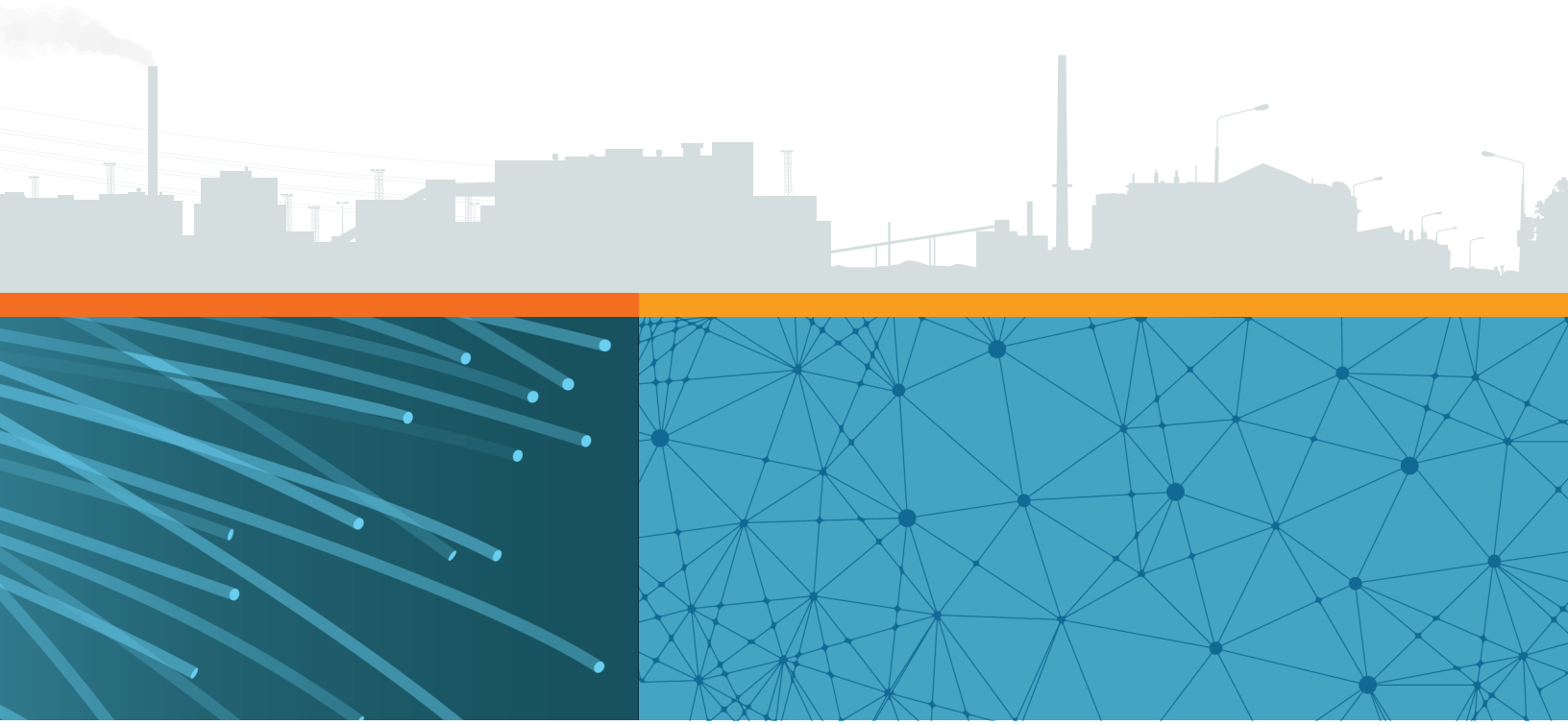
Next Generation Broadband

Cornerstone Infrastructure for 21st-Century Brownfields Redevelopment

Tillman Lay



NALGEP
National Association of Local Government Environmental Professionals

About the National Association of Local Government Environmental Professionals

Founded in 1993 by a group of local officials, NALGEP is a non-profit national organization representing local government professionals responsible for environmental compliance and the development and implementation of local environmental policy. NALGEP's membership includes more than 200 local government entities located throughout America. NALGEP brings together local environmental officials to network and share information on innovative practices, conduct environmental policy projects, promote environmental training and education, and communicate views on national environmental issues. NALGEP is conducting projects on a wide range of environmental issues including brownfields, smart growth, energy conservation, and climate change.

NALGEP launched the Brownfield Communities Network in 2004 to build connections among community leaders promoting the reuse of contaminated property. Guided by an Advisory Council of the nation's local brownfield leaders, the Network is working to harness the knowledge, expertise, and experience of the nation's leading brownfield communities and export it to their peers. The Brownfield Communities Network promotes brownfield cleanup and reuse by providing a forum for communities to overcome barriers and share lessons learned regarding tools, strategies, resources, and partnerships; providing technical assistance and training to local communities and other stakeholders; showcasing examples of successful local brownfield programs and projects; developing new approaches to overcome obstacles to brownfield reuse; and communicating the views of local communities on state and national brownfield issues. Membership in the Brownfield Communities Network is free, for more information visit: www.nalgep.org/issues/brownfields/.

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TABLE OF CONTENTS

Executive Summary 2

Introduction 3

Next Generation Broadband Is the Cornerstone Infrastructure for Any 21st-Century Redevelopment Project 5

- Economic Development and Investment 5
- Education 6
- Healthcare Delivery 6
- Energy and the Environment 7
- Government Performance 7
- Enhancing Civic Engagement and Democratic Processes 7
- Public Safety and Homeland Security 8

Blighted or Depressed Urban and Rural Areas Tend to Be Where Broadband Infrastructure and Adoption Are Lacking 9

Installation of Next Generation Broadband Infrastructure in Brownfield Redevelopments Can Leapfrog Non-Brownfield Areas' Broadband Infrastructure and Make Brownfield Areas a Magnet for Economic Growth and Development 10

Identifying Target Areas for Broadband Brownfield Redevelopment 11

Ownership and Financing Options 13

- Ownership 13
- Financing 14

Examples of Broadband-Based Redevelopment Projects 16

- Waterfront Toronto Project 16
- Google Kansas City Fiber Project 16
- Chattanooga EPB's Fiber-to-the-Home Project 17
- Data Centers as Brownfields Redevelopment 19

Conclusion 19

Executive Summary

Much as railroads were in the 19th century, and electric, telephone and highway transportation networks were in the 20th century, high-speed broadband will be the critical infrastructure of the 21st century. The availability of next-generation high-speed broadband (100 Mbps to 1 Gbps) will play a leading role in determining which communities, and which nations, will enjoy economic growth and prosperity in the 21st century.

Local governments and planners should therefore seriously consider incorporating next-generation broadband infrastructure into brownfields redevelopment projects, whether industrial, commercial, residential or mixed-use. With next-generation broadband, redeveloped brownfield areas can become magnets for economic growth. Without it, they may well fall still further behind the rest of the nation.

This paper is intended to educate planners about the many benefits of next-generation broadband and how broadband can make brownfield redevelopment projects more successful. It also outlines ways that local governments might incorporate broadband into redevelopment projects and provides examples of successful broadband projects.

Part I of the paper summarizes the many benefits of broadband. Widespread deployment of next-generation broadband will be critical to achieving a wide range of vital national public policy goals. Broadband will enable communities to attract new businesses and skilled work forces. Broadband also will be essential to 21st-century education, preparing children for the future information-based economy. It will facilitate the more efficient and widespread delivery of high-quality healthcare services. As the backbone of a "smart grid," broadband will play a critical role in promoting energy efficiency and independence.

