/StdBackPage.aspx?id=32366>.

⁵² Representative of Cuyahoga County Public Library, "E-Mail Communication," November 01, 2013.

⁵³ ASR Analytics, *Progress towards BTOP Goals: Interim Report on PCC and SBA Case Studies*.

⁵⁴ The grantee provided the evaluation study team a list of 595 connected Schools (K-12) institutions. The evaluation study team removed seven schools from this list: six were identified as closed through Internet research and one was a duplicated entry. The evaluation study team also reclassified two as Postsecondary institutions and twelve as Other Community Support. The evaluation study team identified one school in the public data set located at the same address as a reported school; this school was added to the list of connected schools. The evaluation study team could not locate thirty-nine reported institutions in the public data set: seventeen are schools that likely exist but are not in the public data because they opened after the period the data cover or they did not respond to the survey; fifteen are administrative buildings; three are K-12 school support organizations; two provide special education services; one is a bus center; and one is a learning center. These locations were added to the service area total. Characteristics are unavailable for these thirty-nine locations, so the total numbers of students and teachers presented in this report are under-representative of the grant's actual reach.

Hay, "E-Mail Communication," December 04, 2013; National Center for Education Statistics, "Elementary/Secondary Information System (ELSi)."

NCES provides definitions for the following public school levels:

- Primary: lowest grade offered is in pre-kindergarten through third grade and highest grade offered is in pre-kindergarten through eighth grade
- Middle: lowest grade offered is in fourth through seventh grades and highest grade offered is in fourth through ninth grades
- High: lowest grade offered is in seventh through twelfth grades and highest grade offered is twelfth grade
- Other: grades offered do not follow the primary, middle, or high school level configurations, or the school does not have a grade system
- Undefined: missing value

Private schools are categorized into the following levels: Elementary, Secondary, and Combined. NCES does not provide definitions for these levels. The evaluation study team combined the Undefined public school level with missing private school values for school institutions served by the grantee. For other schools in the service area, all Undefined schools are public.

⁵⁵ National Center for Education Statistics, "Elementary/Secondary Information System (ELSi)."

⁵⁶ National Center for Education Statistics, "Elementary/Secondary Information System (ELSi)."

⁵⁷ National Center for Education Statistics, "Elementary/Secondary Information System (ELSi)."

⁵⁸ National Center for Education Statistics, "Elementary/Secondary Information System (ELSi)."

⁵⁹ The grantee provided the evaluation study team a list of 41 connected Postsecondary institutions. The evaluation study team reclassified two as Other Community Support institutions. The evaluation study team reclassified two Schools (K-12) institutions as Postsecondary institutions; one of these is a duplicated of a reported Postsecondary institutions and was removed.

The evaluation study team could not locate one reported institution in the public data set. This location was added to the service area total. Characteristics are unavailable for this location, so student totals do not include this institution. However, nine of the reported institutions are individual buildings, campuses, or centers; this will likely over-represent connected students as a result.

National Center for Education Statistics, "Integrated Postsecondary Education Data System (IPEDS)."

⁶⁰ National Center for Education Statistics, "Integrated Postsecondary Education Data System (IPEDS)."

⁶¹ National Center for Education Statistics, "Integrated Postsecondary Education Data System (IPEDS)."

⁶² Scott M. Andes and Daniel D. Castro, *Opportunities and Innovations in the Mobile Broadband Economy*, *The Information Technology and Innovation Foundation*, 2010, <http://www.itif.org/files/2010-mobile-innovations.pdf>.

Communications Workers of America, *Speed Matters: Benefits of Broadband* (Washington, DC, 2009), http://files.cwa-union.org/speedmatters/CWA_Benefits_of_Broadbandr_2010.pdf.

Linda Ann Hulbert and Regina C. McBride, "Utilizing Videoconferencing in Library Education: A Team Teaching Approach," *Journal of Education for Library and Information Science* 45, no. 1 (2004): 25–35, <http://www.jstor.org/stable/40323919>.

Carly Shuler, *Pockets of Potential: Using Mobile Technologies to Promote Children's Learning* (New York, NY: The Joan Gans Cooney Center, January 2009), <http://joanganzcooneycenter.org/Reports-23.html>.

⁶³ Lorain County Community College, "Welcome to the University Partnership," accessed November 15, 2013, <http://www.lorainccc.edu/UP>.

⁶⁴ Lorain County Community College, "Welcome to InnovatEd," accessed December 02, 2013, <http://www.lorainccc.edu/About+Us/InnovatEd/>.

⁶⁵ Lorain County Community College, "Advanced Digital Forensics Institute," accessed November 18, 2013, <http://www.lorainccc.edu/Business+and+Industry/ADFI/>.

⁶⁶ Lorain County Community College, "Advanced Digital Forensics Institute."

