ENTERPRISE Transportation Pooled Fund Study TPF-5 (231)

ENTERPRISE

Policies, Laws, and Agreements for the Use of Fiber Communications

PROJECT SUMMARY REPORT

Prepared by

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Project Champion

Kevin Price, Illinois DOT, was the ENTERPRISE Project Champion for this effort and served as the overall lead for the project.

Members

The ENTERPRISE Board consists of a representative from each of the following member entities of the program:

- Federal Highway Administration
- Georgia Department of Transportation
- Illinois Department of Transportation
- Iowa Department of Transportation
- Kansas Department of Transportation
- Michigan Department of Transportation
- Ministry of Transportation Ontario
- Minnesota Department of Transportation
- Oklahoma Department of Transportation
- Pennsylvania Department of Transportation
- Texas Department of Transportation
- Transport Canada

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1.0 Introduction

Transportation agencies that utilize fiber optic infrastructure for telecommunications, Intelligent Transportation Systems (ITS), and other applications may be in a position to leverage existing in-place infrastructure owned by other entities and/or share new agency-deployed infrastructure with other entities. In these cases, it is important for agencies to understand laws that govern the use and sharing of fiber optics infrastructure or exchanging resources to gain access to fiber owned by other entities, and to develop internal policies that provide procedural guidance. Agencies may not have the staff, experience, processes, and/or agreements they need to enable sharing fiber infrastructure with another entity.

Some state and provincial transportation agencies have established policies that govern the use of fiber and that guide sharing arrangements. Resource availability and practices would be useful for ENTERPRISE agencies to learn from and model.

The objective of this ENTERPRISE project "Policies, Laws, and Agreements for the Use of Fiber Communications" was to prepare a summary of resources (policies, laws, agreements) on the use of fiber communications of transportation agencies and to highlight practices for sharing fiber infrastructure.

To accomplish the project objective, policies on fiber communications, state and federal laws and/or FHWA rules that govern the use of fiber, and any agreements or partnership strategies used for sharing fiber optic infrastructure were collected and summarized. In addition, the project summarized practices for the use of these policies, laws, and agreements, especially for facilitating resource sharing. A survey was also distributed to transportation agencies to enhance the online search by collecting additional information on current sharing practices including existing policies and agreements. The online research and survey were then used to select four agencies to contact to provide additional details on fiber sharing practices to document in this report.

This document includes the following:

- 2.0 Fiber Communication Related Studies and Resources – Summarizes relevant studies, surveys and other sources on fiber communications and fiber sharing. This section also provides fiber sharing references, sorted by state, resulting from the initial review.
- 3.0 Survey – Presents a summary of responses received from a survey distributed to state and provincial agencies to collect information on current fiber infrastructure sharing and resource exchange practices including existing policies and agreements.
- 4.0 Fiber Sharing Practices – Summarizes interviews conducted with the Iowa Department of Transportation (DOT), Utah DOT, Virginia DOT and Wisconsin DOT on current fiber sharing and resource exchange practices.
- 5.0 Summary – Highlights and summarizes information gathered from Sections 2.0 - 4.0.

For brevity, "right-of-way" ("rights-of-way," etc.) is abbreviated as "ROW" throughout this report unless it is part of a referenced publication's title or a quotation used from a referenced publication.

2.0 Fiber Communication Related Studies and Resources

An online search was conducted to learn of related studies on fiber communications and sharing of fiber infrastructure. The published resources found were not intended to be a comprehensive list of fiber communication related documents, but to provide a sampling of resources. It is important to note that the date of the resources compiled ranges from 2000 to 2016. The resources include relevant studies, surveys and national sources. **Table 1** provides a list of documents sorted by year and links to the documents. A brief summary of each document reviewed is also included in the table.