In addition, broadband offers several public benefits. It will enable government to perform its functions–from provision of government services to the public to internal government communications–more quickly and at lower cost. Broadband will dramatically improve public safety monitoring and communications capabilities. And by enabling citizens to communicate with one another and with their governments in a much more widespread and efficient manner, broadband can enhance civic engagement, the democratic process and First Amendment freedoms.

Part II of the paper describes the link between broadband and brownfields, and the benefits of extending broadband to economically disadvantaged urban core areas and rural areas. These are precisely the areas where broadband deployment and/or adoption are currently lagging, and are also the areas–especially inner-city core areas–that are often within or adjacent to brownfield sites facing redevelopment challenges.

Part III explains how the overlap between many brownfields and "broadband gap" areas presents a unique opportunity for brownfields redevelopers. Installation of new, fiber-to-the-premises broadband infrastructure in brownfields redevelopment areas would leapfrog the lower-speed broadband available in most suburban and non-brownfields areas. That, in turn, could transform a brownfield redevelopment area, and the neighborhoods that surround it, into an economic magnet for business and residential growth.

Part IV of the paper provides information to assist local government planners in targeting brownfield areas where next-generation broadband is lacking.
Part V of this paper examines ownership and financing options for broadband infrastructure in brownfields projects. Options include relying on commercial carriers, municipal ownership, and public/private partnerships.

Part VI of the paper concludes with a description of some recent examples of next-generation broadband projects and the potential benefits they offer to the communities they will serve. In many instances, the installation of technology-leapfrogging, next-generation broadband infrastructure as part of brownfield redevelopment may be a critical ingredient for transforming blighted areas into engines for economic growth and jobs. That would benefit not only the particular communities where the brownfields were located, but the economic health and international competitiveness of the nation.

Introduction

Economic development and, in particular, job creation and growth are key objectives of most brownfields redevelopment projects.[1] Indeed, perhaps the primary purpose of brownfields redevelopment is to return non-productive real estate assets to productive use, promoting the economic development of many of the nation's most environmentally-distressed areas and regions.[2]

In the 21st century, successful brownfields redevelopment will require the installation of infrastructure that makes redeveloped areas economically competitive not only with other areas and regions in the United States, but with the world. While most planners perceive traditional transportation and utility facilities as needed infrastructure, the most critical new infrastructure necessary for 21st-century economic redevelopment will be broadband (high-speed internet) infrastructure.

Congress and the Federal Communications Commission ("FCC") have recognized as much. In 2009, Congress directed the FCC to develop a National Broadband Plan to promote the availability of broadband capability to all people of the United States.[3] Congress required the Plan to examine broadband deployment, adoption, affordability, and the use of broadband to advance solutions to national priorities, including health care delivery, energy independence, education, job creation, and economic growth.

On March 16, 2010, the FCC released the Plan. It set an ambitious goal of delivering 100 megabits-per-second ("Mbps") broadband service to 100 million households by 2020. To achieve this goal, the Plan makes a series of recommendations that would require action by Congress, the FCC, other federal agencies, and state and local governments.

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The Plan recognizes what many already know: Like railroads in the 19th century, electric service in the early 20th century, telephone, radio and TV service in the early-to-mid 20th century, and the interstate highway system in the mid-to-late 20th century, "[b]roadband is *the* great infrastructure challenge of the early 21st-century."[4] The FCC went on to say:

> [A]s with electricity and telephony, ubiquitous connections are means, not ends. It is what those connections enable that matters. Broadband is a platform to create today's high-performance America—an America of universal opportunity and unceasing innovation, an America that can continue to lead the global economy, an America with world-leading, broadband-enabled health care, education, energy, job training, civic engagement, government performance and public safety.[5]

1 *See, e.g.,* National Association of Local Government Environmental Professionals ("NALGEP"), *Brownfield Communities Network Webcast: Job Creation from Brownfields Redevelopment, available at* http://www.nalgep.org/calendar/Index.cfm?Page=1&EventsID=8271.

2 *See id.,* Presentation by David R. Ives, Sustainability Coordinator, U.S. Economic Development Administration at 10, *available at* http://www.nalgep.org/ewebeditpro/items/O93F19724.pdf.

3 FCC, *Connecting America: The National Broadband Plan* (Mar. 16, 2010), *available at* http://www.broadband.gov/download-plan/ ("Plan" or "NBP").

4 NBP at 3 (emphasis in original).

5 *Id.*

Dial-up internet access, as well as DSL and cable modem service, are already widely available across the nation. What is not nearly so widely available, however, is ultra-high speed, or next-generation broadband, providing symmetrical[6] speeds on the order of 100 Mbps to one gigabit-per-second ("Gbps"). This "next-generation broadband" is the transformative technology that, where deployed, can truly fulfill the objectives of the FCC's Plan.

Next-generation broadband and brownfields redevelopment should go hand-in-hand. Brownfields are by definition in need of redevelopment: brownfields are "real property, the expansion, redevelopment, or reuse of which may be complicated by the presence or potential presence of a hazardous substance, pollutant, or contaminant."[7] In this paper, the term "brownfields" is used in a broader sense to refer to any larger contiguous properties, neighborhoods, districts or other tracts of land that are blighted, abandoned, economically depressed, contaminated, or potentially contaminated sites, including former commercial, industrial, residential, or agricultural properties, whether or not those sites satisfy the statutory "brownfield" definition.

Next-generation broadband should be the cornerstone of any redevelopment project, whether it is commercial, residential, industrial or mixed-use. The reason: without next-generation broadband infrastructure in place, a brownfields redevelopment project—at least one that involves anything beyond perhaps the creation of parkland—is unlikely to achieve its maximum potential and benefits. Next-generation broadband infrastructure is "a foundation for economic growth, job creation, global competitiveness and a better way of life."[8]

This paper describes how the presence of next-generation broadband infrastructure will be essential to achieving these objectives, how promoting next-generation broadband deployment and adoption aligns with the objectives of brownfields development projects, and some of the ways in which next-generation broadband can be incorporated into brownfield redevelopment projects. It concludes with examples of broadband's important role in brownfields redevelopment and land revitalization projects.

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6 In the broadband field, "symmetrical" means offering the same speed or capacity in both directions, downstream and upstream. Most residential broadband offerings today are markedly "asymmetrical"—that is, they offer far more capacity downstream to the residential user than they offer upstream from the user to the internet.

7 *See* Small Business Liability Relief and Brownfields Revitalization Act, 42 U.S.C. § 9601(39).

8 NBP at XI.

Next Generation Broadband Is the Cornerstone Infrastructure for Any 21st-Century Redevelopment Project

Broadband is the critical new infrastructure of the 21st century because its deployment and adoption will simultaneously promote a wide range of critical national public policy goals. Indeed, achievement of many of these goals will not be possible without widespread broadband deployment and adoption.

Each of these goals, identified in the FCC's Plan, and how broadband is necessary to achieve them, are set forth below. All of the goals have a relationship with brownfields redevelopment, although some are more direct than others. Some relate directly to commercial, industrial or residential redevelopment use of brownfields. Others relate more indirectly, in the sense that broadband can provide the surrounding residential or commercial areas, often economically-distressed as well, with improved access to commerce, education, healthcare and government, which will in turn bring benefits for the employers and residents in the redeveloped area.

