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United States Government Accountability Office
Washington, DC 20548

June 27, 2012

The Honorable Henry A. Waxman
Ranking Member
Committee on Energy and Commerce
House of Representatives

The Honorable Anna G. Eshoo
Ranking Member
Subcommittee on Communications and Technology
Committee on Energy and Commerce
House of Representatives

The Honorable Edward J. Markey
The Honorable Doris O. Matsui
House of Representatives

Subject: *Planning and Flexibility Are Key to Effectively Deploying Broadband Conduit through Federal Highway Projects*

Affordable access to broadband telecommunications is increasingly viewed as vital to the country's economic growth as well as for improving state and local systems for traffic management, public safety, and educational goals.[1] According to the Federal Communications Commission (FCC), the largest cost element for deploying broadband via fiber optic cable is the cost of placement, such as burying the fiber in the ground, rather than the cost of the fiber itself. Recent legislation introduced in both the U.S. Senate and House of Representatives would require the Secretary of Transportation to require states to install broadband conduit during construction for certain federally funded highway projects in compliance with standards developed by the Secretary, in coordination with FCC.[2] Both the House and Senate bills would make conduit available to any requesting broadband service provider for a "charge not to exceed a cost-based rate." Both bills would affect only new construction or highway expansion projects that receive federal funding and would not, for example, affect projects limited to road resurfacing or general maintenance.

[1]The term broadband commonly refers to high speed Internet access. GAO, *Telecommunications: Broadband Deployment Is Extensive throughout the United States, but It Is Difficult to Assess the Extent of Deployment Gaps in Rural Areas*, GAO-06-426 (Washington, D.C.: May 5, 2006).

[2]H.R. 1695, 112th Cong. (2011); S. 1939, 112th Cong. (2011). As of our reporting date, both bills were pending in Congress.

You requested that we examine proposed federal "dig once" policies that would require the deployment of broadband conduit in conjunction with federally funded highway construction projects as a way to decrease the costs of deploying fiber and eliminate the need for multiple excavations.[3] This report presents information on (1) the advantages and disadvantages of dig once policies and (2) how the broadband deployment experiences of states and localities that have implemented dig once policies can inform the consideration of a federal dig once policy.

Scope and Methodology

This information is based on our analysis of documents from and interviews with officials from FCC; the Federal Highway Administration (FHWA); state departments of transportation in California, Massachusetts, Michigan, Oregon, Utah, and Virginia; associations including the Telecommunications Industry Association, the National Association of Telecommunications Officers and Advisors, the National Association of Regulatory Utility Commissioners, the American Association of State Highway and Transportation Officials, the New America Foundation, the California Emerging Technology Fund, and the Massachusetts Broadband Institute; providers of broadband service and infrastructure including Google, Verizon, Inyo Networks, Sonic.net, Monkeybrains, Slic Network Solutions, and Jaguar Communications; and local government agencies in San Francisco, California; Santa Monica, California; Burbank, California; and Portland, Oregon. State departments of transportation and local government agencies were selected based on recommendations from U.S. Department of Transportation (DOT) and FCC officials and others we spoke with during the course of our work because of their experience with dig once or similar policies. Broadband service and infrastructure providers were selected to achieve a diversity of viewpoints, sizes, and company types. Our selection of stakeholders was judgmental and thus, responses are not generalizable but provide key insights into the experiences of state and local governments and others with experience deploying broadband conduit and networks.

We conducted this performance audit from December 2011 through June 2012 in accordance with generally accepted government auditing standards. Those standards require that we plan and perform the audit to obtain sufficient, appropriate evidence to provide a reasonable basis for our findings and conclusions based on our audit objectives. We believe that the evidence obtained provides a reasonable basis for our findings and conclusions based on our audit objectives.