Table 1: Fiber Communication Related Studies and Resources

Source	Document Title and Brief Summary	Year
U.S. Government Publishing Office	Electronic Code of Federal Regulations (e-CFR) – Accommodation of Utilities[1] This e-CFR proposes policies, procedures, and reimbursement provisions for the adjustment and relocation of utility facilities and recommends policies and procedures for accommodating utility facilities and private lines on the ROW of Federal-aid or direct Federal highway projects.	2016
University of Wisconsin - Extension	Collected Broadband Regulations and Policies in Action – For Wisconsin Stakeholders Exploring Broadband Expansion[2] This collection of sample broadband laws and policies is a starting point for communities in Wisconsin who want to make a more informed decision regarding their own policies, agreements, ordinances, and plans. It provides samples in the areas of public ROW, policies and plans, and contracts and resolutions as well as Wisconsin State Legislation.	2014
National Cooperative Highway Research Program (NCHRP)	Synthesis 462 – Managing Longitudinal Utility Installations on Controlled Access Highway Right-of-Way[3] This Transportation Research Board (TRB) synthesis includes a brief history of longitudinal utility installations on controlled access ROW and current DOT practices for managing these utilities. It documents best practices from a survey of state DOTs and includes both raw input from the 43 DOTs responding to the survey as well as summary survey results. In addition, a literature review and information from states having experience with or using innovative practices in longitudinal installations on controlled access ROW is included.	2014
United States Department of Transportation (USDOT)	Executive Order: Accelerating Broadband Infrastructure Deployment – Successful Practices of Broadband Deployment in Highway Right of Way: Summary Paper[4] This document gives an overview of successful practices for broadband deployment presented in a workshop to local, state, and federal agencies. A summary of follow-up discussions from the workshop and information from an online, six question survey of State DOTs conducted by Wisconsin Extension Service to discover whether state DOTs have specific policies and practices for minimizing excavation of the ROW are also included. In addition, the document includes FHWA's proposed next steps for agency action to help facilitate the deployment of broadband.	2013

Source	Document Title and Brief Summary	Year
USDOT	Executive Order: Accelerating Broadband Infrastructure Deployment[5] The United States has become a global leader in the deployment of broadband services, however, there are areas of the country, primarily rural, that continue to be underserved and may be viewed as less profitable for service expansion. This summary documents background information and FHWA initiatives to be used in discussions to help facilitate the deployment of broadband in highway ROW. It identifies the federal legislation and guidance for states to deploy broadband and provides examples from state and local governments that have deployed broadband. The document presents an overview of broadband deployment in highway ROW from a federal perspective with the intention of using the document internally for discussion purposes and shared with other federal agencies to reduce barriers to the expansion of broadband services in underserved communities. A work plan to implement the Executive Order on Accelerating Broadband Infrastructure Deployment is also included.	2012
Federal Communications Commission (FCC)	Connecting America: The National Broadband Plan[6] The National Broadband Plan is the FCC's "roadmap" to maximize the use of broadband and ensure every American has access to the tools necessary to succeed. Its mission is to create a more productive, creative, and efficient America in which affordable broadband is available everywhere and everyone has the means and skills to use valuable broadband applications. The plan addresses America's broadband gaps and unrealized opportunities by recommending ways federal, state, and local governments can encourage private investment, innovation, lower prices, and better options for consumers.	2010
Colorado DOT	Fiber Optic in Right-of-Way Survey[7] Colorado DOT recommended that AASHTO survey DOT ROW and Utilities Managers to request information on fiber optic cable. This document identifies the four survey questions and includes comments from the 14 DOTs who responded to the survey.	2009
American Association of State Highway Transportation Officials (AASHTO)	Clearinghouse Report – Compensation for Telecommunications in Controlled Access Right-of-Way[8] This AASHTO 2006 Clearinghouse Report includes a survey that was requested by the California DOT and asks states five questions regarding compensation for telecommunications in controlled access ROW. Twenty-three states responded. Each state's comments are included, however, no overall analysis is provided in this document.	2006
USDOT	Utility Rights-of-Way: Resource Sharing – State-by-State Status Report[9] This USDOT survey collects each state's status for accommodating fiber optics and wireless communications on Interstates and other freeways and provides both FHWA and State contacts.	2002