Economic Development and Investment

The FCC found in the NBP that widespread broadband deployment and adoption would serve three critical economic development objectives. It would (1) "make it possible for small businesses to reach new markets and improve their business processes," (2) provide a vehicle for individuals to gain needed job "skills and access careers," and (3) constitute "a core infrastructure component for local communities seeking to attract new industries and skilled work forces."[9]

Many small businesses have yet to take advantage of the e-commerce opportunities made possible by the internet.[10] Although "[a]n estimated 60 million Americans go online every day to find a product or service," only "24% of small businesses use e-commerce applications to sell online."[11] As a result, many small businesses are failing to exploit the market-expanding, scale economies that broadband ecommerce can bring them.[12] Moreover, areas where broadband adoption and availability are low tend to be African American, Hispanic and rural communities.[13]

Broadband's "centrality to economic life make it an essential element of local and regional economic development in the 21st-century."[14] Communities "without broadband infrastructure will find it more difficult to attract [the] investment" and skilled workers that they need to "face growing national and international competition."[15]

It is for this reason that the NBP recommends that "[l]ocal economic developers should view broadband as a part of local infrastructure development and should incorporate it into local economic development strategies."[16] To facilitate localities' inclusion of broadband in their economic development plans, the NBP recommends that:

> the Department of Housing and Urban Development (HUD) and USDA should integrate [broadband] technology assessments into the Empowerment Zone (EZ), Enterprise Community (EC) and Renewal Community (RC) programs.[17]

9 NBP at 265.

10 *See* Columbia Telecommunications Corp., *The Impact of Broadband Speed and Price on Small Business* (Small Bus. Admin., Nov. 2010), *available at* http://www.sba.gov/sites/default/files/rs373tot_0.pdf.

11 NBP at 266.

12 *Id.*

13 *Id.* at 265.

14 *Id.* at 273.

15 *Id.*

16 *Id.*

17 *Id.* at 274.

Each of these HUD programs is designed to promote "the revitalization of impoverished urban and rural communities," and the NBP urges HUD and USDA to incorporate broadband "as a critical input into the communities that they support."[18]

Education

Broadband infrastructure will also be critical to improving the nation's educational system and preparing our children for the future information-based economy. Broadband holds the potential for upgrading education in several ways. Through distance learning, it can bring students to specialized teachers for online classes and permit more individualized instruction. It provides students with access to far broader resources to conduct research and study online. It will facilitate the setting and measurement of educational standards for student progress and achievement. And it will, of course, familiarize students with the IT skills they will need to be productive and obtain jobs in the information-based economy.

While, thanks largely to the FCC's E-Rate program, most schools are now connected to the internet, many schools' internet connectivity is insufficient to meet the broadband bandwidth needs that will be required to exploit fully the educational applications and content that broadband can bring to schools, students and teachers. "Significant upgrades" in schools' broadband infrastructure will be necessary to fulfill those objectives.

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Healthcare Delivery

High-capacity broadband has a unique capability to improve both the efficiency and the effectiveness of healthcare services. As the NBP found, broadband promotes these goals in three ways:

> First, [broadband] enables efficient exchange of patient and treatment information allowing providers to access patients' electronic health records (EHRs) from on-site or hosted locations. Second, it removes geography and time as barriers to care by enabling video consultation and remote patient monitoring. Third, broadband provides the foundation for the next-generation of health innovation and connected-care solutions.[22]

Achieving these benefits, however, will require next-generation broadband infrastructure that is now unavailable in most places. Broadband health IT applications are bandwidth-intensive, with needed capacity ranging from 4 Mbps to 1 Gbps, and typically symmetrical.[23] The FCC observed that data is scarce on healthcare providers' broadband needs and the availability of infrastructure to meet those needs, but also noted that price is an obstacle in many cases, as is adequate broadband infrastructure, particularly in rural areas and in the case of smaller healthcare facilities.[24]

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18 *Id.*

19 *Id.* at 274.

20 *Id.*

21 *Id.*

22 *Id.* at 201.

23 *See id.* at 209-210.

24 *Id.* at 209-213. *See also* Neal Neuberger, *Advancing Healthcare Through Broadband: Opening Up a World of Possibilities* at 4 (Internet Innovation Alliance, 2007), *available at* http://dms.dartmouth.edu/nhtp/pdf/advancing_healthcare_broadband.pdf.

Energy and the Environment

With rising energy prices, growing demand and dwindling supply, as well as increasing awareness of the adverse climate effects of fossil fuel energy emissions, the twin objectives of increased energy independence and efficiency are critical national goals.[25] Widespread deployment and adoption of broadband will play a critical role in achieving those energy policy objectives.

Broadband is integral to the development and deployment of the Smart Grid, because it will provide the communications capability between and among electric generation, transmission and distribution elements of the electric grid, and between the grid and electricity consumers (both business and residential), that enables the grid to be "smart." That is, the communications element of Smart Grid technology is what allows different components of the grid and electric consumers to interact dynamically with one another and to provide real-time market signals that promote energy conservation and efficiency, and in the process, create new Smart Grid-related and alternative energy business and jobs.[26]

The Smart Grid will, however, require new infrastructures, especially broadband infrastructure. Brownfields redevelopments provide the perfect opportunity to install that infrastructure at the outset, rather than the expensive retrofitting that will be necessary in other areas.

Government Performance

Just as with private businesses, broadband offers significant potential for all levels of government (federal, state and local) to improve the efficiency with which they deliver services to residents and perform other governmental functions.[27] This is an important objective, because government "has fallen behind the private sector in using broadband to deliver services."[28]

Broadband would enable local, state and federal governments to conduct more citizen transactions (from voter registration and driver's license renewals to tax payments) and internal government transactions (from contract bidding and awards and job applications to interdepartmental and intergovernmental communications) online, saving considerable time and costs.[29] Moreover, deploying governmental broadband networks could also lower the cost of more widely distributed broadband deployment. The reasons are that the governmental network could serve as an anchor tenant network, which could lower the cost of further broadband network extensions into surrounding unserved and underserved areas, and the governmental network could also spur demand in surrounding areas for the content produced by the governmental network.[30]

Enhancing Civic Engagement and Democratic Processes

Perhaps one of the most important, and underappreciated, benefits of widespread broadband deployment and adoption is its ability to enable government and citizens to communicate with one another in a transparent and efficient manner and to allow the public to communicate with one another on public policy matters of interest to them.[31] Online access to all government documents that are available to the public under open records laws would, for example, greatly increase government transparency and citizens' ability to monitor and gain knowledge of what their governments are doing. Similarly, widespread broadband deployment and adoption would enable members of the public to communicate more easily with one another on public issues of importance to them, and to build coalitions of like-minded citizens. Members of the public also would be able to access and share information and viewpoints on issues of public importance from a much wider array of traditional and non-traditional media sources.

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25 NBP at 247.

26 *See id.* at 249-251. *See generally* White House National Science and Technology Council, *A Policy Framework for the 21st Century Grid: Enabling Our Secure Energy Future* (June 2011), *available at* http://www.whitehouse.gov/sites/default/files/microsites/ostp/nstc-smart-grid-june2011.pdf; Electric Power Research Institute, *Estimating the Costs and Benefits of the Smart Grid* (Mar. 2011), *available at* http://ipu.msu.edu/programs/MIGrid2011/presentations/pdfs/Reference%20Material%20-%20Estimating%20the%20Costs%20and%20Benefits%20of%20the%20Smart%20Grid.pdf.

27 NBP at 283.

28 *Id.*

29 *See id.* at 283-293.

30 *See id.* at 284-285.