Results in Brief

A federal dig once policy would likely have several advantages, including potentially decreasing the frequency of construction on major highways and the cost of installation, while accelerating access to and reliability of broadband networks. However, disadvantages—which could be exacerbated by a requirement to install conduit as part of certain federally funded highway construction—include the potential to install conduit that telecommunications companies might not use and to divert highway funding away from highway construction. DOT, FCC, and state DOT officials we spoke with supported the concept of a dig once policy, but suggested alternative approaches to a federal requirement to install conduit in all covered projects. For example, FCC officials expressed support for a federal requirement for evaluation of the feasibility and need for conduit during federal highway construction, and state and U.S. DOT

[3]Throughout this report we refer to "dig once" policies as those broadband deployment policies focused on increasing coordination between government agencies and utility companies to decrease the frequency of highway excavation.

officials expressed support for a federal role in facilitating discussion and best practice sharing among states implementing broadband deployment policies.

State and local broadband deployment experiences demonstrate the importance of planning and flexibility to effectively implement dig once policies. Officials from states and localities we spoke with have adopted various strategies—including establishing formal coordination processes between state DOTs and local utility companies—but none required installation of conduit as part of all roadway construction. These officials stated that planning and coordination with local officials is a critical step to address a number of considerations that should be taken into account during implementation—such as the location of access points and the appropriate number and size of conduits—to make the conduit installed more useful for telecommunications companies. In addition, officials from states and telecommunication companies stated that the flexibility to take local needs into account in implementing a dig once policy on a project-by-project basis is important and may help to address the potential disadvantages of a federal dig once policy.

Background

FCC regulates interstate and international communications by radio, television, wire, satellite, and cable. According to FCC, communications infrastructure has played a critical role in increasing opportunities for American innovation, industry, job growth, and international competitiveness. As such, FCC works to promote competition, innovation, and investment in broadband services and facilities. Broadband access in the U.S. has thus far been driven largely by private investment and market innovations and has improved considerably in the last decade, but there are critical problems that slow the progress of availability, adoption, and utilization of broadband. Such problems include the high cost of deployment in some locations. To encourage further broadband deployment, FCC's National Broadband Plan recommends that Congress consider enacting dig once legislation applying to all future federally funded highway projects along rights-of-way and that the U.S. DOT make federal financing of highway, road, and bridge projects contingent on states and localities allowing joint deployment of conduits by qualified parties.[4]

Federal funding for highways is provided to the states primarily through grant programs collectively known as the Federal-Aid Highway Program. In a joint federal-state partnership, FHWA, a division within the U.S. DOT, administers the Federal-Aid Highway Program and distributes most of the funding to the states through annual apportionments established by statutory formulas. Once apportioned, the funds are available for obligation for construction, reconstruction, and improvement of highways on eligible routes. About 1 million of the nation's 4 million miles of roads are eligible for federal aid—including the 161,000-mile National Highway System. The responsibility for selecting specific highway projects generally rests with state DOTs and local planning organizations, which have discretion in determining how to allocate available federal funds among various eligible projects.

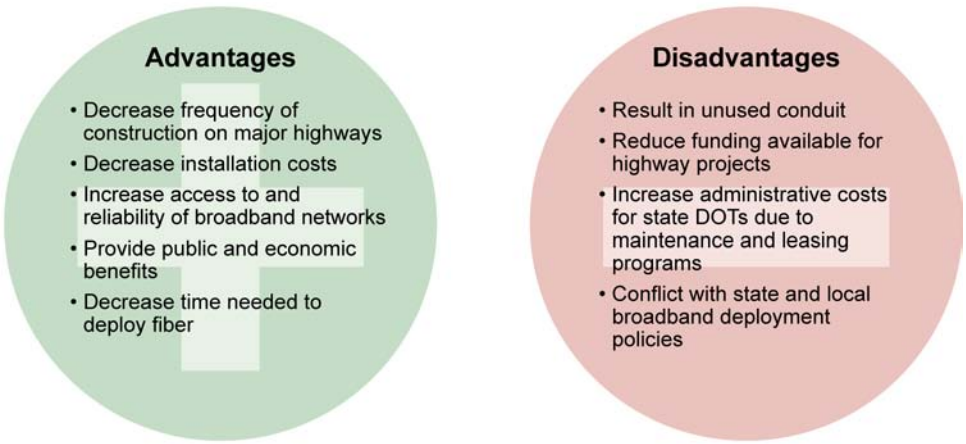
[4]FCC, *Connecting America: The National Broadband Plan* (Washington, D.C.; Mar. 16, 2010). Also see, GAO, *Telecommunications: National Broadband Plan Reflects the Experiences of Leading Countries, but Implementation Will Be Challenging,* GAO-10-825 (Washington, D.C.; Sept. 14, 2010) and GAO, *Telecommunications: Broadband Deployment Plan Should Include Performance Goals and Measures to Guide Federal Investment,* GAO-09-924 (Washington, D.C.; May 12, 2009).