Source	Document Title and Brief Summary	Year
New York University	Large City Technical Exchange and Assistance Program[10] Members of the National Association of City Transportation Officials identified three topics of critical interest: inter-jurisdictional coordination in traffic management, interagency sharing of fiber optic networks, and facilitating high volume pedestrian activity. This report highlights the results of case studies on sharing fiber optics, delivers lessons learned from each case, and highlights the discussion of key issues.	2000

In addition to the studies or efforts described in **Table 1**, the following news articles were found related to fiber communications and fiber sharing:

- Inside Towers
  Indiana Telecoms Protest State Broadband Deal[11] (2016)

- PR Newswire
  USA FIBER Signs Resource Sharing Agreement with State of Maryland[12] (2016)

- Alliance for Innovation – Transforming Local Government
  City of Sacramento and State of California's Fiber Sharing Agreement Leverages Underutilized City Fiber Assets to Benefit Both[13] (2016)

- The Council of State Governments
  The Current State E-Newsletter – Dig Once: Using Public Rights-of-Way to Bridge the Digital Divide[14] (2016)

- Infrastructure Quarterly
  Going the Distance – Oklahoma lay 1,050 miles of fiber optic cable[15] (2013)

From the review of the documents in **Table 1,** a list of transportation agencies referenced in these documents with fiber communication or fiber sharing experiences was produced. As noted above, the dates of the documents reviewed range from 2000-2016. The information in **Table 2** includes a summary of fiber communication references for 18 transportation agencies, sorted by state, from the documents reviewed. **It is important to note that Table 2 is not intended to be all inclusive, but to provide examples of the history of fiber communications and fiber sharing experiences based on the documents reviewed for this project.**

Table 2: Fiber Communication References by State from Review of Table 1 Documents

State	Fiber Communication References from Review of Table 1 Documents
Arizona	The Arizona Digital Highways bill (SB1402) expanded existing rules governing the management of state owned ROW to include transportation-of–information as well as vehicles. Through the partnership of the Arizona DOT and the Arizona Strategic Enterprise Technology (ASET) office, the bill fosters sustainable broadband deployment. When funding is provided to Arizona DOT from a fund managed by ASET's Digital Arizona Project, Arizona DOT will install multiple empty conduit lines in the ROW alongside state highways. Before installation, broadband providers will have pre-agreed to install fiber in the empty conduit, which they will be able to lease on a cost recovery basis. ***Source:*** *Collected Broadband Regulations and Policies in Action – For Wisconsin Stakeholders Exploring Broadband Expansion (2014)* In 2012, Arizona passed legislation to promote high-speed Internet access to citizens statewide. Arizona Digital Highway Bill (SB1402) makes provisions for the state to install empty conduit in connection with rural highway construction. The installation of the conduit would be funded by a state program (which receives federal funding) managed by the Arizona Strategic Enterprise Technology (ASET)'s Digital Arizona Project. The state then leases the conduit to all telecoms. It is expected that this approach will significantly lower costs to providers of service in rural communities; however, so far, no telecoms have shown interest. In the City of Flagstaff, empty conduit is installed whenever there is new street construction. ***Source:*** *USDOT - Executive Order: Accelerating Broadband Infrastructure Deployment – Successful Practices of Broadband Deployment in Highway Right of Way: Summary Paper (2013)* Arizona DOT allows the perpendicular crossing of Arizona DOT ROW by fiber optics or other such entities. Costs incurred to cross our ROW are borne by the permittee. Arizona does not allow the parallel installation of fiber optics or such along ROW corridors. We do not allow by permit or lease the parallel installation of fiber optics or such along our ROW corridors. ***Source:*** *AASHTO Clearinghouse Report – Compensation for Telecommunications in Controlled Access Right-of-Way (2006)*
Arkansas	Arkansas has, as part of its Utility Accommodation Policy, developed guidelines for the installation of fiber optics on the Interstate system. No fees are charged, but Arkansas State Highway and Transportation Department (AHTD) has negotiated shared resource agreements with several telecom companies allowing installation of fiber optic cable in exchange for ownership of fiber, telecommunications equipment, and telecommunications services. All shared resources are for the exclusive use of AHTD. ***Source:*** *AASHTO Clearinghouse Report – Compensation for Telecommunications in Controlled Access Right-of-Way (2006)* Fiber optic lines have been installed on some interstates and the state has received lines in exchange. ***Source:*** *USDOT - Utility Rights-of-Way: Resource Sharing – State-by-State Status Report (2002)*