31 *See id.* at 299-300.

Put a little differently, broadband makes possible something the framers of the Constitution could not imagine: a real-time, nationwide public forum in which all residents can exchange views on the matters of importance to them. Broadband essentially provides everyone with his or her own printing press. Because brownfield areas and their surrounding communities are often populated by the socioeconomically underprivileged, who tend to have less access to the voting booth and to the means required to voice their views through traditional mass media, this broadband trait is likely to be particularly helpful to residents living in or near brownfield areas.

Public Safety and Homeland Security

Broadband deployment and adoption hold great promise for making revolutionary improvements in public safety and homeland security capability and responsiveness. Broadband can improve responsiveness to local, state and federal emergencies in several ways.

First, by establishing common protocols, broadband can permit local, state and federal first responders and law enforcement agencies to send and receive voice, video and data from one another, and to do so in real-time.[32] This would be a marked improvement over current public safety networks, which are balkanized not only at the local and state level, but also often between different departments (police and fire) within the same jurisdiction. Unlike current public safety systems, which are largely voice, IP-based broadband also facilitates the exchange of more bandwidth-intensive data and video communications among first responders. That, in turn, not only would reduce fire, police and medical emergency response time, but also would facilitate better informed and coordinated emergency response and, in addition, assist in preventing acts of crime and terror.[33]

Second, IP-enabled broadband networks would greatly improve citizens' ability to receive and send information in real time about emergencies, both large and small. Broadband would permit 911 call centers to receive text, video and pictures from callers, and it would enable government to use the emergency alert system to send information to the public via multiple media (text, voice, video or data) and multiple formats and languages.[34]

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32 *See id.* at 313, 304-322.

33 *See id.* at 313.

34 *Id.*

Blighted or Depressed Urban and Rural Areas Tend to Be Where Broadband Infrastructure and Adoption Are Lacking

As Part I shows, broadband deployment and adoption are critical to any community's future economic growth and success. The Plan and other sources, however, reveal that "as many as 26 million Americans live in areas unserved by broadband capable of 'originat[ing] and receiv[ing] high-quality voice, data, graphics, and video telecommunications.'"[35] Moreover, even these figures are understated, because they are based on a "broadband" definition of at least 4 Mbps downstream and 1 Mbps upstream,[36] a level well below the next-generation, high-capacity broadband (on the order of 50 to 100 Mbps or more) that will be necessary for businesses, governments, health care centers, schools and residents to take full advantage of the many of the benefits broadband offers.[37]

The FCC's *Seventh Section 706 Report* concludes:

> [T]he situation [relating to access to broadband] is particularly bleak for Americans in rural and tribal areas. In addition, Americans with low-income, or who are less educated, unemployed, disabled, seniors, Blacks, and Hispanics have a much lower broadband adoption rate than average.[38]

Thus, broadband availability and/or adoption tend to be lower in demographic areas that are characterized as rural, low income, high unemployment, less educated, or minority, or some combination of all of those factors. That is often a description of neighborhoods within or adjacent to a brownfields area facing redevelopment challenges. It is true that in inner city, urban core areas, the problem seems to be more of a broadband adoption problem than a broadband deployment problem,[39] although the *Seventh Section 706 Report* suggests that this could be at least partly the result of a lack of granularity in the broadband deployment data at the census tract (as opposed to county) level.[40] In any event, low broadband adoption in minority, urban core areas is itself a broadband access issue that next-generation broadband infrastructure in inner city brownfield areas could help to alleviate, in at least two ways.

First, next-generation broadband would give residents in these urban core areas access to health, education, and job-related information and skills to which they have never previously had access. That would give inner-city residents far more reason to become broadband subscribers than they have ever previously had.

Second, the broadband adoption problem in core urban areas is, in many respects, a broadband affordability, or price problem. Deployment of next-generation broadband as part of a larger brownfields redevelopment project could help to alleviate this problem by lowering per-capita deployment costs, and thus broadband prices, in surrounding economically disadvantaged areas.

That is not to say that deployment of next-generation broadband, all by itself, would eliminate the digital divide in poor neighborhoods. Rather, the point is that, whether measured by broadband deployment or adoption, the nation's broadband gaps are particularly acute in areas that share many economic and demographic attributes with brownfields and their surrounding neighborhoods. And unless those gaps are filled, these disadvantaged areas are likely to fall still further behind the rest of the nation and the world in terms of economic opportunity and growth, education, healthcare, energy efficiency and democratic participation. That is why next-generation broadband infrastructure should go hand-in-hand with brownfields redevelopment.

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35 *Inquiry Concerning Deployment of Advanced Telecommunications Capability to All Americans,* GN Docket No. 10159, Seventh Broadband Progress Report and Order on Reconsideration FCC 11-78, 26 FCC Rcd 8008, 8009 (¶ 1) (rel. May 20, 2011) (*"Seventh Section 706 Report"*) (quoting 47 U.S.C. § 1302(d)(1)).

36 *Id.* (¶ 1 n.2).

37 *See, e.g.,* NBP at 9.

38 *Seventh Section 706 Report,* 26 FCC Rcd at 8011 (¶ 4) (footnotes omitted).

39 *Id.* at 8028-32 (¶¶ 38-45).

40 *See id.* at 8031-32 (¶ 45 & Table 6) (showing over 4,800 urban core census tracts unserved by broadband).

Installation of Next Generation Broadband Infrastructure in Brownfield Redevelopments Can Leapfrog Non-Brownfield Areas' Broadband Infrastructure and Make Brownfield Areas a Magnet for Economic Growth and Development

When a brownfield area is redeveloped, new next-generation broadband infrastructure can be most cost-effectively installed at the same time as all other redevelopment infrastructure is installed. That provides a unique opportunity for the brownfield redevelopment area to leapfrog the preexisting broadband infrastructure not only in immediately surrounding nonbrownfield areas, but also in the larger surrounding metropolitan area.

Unlike the case with a brownfield redevelopment, installation of new next-generation broadband infrastructure in non-redevelopment areas is likely to require significantly greater retrofitting of existing local telephone and cable TV company infrastructure, which generally falls far below 100 Mbps and is asymmetrical. Existing facilities-based broadband providers (primarily, the local telephone company and the local cable TV company) are not likely, at least in the near term, to have any economic incentive to upgrade their existing networks to next-generation broadband capability in the non-brownfield areas they currently serve, for at least two reasons. First, as noted above, retrofitting carriers' existing networks to be next-generation broadband networks—especially, but not exclusively, in multi-tenant or multi-business building environments—would be very expensive. Second, those companies' existing, lower-capacity broadband networks in non-brownfield areas already generate a lucrative revenue stream, without the need for incurring the significant expense of a next-generation broadband network upgrade.

As a result, investment in next-generation broadband network infrastructure in brownfield redevelopment areas would provide a unique opportunity for a redevelopment project to leapfrog the existing broadband architecture in many non-brownfield areas. That, in turn, could transform a brownfield redevelopment area, as well as the neighborhood that surrounds it, into an economic and demographic magnet for business and residential growth.

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Thus, installation of technology-leapfrogging, next-generation broadband infrastructure as part of brownfield redevelopment is a crucial ingredient for turning blighted areas into engines of economic growth. That would benefit not only the communities where brownfields are located, but the economic health and competitiveness of the nation as a whole.