Fiber optic cables provide extremely fast data transmission speeds and are commonly used for long haul transmissions, such as the Internet backbone and middle mile.[5] Fiber optic technology converts electronic signals carrying data to light, sends the light through transparent glass or plastic fibers about the diameter of a human hair, and converts the light back to electronic form for delivery. These fibers are combined into cable of various size diameters, and these cables are then commonly buried inside an underground conduit where they are better protected from the elements or natural disasters. Depending on traffic demand, fiber optic technology may be deployed from the provider's facilities to a customer's home or business. In many instances, the part of the connection to the customer's premises, commonly called "the last mile," may be provided over coaxial cable, copper loop, or wireless technology, which may be more cost-effective than a total fiber connection. Industry documentation estimates that the expected useful life of fiber cables is between 20 and 25 years and that the expected useful life of underground conduit is between 25 and 50 years. Current dig once policy proposals are focused on increasing middle-mile and backbone broadband infrastructure rather than last-mile fiber infrastructure to homes and businesses.

A Federal Dig Once Policy Has Several Potential Advantages and Disadvantages

Federal and state officials and industry representatives we spoke with described the potential advantages and disadvantages associated with federal dig once policies (see figure 1). While the potential advantages apply to dig once policies in general, some potential disadvantages may be more or less applicable depending on the specific elements of a federal dig once policy.

Figure 1: Federal and State Officials' Views about Potential Advantages and Disadvantages of a Federal Dig Once Policy



Source: GAO.

[5]"Long haul transmissions" are transmissions of data over long distances. The infrastructure used for these long haul transmissions includes what are commonly called the Internet "backbone" and "middle mile" fiber, and does not typically provide broadband service to end users.

Potential Advantages

- *Decrease frequency of construction on major highways.* Combining broadband conduit installation with highway construction, rather than installing the conduit at a later date, might result in fewer construction-related disturbances on federal-aid highways. Decreasing the number of times a roadway is under construction should decrease construction-related traffic congestion and could potentially increase the life-span of roadways, as frequent construction can reduce the integrity of road materials.

- *Decrease installation costs.* The cost to install underground conduit for broadband deployment varies, but installation costs could decrease in some cases if conduit is installed during road construction projects because of the ability to share those costs with others involved in the road project. One industry official stated that cost savings would depend on the type of work being completed for the principal highway project. If the highway project includes, for example, digging trenches for water mains or other facilities, then trenching equipment will be on site and available and the costs for that equipment would be shared among the broadband, water, and other portions of the project. Officials we spoke with noted that the amount of cost savings also depends on the type of terrain in which the conduit is installed and the installation method required. For example, for a 2011 broadband deployment project through portions of California and Nevada, the average contractor bid was $2.18 per linear foot for "plowing"[6] in dirt and $10.86 per linear foot for "trenching"[7] in dirt. For the same project, the average contractor bid for installing conduit by "boring"[8] was about $22 per linear foot in dirt but about $108 per linear foot in areas with solid rock. Taking these factors into consideration, some of the state officials we spoke with reported that coordinating road work and underground conduit deployment in their states had resulted in cost savings. For instance, officials from one state DOT as well as an engineering assessment commissioned for the city of San Francisco estimate that when conduit and fiber installation is coordinated with a road or utility project, savings range from 25-33 percent and are greatest in densely populated areas where the complexity and cost of construction is highest. Similarly, Utah DOT, in comparing two rural broadband deployment projects, estimated cost savings of roughly 15.5 percent per mile when conduit and fiber were installed during a road project rather than being installed independent of a road project.