State	Fiber Communication References from Review of Table 1 Documents
Colorado	Colorado DOT does not allow public utilities to run parallel to the interstate inside the controlled access. Only perpendicular crossings are allowed. ***Source:*** *Colorado DOT - Fiber Optic in ROW Survey (2009)* Colorado accommodates fiber optics along interstate and freeway ROW through "Shared Resources". Colorado receives compensation based on the appraised value of the ROW. ***Source:*** *AASHTO Clearinghouse Report – Compensation for Telecommunications in Controlled Access Right-of-Way (2006)* Fiber optic installations have been permitted in exchange for fibers to be used by Colorado DOT. ***Source:*** *USDOT - Utility Rights-of-Way: Resource Sharing – State-by-State Status Report (2002)*
Illinois	The Illinois DOT currently employs a Dig Once policy. This policy was codified into state law, 605 ILCS 5/9-131 of the Illinois statutes, and states that the Department of Central Management Services shall collaborate to install fiber-optic network conduit where it does not already exist in every new State-funded construction project that opens State-owned roadways. ***Source:*** *Collected Broadband Regulations and Policies in Action – For Wisconsin Stakeholders Exploring Broadband Expansion (2014)* Illinois charges fair market value of a lease for the use of Interstate ROW for fiber optic cables. There are no charges for use of other state highway ROW. Illinois charges an annual fee based on the current fair market value of a lease for the land so fees are higher in urban areas and lower in rural areas. ***Source:*** *AASHTO Clearinghouse Report – Compensation for Telecommunications in Controlled Access Right-of-Way (2006)*
Iowa	The Iowa DOT shares some fiber-optic lines with a communications company owned by the state. ***Source:*** *USDOT - Utility Rights-of-Way: Resource Sharing – State-by-State Status Report (2002)*
Kansas	Kansas has a fiber optic line on a section of Interstate maintained by the Kansas Turnpike Authority as well as on other freeways. In one case cash compensation was exchanged. Kansas DOT has two shared resource projects. The statewide contract covers 550 miles of ROW from Kansas City to the Colorado border and from Salina south to Wichita. ***Source:*** *USDOT - Utility Rights-of-Way: Resource Sharing – State-by-State Status Report (2002)*
Louisiana	Louisiana Revised Statute 48:381.2 provides for fiber optic installations in controlled access ROW. Per the statute, Louisiana receives one-time compensation per mile. The statute also allows the department to receive an equivalent value in in-kind goods and services. ***Source:*** *AASHTO Clearinghouse Report – Compensation for Telecommunications in Controlled Access Right-of-Way (2006)*