⁶⁷ OneCommunity, *2013 Report to the Community*, 2013, http://www.onecommunity.org/wp-content/uploads/2013/09/1C_2013_Report.pdf.

⁶⁸ Ruth H. Moody and Michael P. Bobic, "Teaching the Net Generation without Leaving the Rest of Us Behind: How Technology in the Classroom Influences Student Composition," *Politics & Policy* 39, no. 2 (April 29, 2011): 169–194, doi:10.1111/j.1747-1346.2011.00287.x.

⁶⁹ The South Dakota Bureau of Information and Telecommunications, "Broadband Benefits for Rural Areas," February 01, 2011, <http://broadband.sd.gov/Benefits-Rural.aspx>.

⁷⁰ The grantee provided the evaluation study team a list of 195 connected Healthcare institutions. The evaluation study team reclassified one as a Public Safety institution. Eleven of the connected Healthcare institutions reported by OneCommunity are not healthcare providers and, therefore, do not fall within any of the taxonomy groups. The evaluation study team could not find any information on one reported institution in its research.

Hay, "E-Mail Communication," December 04, 2013.

⁷¹ Centers for Medicare & Medicaid Studies, "National Plan and Provider Enumeration System (NPPES)"; National Uniform Claim Committee, *Health Care Provider Taxonomy*.

The evaluation study team used background information to determine the taxonomy groups in which grantee-connected healthcare institutions fall based on the taxonomy system in National Uniform Claim Committee, *Health Care Provider Taxonomy*. This is the same taxonomy used in Centers for Medicare & Medicaid Studies, “National Plan and Provider Enumeration System (NPPES).”

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1. If a normal full-time schedule is 40 hours a week, multiply 40 hours x 52 weeks = 2,080 Total Hours per year.
2. Divide 2,080 Total Hours by 4 to equal 520 regular quarterly hours.
3. If two full-time employees each worked 520 hours (1,040 hours) for the quarter and another half-time employee worked 260 hours, the Total Hours for the three employees is 1300 (520 + 520 + 260 = 1300).
4. Divide 1300 by 520 to equal 2.5 Recovery funded jobs during that quarter.

For more information, visit <http://www.recovery.gov/News/featured/Pages/Calculator.aspx>

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Glossary

Acronym	Definition
ADFI	Advanced Digital Forensics Institute
AFIS	Automated Fingerprint Identification System
APR	Annual Performance Progress Report
ASR	ASR Analytics, LLC
BCI	Bureau of Criminal Investigation
BTOP	Broadband Technology Opportunities Program
CAH	Critical Access Hospital
CAI	Community Anchor Institution
CCI	Comprehensive Community Infrastructure
CCPL	Cuyahoga County Public Library
CMS	Centers for Medicare & Medicaid Services
CRIS	Cuyahoga Regional Information Services
CWRU	Case Western Reserve University
DWDM	Dense Wavelength Division Multiplexing
EA	Environmental Assessment
EHR	Electronic Health Record
EMR	Electronic Medical Record
EMS	Emergency Medical Services
ERP	Enterprise Resource Planning
FBI	Federal Bureau of Investigation
FCC	Federal Communication Commission
GCHI	Global Center for Health Innovation
GENI	Global Environment for Network Innovations
GIS	Geographic Information System
GLIDE	Great Lakes Innovation and Development Enterprise
GPS	Global Positioning System
HCAHPS	Hospital Consumer Assessment of Healthcare Providers and Systems
HIMSS	Healthcare Information and Management Systems Society
HVAC	Heating, Ventilation, and Air Conditioning
ICB	Individual Case Basis
IMLS	Institute of Museum and Library Services

Acronym	Definition
IRU	Indefeasible Rights of Use
ISP	Internet Service Provider
ITC	Information Technology Center
IVDL	Interactive Video Distance Learning
LCCC	Lorain County Community College
LMS	Learning Management System
MARCS	Multi-Agency Radio Communication System
MPLS	Multiprotocol Label Switching
MSA	Master Service Agreement
MTA	Medical Technical Assistant
NBM	National Broadband Map
NCIC	National Crime Information Center
NCIS	Naval Criminal Investigative Service
NCOCC	North Central Ohio Computer Cooperative
NOC	Network Operations Center
NPES	National Plan and Provider Enumeration System
NRC	Non-recurring Charge
NTIA	National Telecommunications and Information Administration
OMMC	Ohio Middle Mile Consortium
PACS	Picture Archiving and Communication System
PCC	Public Computer Centers
POP	Point of Presence
PPR	Quarterly Performance Progress Report
RHCPP	Rural Health Care Pilot Program
RTA	Regional Transit Authority
SBA	Sustainable Broadband Adoption
UP	University Partnership
VoIP	Voice Over Internet Protocol
VPN	Virtual Private Network
WAN	Wide Area Network

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