- *Increase access to and reliability of broadband networks.* Officials stated that dig once policies could increase access to and reliability of broadband networks at a faster rate than current deployment efforts. For example, dig once policies could provide telecommunications companies with access to lower cost state-owned conduit in rural areas, thus encouraging them to build out their networks in those areas. Further, installing additional conduit in areas that already have broadband access could improve network reliability by providing redundancy in cases of damage by natural disasters, sabotage, or construction. Additionally, officials stated that dig once policies can provide an opportunity to

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[6]"Plowing" is a method of installing underground conduit using a plow blade (pulled by a tractor) to provide an opening in the ground. The conduit is then placed at the required depth through a feed tube located on the blade. The dirt is then placed back over the opening to cover the conduit. Plastics Pipe Institute, *Second Edition Handbook of PE Pipe*, Chapter 14 http://plasticpipe.org/pdf/chapter14.pdf.

[7]"Trenching" is a method of installing underground conduit by which a trench is made using specialized trenching equipment. The conduit is then placed in the ground and the trench is backfilled. Plastics Pipe Institute, *Second Edition Handbook of PE Pipe*, Chapter 14 http://plasticpipe.org/pdf/chapter14.pdf.

[8]"Boring" (directional boring) is a trenchless method of installing underground conduit using a steerable horizontal drill underneath existing obstacles such as rivers or highways. Plastics Pipe Institute, *Second Edition Handbook of PE Pipe*, Chapter 14 http://plasticpipe.org/pdf/chapter14.pdf.

replace aging or aerial infrastructure (such as underground copper infrastructure or fiber attached to telephone poles) with underground conduit, which is less susceptible to damage.

- *Provide public and economic benefits.* Officials we spoke with stated that a dig once or similar policy could lead to various public and economic benefits. First, officials from some state DOTs, local governments, and industry organizations stated that a dig once policy could assist states and localities in developing intelligent transportation[9] and public safety systems by making conduit available for state and local use. Officials in some localities also stated that access to locally owned conduit has reduced local government telecommunications costs. Second, some officials stated that a dig once policy might lead to decreases in broadband prices and/or increased broadband performance for consumers because of potentially increased competition resulting from the availability of conduit open to all broadband providers. Third, officials in some localities as well as industry stakeholders stated that increased access to broadband benefits existing businesses and could draw new businesses to the area, both of which could increase local economic activity.

- *Decrease time needed to deploy fiber.* Some officials we spoke to stated that, depending on implementation, a dig once policy has the potential to decrease the time it takes to deploy fiber by reducing the legal and regulatory steps associated with activities such as environmental impact studies and obtaining permits in multiple jurisdictions. For instance, if companies have access to state-owned conduit, they may be able to deploy fiber through that conduit without completing steps such as environmental impact studies, which would have been completed at the time of conduit installation.