State	Fiber Communication References from Review of Table 1 Documents
Maryland	Since 1994 Maryland has executed 23 agreements with private companies (Verizon, Nextel, AT&T). Agreements are based on sharing ROW for monetary or in-kind compensation (communications or IT equipment provided to Maryland State Highway Administration). Private entity installs and maintains the conduit. Through resource sharing the state has been able to achieve interoperability and reduce capital costs for communications infrastructure. ***Source:*** *USDOT - Executive Order: Accelerating Broadband Infrastructure Deployment – Successful Practices of Broadband Deployment in Highway Right of Way: Summary Paper (2013)* Maryland has a Resource Sharing Policy for fiber along highway ROW. Rates charged vary upon the specific proposal received and are negotiated with the telecom company based on the location and the state's existing or future needs along the proposed route. ***Source:*** *AASHTO Clearinghouse Report – Compensation for Telecommunications in Controlled Access Right-of-Way (2006)*
Massachusetts	The state receives fiber line in exchange for accommodation. ***Source:*** *USDOT - Utility Rights-of-Way: Resource Sharing – State-by-State Status Report (2002)*
Michigan	The Department of Natural Resources (DNR) has initiatives to expand broadband into rural areas of Michigan. Senate Bill 499 authorizes the installation of fiber optics facilities in rail-trail corridors. The DNR has ownership of the conduit and no resource sharing is involved. There is a flat fee for use of the land and a streamlined process for obtaining permits. ***Source:*** *USDOT - Executive Order: Accelerating Broadband Infrastructure Deployment – Successful Practices of Broadband Deployment in Highway Right of Way: Summary Paper (2013)*
Minnesota	Minnesota DOT (MnDOT) has a utility accommodation policy and formal policy for telecoms. The Telecom Act was passed allowing for conduit to be placed in Interstate ROW (2006); AT&T sought legislation to put fiber in the Interstate. The telecom company running fiber in I-94 went bankrupt and the state ended up owning the facilities. Through Minnesota's broadband initiatives such as Connect Minnesota and the creation of a Broadband Task Force, the state is widely looking at the implementation of broadband. A study is underway on developing a statewide infrastructure that supports broadband; it is being proposed that future highway construction would include the installation of conduit. ***Source:*** *USDOT - Executive Order: Accelerating Broadband Infrastructure Deployment – Successful Practices of Broadband Deployment in Highway Right of Way: Summary Paper (2013)* MnDOT accommodates private sector fiber on the interstate ROW through a barter arrangement by a Minnesota bandwidth expansion project, Connect Minnesota. There are no direct fees but Minnesota uses offsetting reciprocal agreements to accommodate yearly maintenance costs. Barter values are based on initial capital costs which considers the conduit size, number of fibers, and distance. ***Source:*** *AASHTO Clearinghouse Report – Compensation for Telecommunications in Controlled Access Right-of-Way (2006)*

State	Fiber Communication References from Review of Table 1 Documents
New York	New York State DOT accommodates the occupancy of fiber optics within its interstate highway ROW using a "Request For Proposals" (RFP) process. The Department charges a fee for such occupancies. However, the amount of the fee may be adjusted to reflect what service(s) and/or public benefit the State may be receiving as a direct result of such occupancies. The State shall have the limited right to use the State fiber to provide capacity to commercial or for-profit entities solely in connection with economic development activities in the State of New York. ***Source:*** *AASHTO Clearinghouse Report – Compensation for Telecommunications in Controlled Access Right-of-Way (2006)*
Rhode Island	The state received two conduits for state use in exchange for allowing private usage of ROW. ***Source:*** *USDOT - Utility Rights-of-Way: Resource Sharing – State-by-State Status Report (2002)*
Texas	The utility accommodation rules in Texas allow the establishment of a utility strip, which is, "the area of land established within a control of access highway, located longitudinally within the area between the outer traveled way and the ROW line, for the nonexclusive use, occupancy, and access by one or more authorized public utilities." For traffic safety reasons, Texas DOT does not allow access to utility strips directly from the main lanes of the controlled access facility, regardless of the presence or absence of frontage roads. Further, utility strips do not convey an easement or property interest and may not be occupied by other utilities without an exception specifically approved for each utility. ***Source:*** *NCHRP - Synthesis 462 – Managing Longitudinal Utility Installations on Controlled Access Highway Right-of-Way (2014)*
Utah	Utah allows communication utilities on controlled access ROW if the utility provides a service to the DOT. Installations may involve conduits that allow future expansion for other communication utilities. ***Source:*** *NCHRP - Synthesis 462 – Managing Longitudinal Utility Installations on Controlled Access Highway Right-of-Way (2014)* Utah allows fiber on interstates and charges fees. The amount varies (state law) because the amount charged is based on the value of the adjoining properties or area properties and the type of conduit, however Utah prefers to accept "in-kind" payment. The amount charged is an annual amount based on a per mile charge. ***Source:*** *AASHTO Clearinghouse Report – Compensation for Telecommunications in Controlled Access Right-of-Way (2006)*
Vermont	Vermont allows for the installation of fiber on the Interstate. Using funds from National Telecommunications and Information Administration grants, the State recently installed 14 miles of conduit along the Interstate, which has been leased to a telecom for a 20-year period at $5,000 per year, and lateral connections for $1,000 per year. The DOT also has a barter agreement in place with the telecom for the use of one conduit. A public-private agreement is in negotiation to add conduit along the entire Interstate. One hundred and forty-four (144) strands would be installed and used for ITS purposes and excess capacity for the State. ***Source:*** *USDOT - Executive Order: Accelerating Broadband Infrastructure Deployment – Successful Practices of Broadband Deployment in Highway Right of Way: Summary Paper (2013)*