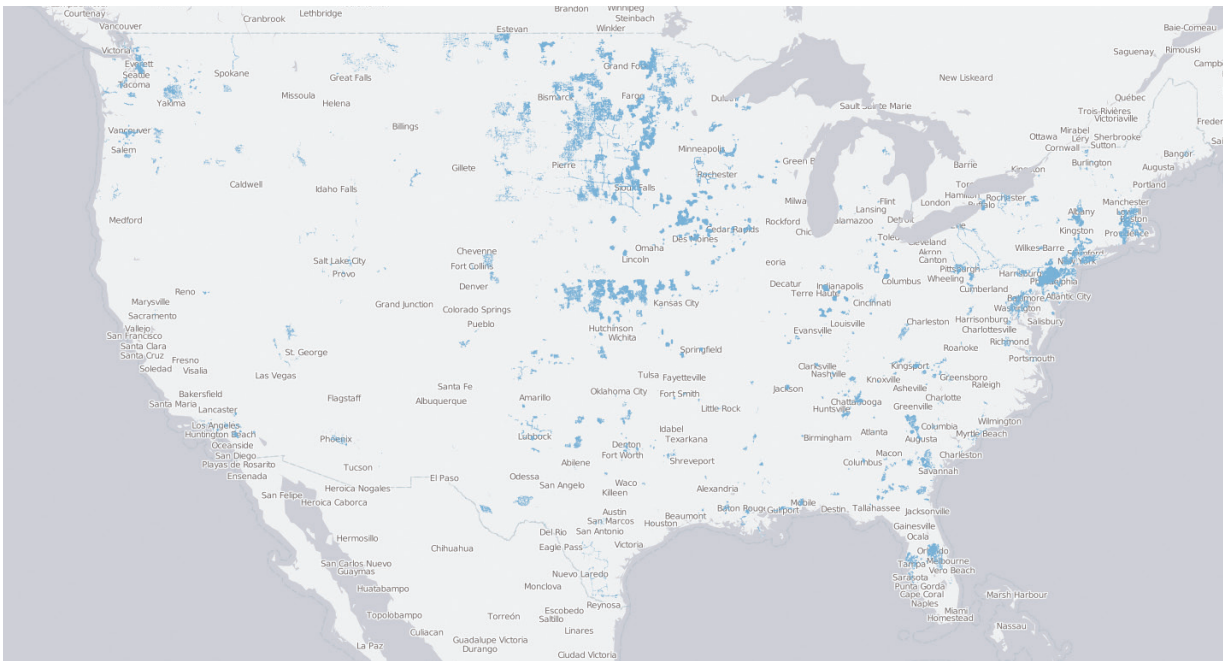
Identifying Target Areas for Broadband Brownfield Redevelopment

The next question becomes: If next-generation broadband infrastructure is a critical ingredient to brownfields redevelopment success, how can one identify whether a particular brownfields area is a good candidate for next-generation broadband?

Generally speaking, the likely answer is that most brownfield areas are good candidates because next-generation broadband is not yet widely deployed. A good surrogate indicator of next-generation broadband deployment is the deployment of fiber optic capacity to the home (or other end-user premises, such as businesses).

The National Telecommunications and Information Administration ("NTIA"), in collaboration with the FCC, has created a National Broadband Map ("Broadband Map") site (www.broadbandmap.gov) that sets forth both maps and data providing broadband deployment information. The maps and data are broken down by type of broadband technology and data speed, and at the national, state and local level. The Broadband Map is still very much a work in progress, and the accuracy of its data is still subject to some question.[41] But it is probably the best available tool at the current time to assess broadband availability in a particular location.

The Broadband Map reveals that fiber-to-the-end-user technology, the best surrogate indicator of next-generation broadband, is only very sparingly deployed.[42] Outside of the Washington, D.C./Philadelphia/New York corridor and in the Boston area (areas where Verizon has deployed FiOS), fiber is available only to a small sprinkling of areas across the nation, and virtually nonexistent west of the Continental Divide.[43]



National Broadband Map of the availability of fiber-to-the-premises broadband service.
www.broadbandmap.gov/technology

41 *See, e.g.,* Lauren Katims, *National Broadband Maps Accuracy Questioned,* Government Technology, www.govtech.com/wireless/National-Broadband-Maps-Accuracy-Questioned.html.

42 *See Type of Technology Available,* National Broadband Map, http://www.broadbandmap.gov/technology (last visited Mar. 6, 2012).

43 *See id.*

Broadband Map data concerning broadband deployment by technology and data speed tells a similar story. Fiber is available to less than 15% of households and the population nationwide.[44] Broadband technology with a download speed of more than 100 Mbps is available to less than 11% of households and the population nationwide.[45]

Broadband speed tests conducted for the NTIA and FCC likewise reveal that broadband speeds currently available to residential, business and institutional users are far below even 50 Mbps, much less the 100 Mbps lower threshold of next-generation broadband. Combined download/upload speeds for 75% of large to medium-sized businesses are less than 40 Mbps, and for small businesses, 75% have combined broadband speeds of less than 15 Mbps.[46] 75% of schools, libraries and community centers have combined download/upload speeds of less than 40 Mbps.[47] And 75% of residences have combined download/upload speeds of less than 20 Mbps.[48]

The Broadband Map enables users to access similar broadband availability data at the state, county, Metropolitan Statistical Area, Congressional district, and census place level.[49] Unfortunately, however, the state and local-level data provides broadband speed availability information only at the 3 Mbps/0.768 Mbps level, not higher speed levels. As a result, the Broadband Map data does not provide much in the way of granular, local information about the availability of next-generation broadband. But the local data does break down broadband availability by technology, and again, fiber-to-the-home technology availability is the best surrogate indicator of next-generation broadband availability in a particular area.

Fiber is available to less than 15% of households and the population nationwide. Broadband technology with a download speed of more than 100 Mbps is available to less than 11% of households and the population nationwide.

Thus, in planning brownfield redevelopment projects, managers should use the Broadband Map as a starting point for assessing the extent of next-generation broadband availability (or the lack thereof) in the proposed project area, using fiber-to-the-home availability as a surrogate for next-generation broadband. Managers should then follow up with local businesses and government "on the ground" to verify the Broadband Map's accuracy in the proposed project area. Assuming next-generation broadband is currently unavailable in the area (and the odds are that it will not be), it should be incorporated into the infrastructure plan for the redevelopment project.

44 *NTIA and FCC,* Broadband Statistics Report: Access to Broadband Technology by Speed at 1 (Feb. 2011), *available at* http://www.broadbandmap.gov/download/reports/national-broadband-map-technology-by-speed.pdf.

45 *See id.*

46 *See Analyze>Summarize>Nationwide,* National Broadband Map, http://www.broadbandmap.gov/summarize/nationwide (last visited Mar. 6, 2012).

47 *Id.*

48 *Id.*

49 *See Analyze,* National Broadband Map, http://www.broadbandmap.gov/analyze (last visited Mar. 6, 2012).

Ownership and Financing Options

Because broadband infrastructure, like traditional utility infrastructure, would typically be one component of a larger redevelopment project, ownership and financing arrangements for broadband infrastructure would most likely tend to follow the arrangements for other utility infrastructure. Much would depend, of course, on the scale and nature of the particular brownfields redevelopment.[50]

In the case of broadband/telecommunications infrastructure, however, there are a few considerations to keep in mind. First, one option for obtaining broadband infrastructure would be to rely on the local carriers–typically, the local telephone company or the local cable television operator–that provide service in the surrounding area. Second, as an alternative, installation of the broadband infrastructure, as well as recurring charges for service, can be the responsibility of a non-carrier third party, with the third party owning the facilities and taking on the role of a service provider or, alternatively, with the developer owning the facilities and the third party serving as a contractor to the facility-owing developer in providing broadband service. Third, installation of the necessary broadband infrastructure, especially in a large area or building complex, is an expensive project, one that can and should be capitalized by the brownfields developer or any non-carrier third party. Fourth, the choice of ownership and financing structures for broadband infrastructure are likely to be significantly related to, and influenced by, the ownership and financing arrangements made for the entire redevelopment project.