Potential Disadvantages

- *Result in unused conduit.* Most officials we spoke with stated that a dig once policy that included a federal mandate to install conduit could result in miles of unused conduit and wasted funds. For example, while installing conduit for Virginia DOT use in 1998, the agency installed spare conduit in a major highway interchange with the intent to lease it to generate revenue and to avoid additional construction by telecommunications companies. Officials told us that local telecommunications companies were not interested in leasing the conduit because their customer base in the area—largely U.S. government agencies and contractors—often requires carriers to own their infrastructure rather than lease infrastructure. According to Virginia DOT officials, it took 10 years for the agency to generate revenue from the extra conduit by selling portions of the conduit system in 2008 and 2011. Officials at Caltrans, California's DOT, told us that the agency had a similar experience with conduit installed in the 1990s that remains unused. Further, while some officials stated that short pieces of installed conduit can prove to be useful, others were concerned that many current highway projects are completed over distances of 1 or 2 miles. A mandate to install conduit with federal highway projects could result in small segments of conduit across the country that do not connect to other broadband infrastructure. Additionally, industry and other officials stated that it may take many years for companies to develop a need for the conduit installed as a result of dig once policies. With no active fiber inside the conduit to provide incentive for states and companies to protect conduit from road work and other hazards, officials were concerned that the conduit might become damaged and unusable.

[9]Intelligent transportation systems use communications, electronics, sensors, and computer hardware and software to improve the performance or safety of freeway and transit systems that are designed to improve traffic flow. GAO, *Intelligent Transportation Systems: Improved DOT Collaboration and Communication Could Enhance the Use of Technology to Manage Congestion,* GAO-12-308 (Washington, D.C.: Mar. 19, 2012).

- *Reduce funding available for highway projects.* While the costs of conduit installation are small relative to the costs of most highway projects, a dig once policy could reduce funding available for highway projects at a time when most state DOTs are struggling financially. For example, according to Utah DOT officials, broadband conduit and fiber installation comprised approximately 7 percent of the total budget for a 19.36-mile road construction project in Utah. Unless an alternative funding source were established, the incremental costs of conduit installation and conduit management would be borne by either state DOT budgets or federal-aid highway funding, thus reducing the amount of funding available for the principal mission of the project: highway construction. While leasing programs may help states recover these costs, states will be responsible for the costs of conduit installation and administration until the conduit becomes used by telecommunications companies. Additionally, state DOT and U.S. DOT officials stated that broadband conduit design and construction could delay the design and completion of highway projects.

- *Increase administrative costs for state DOTs and local governments due to maintenance and leasing programs*. In addition to the costs of installation, some officials expressed concern about the costs to maintain the conduit, maintain a conduit inventory, and administer a leasing program, all of which may require additional personnel. In states and localities we spoke to, additional personnel have been hired in order to manage leasing programs and maintenance, such as might be required under a federal dig once policy. For instance, Utah DOT employs one full-time employee in addition to contract support to manage the agency's fiber optic program. Similarly, the city of Santa Monica, California, employs three full time employees to manage the technical and marketing aspects of its broadband program, and has begun working with a contractor to assist with administering the network.

- *Conflict with state and local broadband deployment policies*. State and local officials raised concerns about a federal dig once policy and cost-based rate requirement affecting states' ability to continue current broadband deployment programs. For example, Utah DOT officials expressed concern that a requirement to install conduit and lease it at a cost-based rate would prohibit Utah's current broadband deployment efforts in which the state trades the use of excess state-owned conduit and fiber for access to conduit owned by telecommunications companies.[10] Similarly, Massachusetts DOT (MassDOT) officials stated concerns that a requirement to lease conduit at a cost-based rate would prohibit the state's current practice of charging market-based leasing fees to companies that place fiber infrastructure in the state's right-of-way, resulting in the loss of a revenue stream. U.S. DOT officials also noted that some states restrict the use of transportation funding for utilities infrastructure, a restriction that may conflict with a federal dig once policy.

FCC officials stated that the agency has not conducted any studies on dig once policies or implemented policies similar to dig once, but that the agency generally supports a federal dig once policy. FCC officials further stated that they would support a dig once policy that requires an evaluation of the feasibility and need for broadband conduit as a part of the highway construction process, rather than a mandate to install conduit in all covered projects. While DOT does not currently have any programs or policies that promote dig once or similar broadband deployment strategies, DOT has expressed support for developing a dig once policy and noted that current regulations allow for fiber optic cable to be run lengthwise along highway rights-of-way.[11] However, if a federal dig once policy were implemented, DOT officials expressed

[10]Additional information about this arrangement is provided below.