State	Fiber Communication References from Review of Table 1 Documents
Virginia	Virginia DOT is considering installing conduit with any new road construction. If a service provider installs it, they would also own the conduit. VDOT owns conduit in the Northern Virginia and Hampton Roads Districts. In the 1990s, VDOT went out with a request for proposals to place broadband in the ROW and did not get a response. As a result of the Creosol settlement, the General Assembly required that some of the money be used to place broadband along several rural corridors. VDOT worked with two "authorities" that were created for that purpose and laid the conduit. As part of the arrangement VDOT was able to get fiber placed that was able to connect the Salem traffic center with the main operations center in Richmond. ***Source:*** *USDOT - Executive Order: Accelerating Broadband Infrastructure Deployment – Successful Practices of Broadband Deployment in Highway Right of Way: Summary Paper (2013)*
Wisconsin	The Wisconsin DOT (WisDOT) has entered into many shared-resource agreements whereby WisDOT received dark fiber in exchange for the longitudinal use of controlled access highway ROW. ***Source:*** *Collected Broadband Regulations and Policies in Action – For Wisconsin Stakeholders Exploring Broadband Expansion (2014)* Wisconsin has some corridors with communication utilities on controlled access ROW; this arrangement provides WisDOT with access to dark (unused) fiber, which WisDOT has accepted in lieu of a cash payment. WisDOT has been able to use the fiber to make connections to its ITS facilities such as changeable message signs, ramp meters, and traffic cameras. ***Source:*** *NCHRP - Synthesis 462 – Managing Longitudinal Utility Installations on Controlled Access Highway Right-of-Way (2014)* WisDOT allows fiber to be placed along interstates and controlled access highways for cash, or conduit and/or fiber. In the case of conduit and/or fiber, the value of cannot be lower than the equivalent cash value of the ROW. ***Source:*** *AASHTO 2006 Clearinghouse Report – Compensation for Telecommunications in Controlled Access Right-of-Way (2006)* WisDOT has received cash for access to fiber optic lines along interstates but could receive fiber, cash, or both. ***Source:*** *USDOT - Utility Rights-of-Way: Resource Sharing – State-by-State Status Report (2002)*

Three of the documents noted in **Table 1** provided overall national guidance on fiber communication. A summary of the information found from review of the documents is included below:

- *Electronic Code of Federal Regulations – Accommodation of Utilities (2016)*
  (a) It is in the public interest for utility facilities to be accommodated on the ROW of a Federal-aid or direct Federal highway project when such use and occupancy of the highway ROW do not adversely affect highway or traffic safety, or otherwise impair the highway or its aesthetic quality, and do not conflict with the provisions of Federal, State or local laws or regulations.