Ownership

While not mutually exclusive (some of these options overlap or could be combined), the basic ownership options for broadband infrastructure are as follows:

CARRIER-OWNED

As noted, one option would be to have a local broadband carrier install and own the broadband facilities and to provide broadband services to the project. The local telephone and cable television companies, which provide broadband services to the surrounding area, are both logical candidates. But there are others as well. In most metropolitan areas, there are also competitive local exchange carriers ("CLECs") that specialize in providing broadband and telecommunications services to large, typically business, customers.

The primary advantages of using a preexisting carrier are that it would rely on the experience and expertise of the carrier in installing the network and providing broadband service and, at least in the case of the incumbent local telephone company or cable operator, ensure the long-term presence and reliability of the provider. The primary disadvantages of relying on existing carriers are a loss of control over pricing and a lack of equity participation in the broadband revenue stream for the redevelopment project. Although perhaps oversimplified, the fundamental tradeoff is between, on the one hand, the potentially greater expertise and somewhat lower upfront cost of relying on an existing carrier[51] and on the other hand, the potentially greater, and less controllable, longer-term costs of relying on an existing carrier.

STATE OR LOCAL GOVERNMENT-OWNED

Another ownership option would be for the broadband infrastructure to be installed and owned by the state or local government, with the government also providing the service (or perhaps relying on a contractor to provide ongoing service). This option may be particularly attractive for those municipalities that have a municipal electric utility, especially where the municipal utility is either already providing, or considering providing, broadband services. A related alternative, where either the municipality or perhaps a state university in the area already has a high-capacity broadband network connecting municipal and/or university locations, would be to extend such a preexisting network to the brownfields redevelopment.

The primary advantages of government ownership are potentially lower costs,[52] potential scale economies,[53]

50 *See* Part VI below.

51 *Id.* (¶ 1 n.2).

51 The qualifier, "somewhat lower upfront cost," is necessary because even where an existing carrier installs and owns the facilities, the carrier will charge the customer for upfront installation costs. Thus, installing broadband infrastructure will entail significant upfront costs for the developer under any scenario.

52 Government-owned networks, unlike private networks, are typically non-profit and, as a result, typically offer lower-priced services than private sector carriers.

53 Because of its preexisting utility infrastructure expertise and workforce, for example, a municipal utility may be able to install and operate a broadband network at lower cost than a private entity without such in-place capability.

and (assuming that the state or local government is also involved with the larger brownfield redevelopment project) greater cost and network control. The last of these three advantages—greater cost and network control—is particularly desirable. The disadvantages are potentially greater financial risk, lesser scale economies than a traditional carrier, and, in some cases, potentially less network expertise than a traditional carrier.[54]

NON-CARRIER INVESTOR-OWNED

A third option is to have the broadband facilities owned by a non-carrier investor, which contracts with a third party with expertise to build and operate the network. This arrangement shifts most of the risk—but also most, if not all, of the potential financial return—to the non-carrier investor and away from the redevelopment project. Depending on the redevelopment project's contractual arrangements with the investor-owner, the redevelopment project could also lose a significant degree of control over broadband service costs under this approach.

PUBLIC/PRIVATE PARTNERSHIP

Yet another possible ownership structure for the redevelopment project's broadband infrastructure would be a public/private partnership. A "public/private partnership" is an entity—typically a joint venture—in which both the public sector redevelopment project and a private sector carrier or investor hold equity interest. The public sector owner would contribute access rights and perhaps some financing, and the private sector entity would contribute broadband network facilities and financing. The joint venture would be jointly overseen by both the public sector contributor and the private sector contributor.[55]

This arrangement seeks to blend the advantages of the other ownership arrangements—providing the public sector redevelopment entity with greater control over costs and equity return participation, while shifting some of the investment risk to a third-party investor and providing private sector broadband and management expertise. The public/private partnership model should not, however, be viewed as a perfect model, any more than the other models. The cost/benefit ratio of the public/private ownership model, perhaps as much if not more so than the other models, depends heavily on the identity and reliability of the private partner, as well as the financial and other details of the contractual arrangements with that partner.

Financing

Given the current economic environment, financing of any brownfields redevelopment project, let alone the financing of the broadband infrastructure component of such a project, will be a challenging task. Moreover, the opportunities for federal government assistance in financing broadband infrastructure provided by the 2009 stimulus legislation have expired.

Nevertheless, financing opportunities do remain, although the scope and availability of some of them remain uncertain.

FEDERAL PROGRAMS

In light of current federal budget constraints, federal funding assistance for broadband infrastructure and brownfields redevelopment is both limited and in flux. There are, however, several federal government loan, grant, and tax incentive programs available to assist in brownfields cleanup and redevelopment activities. The EPA manages a number of key brownfields redevelopment programs, including grants to cover the assessment of brownfield sites,[56] grants for the cleanup of such sites,[57] revolving loan fund grants,[58] and brownfields-related job training grants.[59] A relatively new program, the Brownfields Area-Wide Planning Program, is particularly relevant because it provides grants for communities to plan the cleanup and redevelopment of multiple brownfield parcels in a broader area. In addition, the Brownfields Expensing Tax Incentive allows federal taxpaying owners of qualifying brownfield properties to reduce their taxable income by the costs of cleanup expenses. These grants and assistance programs can provide substantial help to local governments throughout the brownfield redevelopment process. In terms of direct federal support for broadband development,

54 In addition, some states have enacted laws either prohibiting or restricting the ability of local governments from providing broadband or telecommunications services. *See, e.g., Community Broadband Preemption Map,* Community Broadband Networks, http://www.muninetworks.org/content/community-broadband-preemption-map (last visited Mar. 6, 2012).

55 Again, laws in some states may prohibit, or greatly restrict, this option. *See* note 54 *supra.*

56 *Assessment Pilots/Grants,* U.S. EPA Office of Brownfields and Land Revitalization ("OBLR") (Sept. 29, 2010), www.epa.gov/brownfields/assessment_grants.htm.

57 *Cleanup Grants,* U.S. EPA OBLR (Feb. 17, 2011), www.epa.gov/brownfields/cleanup_grants.htm.

58 *Revolving Loan Fund Pilot/Grants,* U.S. EPA OBLR (Dec. 29, 2011), www.epa.gov/brownfields/rlflst.htm.

59 *Environmental Workforce Development and Job Training,* U.S. EPA OBLR (Feb. 16, 2012), http://www.epa.gov/brownfields/job.htm.

the Department of Agriculture's Rural Utilities Service ("RUS") has the Community Connect grant program and the Telecommunications Infrastructure loan program, which are available for financing rural broadband infrastructure projects.[60]

It is important to keep in mind, however, that nearly all of the federal funding programs that support economic development can be considered as potential tools for redeveloping brownfields and integrating next-generation broadband development. Some of the more important programs include the Department of Treasury's New Markets Tax Credit program, the Department of Commerce's Economic Development Administration grants, and the Department of Housing and Urban Development's ("HUD") programs, including the Community Development Block Grants, Empowerment Zone and Renewal Community programs.[61]

This list of potential federal funding sources for broadband infrastructure and brownfields redevelopment is not intended to be exhaustive. As a practical matter, almost any federal program that provides funding for brownfields redevelopment is a potential source of funding for the broadband infrastructure component of such a redevelopment project.