[11]23 C.F.R. § 1.23(b),(c).

concern that the agency would be making decisions and setting policy outside of its scope of expertise, which is focused on transportation, rather than broadband deployment. Additionally, DOT officials stated that a dig once policy applying to federally funded new construction and expansion highway projects would likely affect a very small percentage of the nation's roadways. While approximately 30 percent of all federal-aid highway program funding is allocated annually toward reconstruction and widening improvement projects, this funding is spent on about 4 percent of the National Highway System, or approximately .01 percent of the nation's roads open to public travel.[12]

Some state DOT officials we contacted suggested that, rather than a federal dig once policy, U.S. DOT and FCC should act as facilitators to assist states in creating broadband deployment policies. For instance, officials in one state suggested that US DOT facilitate a workshop in which state DOTs with established broadband policies share best practices and ideas with other states. The U.S. DOT officials we spoke with expressed support for this type of facilitation, rather than legislation linking federal highway funding to deployment of broadband conduit. On June 14, 2012, the President issued Executive Order 13616,[13] "Accelerating Broadband Infrastructure Deployment," that, among other activities, requires that the U.S. DOT do the following:

- Implement a flexible set of best practices that can accommodate changes in broadband technology and minimize excavations consistent with competitive broadband deployment.

- Work with state and local governments to help them develop and implement best practices on establishing dig once requirements, effectively using private investment in state intelligent transportation infrastructure, and other related activities.

Broadband Deployment Experiences Illustrate the Benefits of Planning and Flexibility

Officials from states and localities we spoke with have had a variety of broadband deployment experiences and have adopted various strategies to promote broadband deployment and infrastructure. Some have implemented dig once policies that encourage coordination between transportation agencies and utility companies to prevent additional road construction, but we did not identify any states or localities that have dig once policies that require installation of conduit as part of any road construction project. State and local strategies include formal coordination policies between state DOTs and utility companies, a system of trading the use of state-owned conduit for use of conduit owned by telecommunications companies, and city-owned fiber optic networks, among others. For example:

- Michigan DOT has implemented a formal coordination process in which the DOT provides its future road work plans to local utility companies, giving the companies an opportunity to complete work while the DOT has roads under construction.

[12]DOT also noted that, when possible, state and local agencies allow utilities to install facilities, such as conduit, outside of the roadway, which would negate most of the cost savings of installing conduit at the same time as road construction.

[13] 77 Fed. Reg. 36903 (June 20, 2012).

- Similarly, the city of San Francisco coordinates with local utility companies through its joint trenching policy, which allows utility companies to install conduit or perform maintenance either prior to or during roadway reconstruction and restoration. The policy includes a 5-year moratorium on excavating streets that have been reconstructed, repaved, or resurfaced.

- Utah DOT and Virginia DOT leverage private companies' assets to decrease the cost of expanding their state-owned fiber optic networks, which support their intelligent transportation systems, through a fiber optic resource sharing program and conduit trade system. Virginia's DOT allows private companies to install conduit and/or fiber in its limited access right-of-way, where it does not typically allow utility installations, in exchange for the use of company-owned conduit and/or fiber in areas where the state does not have broadband infrastructure. Utah DOT installs conduit for its own network—sometimes coordinating conduit installation with road construction—and allows private companies to use excess state-owned conduit in exchange for the use of company-owned conduit in areas where the state does not have broadband infrastructure.

- MassDOT views its highway right-of-way as an asset developed by the state and, correspondingly, charges telecommunications companies leasing fees for using it. Companies with underground fiber networks provide MassDOT with fiber or conduit space, and then the value of the fiber or conduit space is deducted from the company's leasing fee.

- Both Santa Monica and Burbank have city-owned fiber optic networks. The city of Burbank has deployed its network primarily through existing electrical conduit and generates nominal revenue for Burbank Water and Power by leasing excess capacity to local businesses. Santa Monica built its fiber optic network to reduce the city's costs associated with buying Internet service from a telecommunications company, enhance telecommunications services, and promote economic development. The city generates revenue through leasing services to local businesses to support network operations and fund community programs.

Planning and Flexibility Are Key to Successfully Implementing Dig Once Policies

State, local, and industry officials we contacted who have experience deploying broadband networks stated that planning is an important aspect of ensuring that a broadband deployment project is successful. For example, officials planned Digital 395, a 583-mile broadband deployment project located primarily along highway 395 in California and Nevada, for more than 2 years prior to breaking ground to install conduit. Planning steps included identifying levels of broadband service in the deployment area and the number of households and businesses located in the proposed service area. Additionally, recent federal programs that promote broadband deployment[14] have required grant and loan applicants to demonstrate planning and goal setting, including how the project will create sustainable broadband adoption in the target area, a project timeline that establishes key milestones for the implementation of the project, and potential challenges that could pose delays, among other information.

Officials stated that coordination between states and local communities is an important part of planning the deployment of broadband networks because local communities have a better

[14]The American Recovery and Reinvestment Act of 2009 established the Broadband Technology Opportunities Program, administered by the Department of Commerce's National Telecommunications and Information Administration to facilitate broadband access to unserved and underserved areas in the United States. Pub. L. No. 111-5, § 6001 (Feb. 17, 2009). Additionally, the Department of Agriculture's Rural Utilities Service established the Broadband Initiatives Program to make loans and award grants for broadband infrastructure projects in rural areas.

understanding of their broadband needs than states or the federal government and working with local officials helps ensure that local requirements are met by the state.[15] Additionally, a better understanding of the broadband needs in an area should help state DOTs determine which highway projects should include conduit. For example, some officials stated that interstate highways in the northeast U.S. typically have enough fiber optic infrastructure and that more conduit is not needed. Additionally, some areas may not need new conduit because there are alternative deployment methods. For example, Google officials stated that in a recent fiber deployment project in Kansas City, Kansas, Google deployed fiber optic cables through existing municipally owned utility conduit, so there was little need for additional conduit during the deployment process.

Officials stated that planning, including coordination with local officials, may help address several implementation considerations that should be taken into account for conduit installed under a dig once policy to be useful and appealing to telecommunications companies. Leaving these considerations unaddressed may result in conduit that is poorly designed or managed. State DOT and other officials stated that if officials were tasked with implementation of a dig once policy, they should consider conduit access, installation, management, maintenance, and cost issues, including:

- *The location of access points along the conduit.* To allow for maintenance and the connection of customers to the fiber optic cable, there should be points along conduit at which fiber optic cable can be installed in the conduit and accessed in the future.

- *The number and size of conduits.* The number of conduits and size of conduit affect the number and strand count of fiber optic cables that can be installed in a single conduit or a bank of conduit. For example, if a state installs four 1-inch conduits, it likely means that the maximum amount of fiber optic cable the conduits can house is four half-inch fiber optic cables.

- *Security of conduit and access points*. Telecommunications officials stated that companies may not want to share conduit and access points with other companies because of security and safety concerns about their fiber optic cables being damaged by another party. Additionally, an official suggested that the creation of a qualified vendor list is needed to control who can access the conduit to pull fiber optic cable, perform maintenance, and prevent damage as a result of negligence.

- *The conduit allocation process.* The allocation of conduit between public and private entities needs to be managed to effectively give companies access to the conduit and to prevent misuse of the conduit. For example, some officials were concerned that large companies might be allowed to lease all excess conduit space in order to eliminate competition.

- *A conduit map.* A high-quality map or database displaying the location, number, and size of conduits is necessary for telecommunications companies to efficiently locate and access the conduit.

[15]U.S. DOT also noted that local agencies currently have the responsibility for determining when, where, and under which conditions utilities are allowed to occupy all public rights-of-way, including those on roadways. As such, these local agencies have the controls and authority to require funding and installation of conduit for broadband services if they determine there is a need.