STATE AND LOCAL FUNDING

Due to the bleak current condition of state and local government budgets, state and local governments are a shrinking source of direct government funding for redevelopment projects. They nevertheless remain important potential financial contributors to projects, in at least two respects.

First, state or municipal bonds, with their accompanying tax advantages, could be an important source of debt financing for broadband infrastructure and, more generally, brownfields redevelopment projects. Indeed, providing tax-advantaged debt financing to the project could be a state or local government's primary contribution to a public/private partnership for redevelopment.

Second, state and, especially, local governments may contribute important in-kind benefits to a redevelopment project. Examples of such inkind contributions include access to local rights-of-way, access to other municipal property, utility infrastructure (where there is a municipal utility), and condemnation authority.

It is important to keep in mind, however, that nearly all of the federal funding programs that support economic development can be considered as potential tools for redeveloping brownfields and integrating next-generation broadband development.

PRIVATE SECTOR FUNDING

Funding from the private sector is likely to be critical to any successful broadband-oriented brownfields redevelopment project, especially in light of current federal, state and local government budget constraints. Indeed, private sector investment is a substantial component of all but one of the broadband-related redevelopment projects described in Part VI below.

The depressed economy notwithstanding, there are substantial private sector funds available. The problem is that those funds are largely sitting on the sideline. The key to attracting private sector investment is to fashion a redevelopment project that holds great promise of attractive economic returns.

Brownfields redevelopment projects, if properly planned, may offer that promise. Blighted urban neighborhoods near a city's inner core, if redeveloped for mixed commercial/residential, residential or industrial use with "leapfrogging" next-generation broadband infrastructure, have several built-in advantages that should make them attractive locations for creating new economic magnet areas. "[I]nner city neighborhoods boast, among other factors, access to a large labor force, untapped consumer markets, and proximity to central business districts and regional transportation systems."[62]

60 *See, e.g., RUS Telecommunications Programs,* USDA Rural Development (Mar. 2, 2012), http://www.rurdev.usda.gov/RUSTelecomPrograms.html.

61 *See* NBP at 274 & n.80; HUD, *Advance Notice of Requirements for HUD's Fiscal Year 2011 Sustainable Communities Regional Grant Program* (June 20, 2011), *available at* http://portal.hud.gov/hudportal/documents/huddoc?id=ascrp01nofa.pdf.

62 Boston Consulting Group, *America's Inner Cities: Wired to Compete* at 1 (Nov. 2002), *available at* http://www.icic.org/ee_uploads/publications/Inner-City-EBussiness-02-March.pdf.

Examples of Broadband-Based Redevelopment Projects

This section furnishes a few examples of broadband-influenced redevelopment projects. They vary considerably in scope, nature and stage of completion. The examples are intended to provide a sampling of the types of economic redevelopment that broadband infrastructure can promote. Some of the examples, like the Google Kansas City project and the Chattanooga EPB project, are projects that cover a wide-area and are not solely brownfields-focused. But the premise behind these projects is the same one that should guide smaller-scale brownfields redevelopment projects, and one that underlies broadband generally: "[A]reas that have improved their broadband infrastructure attract new businesses that grow the economy."[63]

Waterfront Toronto Project

The Waterfront Toronto Project "is the largest urban redevelopment project currently underway in North America, and it is one of the largest waterfront restoration efforts ever undertaken in the world."[64] It is a comprehensive residential and commercial redevelopment project, encompassing 1,977 acres.[65] The project is expected to take twenty-five years to complete, ultimately resulting in 40,000 new residences and 40,000 new jobs. Since 2001, the project has already contributed $1.9 billion to the Canadian economy.[66]

For purposes of this paper, the Waterfront Toronto project possesses two notable attributes. First, it involves the wholesale redevelopment of what was a classic urban brownfields area: an old and largely abandoned industrial riverfront district, cut off from the rest of the city by a highway.[67]

Second, the Waterfront Toronto project places central emphasis on creating an "intelligent community" infrastructure that will promote economic development, energy conservation, and community security.[68] Ultra high-speed broadband infrastructure will be installed throughout the project, with fiber connectivity reaching every residence and business.[69] The network will provide minimum speeds of 100 Mbps, with speeds of up to 1 Gbps for residential customers and 10 Gbps for commercial customers.[70] In late 2010, the Toronto Waterfront project opened up information technology procurement contracts for bidding for as much as $1 billion.[71]

Obviously, few redevelopment projects will approach Waterfront Toronto's scale, and the jury is still out on how successful it will be. But the project is a clear example of employing "leapfrog" broadband infrastructure as a cornerstone of urban brownfields redevelopment.

Google Kansas City Fiber Project

Although not a brownfields redevelopment project, the Google fiber-to-the-premises project in Kansas City will be an important experiment in assessing the potential economic growth and development benefits that ultra high-speed broadband infrastructure might bring to a community. In 2010, Google selected Kansas City, Kansas, from more than 1,000 municipal applicants as the location of its community-wide, ultra high-speed broadband project. The project was subsequently expanded to include Kansas City, Missouri. Working with contractors, Google will manage the development

62 Boston Consulting Group, *America's Inner Cities: Wired to Compete* at 1 (Nov. 2002), *available at* http://www.icic.org/ee_uploads/publications/Inner-City-EBussiness-02-March.pdf.

63 Jim Romeo, *Broadband: The Base for New Business,* Area Development Online (2011), http://www.areadevelopment.com/Print/logisticsInfrastructure/directory2011/broadband-base-new-business33552.shtml?ID=1936&IDI=82 ("Romeo").

64 See Scope & Scale, Waterfront Toronto, http://www.waterfrontoronto.ca/about_us/scope_and_scale (last visited Mar. 6, 2012).

65 *Id.*

66 *Id.*

67 *See History and Heritage*, Waterfront Toronto, http://www.waterfrontoronto.ca/about_us/history_and_heritage (last visited Mar. 6, 2012).

68 *Intelligent Communities,* Waterfront Toronto, http://www.waterfrontoronto.ca/our_waterfront_vision/innovation/_intelligent_communities (last visited Mar. 6, 2012).

69 *See* John Jung, Toronto's *Intelligent Waterfront Bets on Open Access Ultra High-Speed Broadband,* Digital Communications (Aug. 2, 2011), http://www.digitalcommunities.com/blogs/communities/Torontos-Intelligent-Waterfront-Bets-on-Open-Access-Ultra-High-Speed-Broadband.html.

70 *Id.*

71 *See* Nestor E. Arellano, *Toronto Waterfront Project Opens Up $1 Billion IT Contract Opportunities,* IT Business (Aug. 11, 2010), http://www.itbusiness.ca/it/client/en/home/DetailNewsPrint.asp?id=58724.

and deployment of the network throughout the Kansas City area, with the deployment process beginning in late 2011 or early 2012 and initial offering of service in the summer of 2012.[72] The service will be offered to at least 50,000 and potentially up to 500,000 residents.[73] Google's network will deliver speeds of up to 1 Gbps.[74] Google's goal is for its Kansas City fiber project to serve as a test bed for the new applications and services made possible by ultra high-speed broadband, with the hope that the benefits accruing in Kansas City will spur wider investor and community interest in installing similar next-generation broadband infrastructure in other communities nationwide.