- *The management of right-of-way access.* Depending on how a policy is implemented, state-owned conduit could make the permitting and coordination process for accessing rights-of-way in different jurisdictions easier—by requiring that companies only coordinate with the state DOT—or more difficult—by requiring that companies coordinate with all the jurisdictions the conduit crosses through.

- *The designation of conduit maintenance responsibilities.* The clear designation of maintenance responsibilities is important because maintenance can become complicated if conduit or fiber is damaged by an outside party, natural disaster, or another telecommunications company.

- *Setting conduit access rates*. The cost to lease conduit from the state must be reasonable and, if the conduit is leased at a cost-based rate, states should clearly delineate how costs would be allocated among users. For example, states should decide if the access rates will differ depending on the number of companies that are colocated in conduit. If one company has to bear all of the costs because it is the only company using the conduit, versus three companies sharing the cost of the conduit, telecommunications companies may be hesitant to be the first to lease conduit.

In addition to planning, state and telecommunications company officials stated that a dig once policy should allow for flexibility based on the needs of states and localities. Officials stated that flexibility is beneficial when deploying broadband infrastructure because different areas of the country have different needs, so conduit installation should be considered on a project-by-project basis. For example, some officials stated that it does not make sense to install conduit in a 5-mile stretch of road that is not close to other telecommunications infrastructure or if no work is planned on successive lengths of road in the near future. Additionally, it may be cost prohibitive to install conduit in some areas of the country where terrain is challenging. For example, the average contractor bid for boring in areas of solid rock was about five times the cost of directional boring in areas with mostly dirt for a 2011 broadband deployment project through portions of California and Nevada. Similarly, in rural areas, aerial installation allows for more flexibility to connect newly built homes to fiber optic cables than underground conduit, according to an official at a telecommunications company that specializes in providing broadband to rural areas. However, officials told us that certain areas or projects would benefit greatly from pre-installed conduit, including bridges, interstate highway crossings, and highway interchanges. Officials stated that such projects can be difficult, costly, and even dangerous places to install conduit so preexisting conduit could facilitate broadband deployment to areas surrounding such projects.

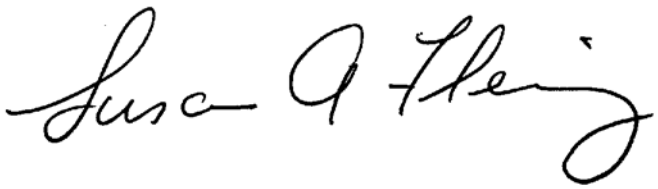
According to some state, local, and telecommunications officials, planning and flexibility in a dig once policy may help address potential disadvantages by, for example, accommodating states' and localities' existing broadband deployment programs, decreasing the likelihood of installing conduit that will never be used, and giving states the ability to set their own conduit access rates. For example, officials in one locality said they would like to continue to generate revenue from leasing excess capacity from the city-owned network to private businesses, but they are unsure how a national policy would affect local policy. Flexibility in a federal policy could also give states the ability to set their own conduit-leasing rates, within reason. According to some state and industry officials, state DOTs should be able to charge an amount greater than a cost-based rate to fund future conduit expansion and to ensure that costs associated with conduit installation and administration are fully recovered.

Agency Comments

We provided a draft of this report to FCC and U.S. DOT for comment. DOT had no comments. FCC provided technical comments, which we incorporated as appropriate.

We are sending copies of this report to the Federal Communications Commission, the U.S. Department of Transportation, and other interested parties. In addition, this report will be available at no charge on the GAO website at http://www.gao.gov.

If you or your staff have any questions about this report, please contact me at (202) 512-2834 or flemings@gao.gov. Contact points for our Offices of Congressional Relations and Public Affairs may be found on the last page of this report. Additionally, Sara Vermillion, Assistant Director; Laura Erion; Colin Fallon; Katie Hamer; and Crystal Wesco made key contributions to this report.



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