The mayors of Kansas City, Kansas, and Kansas City, Missouri, have appointed a 12-member Bistate Innovation Team to recommend "ways Google Fiber can benefit the KC metro area and its citizens."[75] In words that echo the many benefits of broadband infrastructure noted in the FCC's NBP, the Bistate Innovation Team "will explore ways the community can use Google Fiber to improve public services; create community; assist and advance education; spark economic development; create jobs; or otherwise improve the quality of life in the KC metro area."[76]

In November 2011, the Bi-State OneKC Brownfields Coalition Assessment Project applied for a $1 million Brownfields Coalition Assessment Grant to assess brownfield sites in shared riverside industrial zones and neighborhoods in Kansas City, Kansas, and Kansas City, Missouri. The application states that the Bi-State OneKC Coalition anticipates that the Google fiber project will extend into or near the redevelopment project area, and more generally, that the Coalition will monitor Google's fiber deployment "in the 'digital divide' neighborhoods and use the new network to engage residents with social media and web-based strategies for outreach and collaboration, environmental education and other project-related uses."[77]

Chattanooga EPB's Fiber-to-the-Home Project

Another example is provided by the Chattanooga Electric Plant Board ("EPB"), the city's municipal utility. The EPB has built an ultra high-speed broadband system (up to 1 Gbps) to serve all of the 170,000 businesses and homes in EPB's service area.[78] EPB anticipates that the new high-speed broadband infrastructure will be an engine for economic growth and attract more high-tech jobs and a more educated and entrepreneurial workforce.[79] EPB views the Chattanooga area's ability to attract a new Volkswagen manufacturing plant and new Amazon distribution centers as confirmation of that.[80]

The Chattanooga EPB's broadband network is the first city-wide gigabit-per-second network in the United States.[81] All services are symmetrical, and prices range from $58/month for 15 Mbps service to $350/month for 1 Gbps service.[82] The system cost approximately $220 million, with $111 million, or a little over 50%, of the cost coming from a stimulus grant from the U.S. Department of Energy.[83]

According to Harold DePriest, EPB's chief executive, "[t]he overriding consideration is that this [1Gbps network] is a real tool for economic development for

72 *See Google Fiber & Kansas City Frequently Asked Questions,* Google, http://www.google.com/fiber/kansascity/faq.html (last visited Mar. 6, 2012) (*"Google Fiber"*).

73 *Mayor's Bistate Innovations Team,* MidAmerica Regional Council (Jan. 27, 2012), http://marc.org/MBIT (last visited Mar. 6, 2012) ("MBIT").

74 *Google Fiber, supra.*

75 MBIT, *supra.*

76 *Id.*

77 *Application of BiState OneKC Brownfields Coalition Assessment Project for 2012 Brownfields Coalition Assessment Grant* at 6 (Nov. 28, 2011), *available at* ftp://ftp.kcmo.org/outgoing/CD/abracker/Bi-State%20Brownfields%20Grant%20Proposal%202012/2012%20Coalition%20Application%20112811%20(final).pdf.

78 *Chattanooga Gig: Your Gig Is Here*, http://chattanoogagig.com/ (last visited Mar. 5, 2012) (*"Chattanooga Gig"*). *See also* Bob Diddlebock, *Cities Rush into High Speed Internet*, Time (June 17, 2011), http://www.time.com/specials/packages/printout/0,29239,2026474_2026675_2078442,00.html.

79 *Id.*

80 *Chattanooga Gig, supra.*

81 Steve Lohr, *Fastest Net Service in U.S. Coming to Chattanooga,* The New York Times (Sept. 12, 2010), http://www.nytimes.com/2010/09/13/technology/13broadband.html?pagewanted=print ("Lohr").

82 Id.; Christopher Mitchell, *Case Study: Municipal Fiber in Chattanooga, Tennessee,* Broadband Properties 40, 41 (May/June 2010), *available at* http://www.bbpmag.com/2010mags/may-june10/BBP_MayJune10_Chattanooga.pdf ("Mitchell").

83 Mitchell at 41; Romeo, *supra.*

our community."[84] To date, the number of subscribers (mostly businesses) to the top-end 1 Gbps service has been small.[85] One of those early customers is a radiology clinic, which uses the service to "help rural hospitals," an example of the fact that the "burgeoning area of telemedicine requires next-generation [broadband] networks to transmit very large data files quickly."[86]

But EPB sees the primary benefits of its next-generation broadband network as occurring in the future. EPB's chief operating office, David Wade, has stated: "We knew that the [1 Gbps] capacity had to be there before people could start creating applications that could utilize the capacity."[87] The attitude is: "build for the future, not the present, and then encourage people to grow new applications that take advantage of [capacity] abundance rather than conform to [capacity] scarcity."[88]

Data Centers as Brownfields Redevelopment

Another, more specialized but limited use of broadband infrastructure to spur brownfields redevelopment is to convert brownfield areas into data centers. A data center—sometimes known as a server farm—is a facility used to house centrally one or more businesses' servers, computer systems, data storage systems and associated equipment.[89] Each data center serves as one or more of the data center owner's central nodes for communications, data storage and routing. For security purposes, data centers are often located away from the owner's general offices or business facilities. Telecommunications and broadband service providers, internet service providers, and web-based firms, as well as more general large businesses, such as financial institutions and other service industries, typically have one, or several, data centers. Thus, large businesses, as well as broadband and internet-related businesses, may have multiple data centers distributed geographically across their entire service footprint. Because data centers are hubs of data storage and transport, they require substantial broadband infrastructure support.

Industrial brownfield areas hold promise for the location of data centers.[90] According to press reports, "data center operators, including Unisys and Digital Realty Trust, lured by cheap property and cheap power, built new locations in downtown St. Louis."[91] Vacant properties in the California Bay Area are also being acquired and converted to data center use.[92]

The information technology industry is likely to be the key industry of the 21st century. It would be appropriate if that 21st-century industry were to replace 20th-century manufacturing in the brownfield areas that manufacturing once occupied.

Conclusion

Broadband infrastructure is not, by itself, a panacea for brownfields redevelopment. But it will be a necessary, fundamental ingredient for success in many brownfields redevelopments. Next-generation broadband infrastructure will be essential to attract new businesses to a community, and to attract the highly educated and entrepreneurial workforce those businesses will demand. Next-generation broadband networks will be the lifeblood of virtually any successful urban revitalization or brownfields redevelopment.

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84 Lohr, *supra.*

85 Nate Anderson, *How Do You Use 1Gbps Internet Links? Chattanooga Residents Find Out,* Ars Technica, http://arstechnica.com/tech-policy/news/2011/04/how-chattanooga-uses-1gbps-internet-connections.ars ("Anderson").

86 Mitchell, *supra,* at 40.

87 Anderson, *supra.*

88 *Id.*

89 *See* ADC Telecommunications, *TIA-942 Data Center Standards Overview* (2006), *available at* http://www.adc.com/Attachment/1270711929361/102264AE.pdf.

90 *See* Derrick Harris, *Can Data Centers Help Cure Urban Decay?,* GigaOM (Feb. 9, 2011), http://www.gigaom.com/cloud/can-data-centers-help-cure-urban-decay/.

91 *Id.*

92 J.K. Dineen, *Commercial Real Estate: Surging High-Tech Firms Grab Vacant Office Space,* San Francisco Business Times (Dec. 31, 2010), http://www.bizjournals.com/sanfrancisco/print-edition/2010/12/31/commercial-real-estate-surging.html.

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