(b) Since by tradition and practice highway and utility facilities frequently coexist within common ROW or along the same transportation corridors, it is essential in such situations that these public service facilities be compatibly designed and operated. In the design of new highway facilities, consideration should be given to utility service needs of the area traversed if such service is to be provided from utility facilities on or near the highway. Similarly the potential impact on the highway and its users should be considered in the design and location of utility facilities on or along highway ROW. Efficient, effective and safe joint highway and utility development of transportation corridors is important along high speed and high volume roads, such as major arterials and freeways, particularly those approaching metropolitan areas where space is increasingly limited. Joint highway and utility planning and development efforts are encouraged on Federal-aid highway projects.

- *USDOT - Executive Order: Accelerating Broadband Infrastructure Deployment (2012)*
  Dig Once requirements, as defined by the Executive Order, refer to "requirements designed to reduce the number and scale of repeated excavations for the installation and maintenance of broadband facilities in rights of way." Although this definition provides a basis for understanding the concept of dig once, there are various interpretations of what may constitute a dig once policy and/or policies and practices to facilitate broadband deployment.

  The USDOT-FHWA does not have a dig once policy, but has policies and procedures for accommodating utility facilities and private lines on federally-aided highway projects that support installation practices that minimize excavation. For matters of safety, related especially to utility projects deployed in the highway ROW clear zone area, the FHWA recommends restricting the installation of fiber optic facilities to only one time within the useful life of the facility, or to a point in time when the existing capacity of the conduit is full. The FHWA also has policies that encourage states, in the design of new highway facilities, to consider the utility service needs of the area and to identify the location of these services. They also strongly encourage states to work collaboratively with service providers on joint highway and utility planning.

  There is no congressionally mandated policy, however U.S. Executive Order 13616 issued in 2012 directed the U.S. Department of Transportation to review Dig Once requirements and to work with state and local governments to develop and implement best practices that included Dig Once polices. To date, only a few states have cut costs by reducing unnecessary excavation, however, coordinating construction projects with utility installations can be challenging.

- *Connecting America: The National Broadband Plan (2010)*
  DOTs should implement “joint trenching” and conduit policies to lower the installation costs for broadband networks. At a minimum, states and localities undertaking construction along ROW that are partially or fully financed by DOT should be required to give at least a 90-day notice before projects begin. This would allow private contractors or public entities to add conduits for fiber optic cables in ways that do not unreasonably increase cost, add to construction time, or hurt the integrity of the project. Opportunities for joint trenching and conduit deployment are

varied, from construction of Intelligent Transportation Systems alongside interstates to building and maintenance of recreational rail trails. As a result, information about potential joint trenching and conduit deployment opportunities should be available and accessible to prospective broadband network providers whenever government engages in an infrastructure project, subject to security precautions.

Congress also should consider enacting “dig once” legislation to extend similar joint trenching requirements to all ROW projects (including sewers, power transmission facilities, rail, pipelines, bridges, tunnels and roads) receiving federal funding.

3.0 Survey

This section includes a summary of responses from a survey that was conducted to collect information on current fiber optic infrastructure sharing practices from state and provincial transportation agencies. The survey focused on collecting existing practices, policies and agreements at the agency level.

The survey was administered online via SurveyMonkey and was opened to respondents in October 2016. The survey was distributed to state and provincial transportation agency representatives.

In total, 14 responses were received from the following agencies:

- Idaho Transportation Department
- Illinois DOT
- Iowa DOT
- Kansas DOT
- Louisiana Department of Transportation and Development
- Michigan DOT
- Ministry Transportation Ontario
- North Dakota DOT
- Oklahoma DOT
- Pennsylvania DOT
- Vermont Agency of Transportation
- Virginia DOT
- Wisconsin DOT
- Wyoming DOT

Eleven (11) agencies indicated that they participate in a variety of fiber sharing arrangements including public-private partnerships (state owned), public-private partnerships (private company owned), and public-public partnerships (state owned or other public agency owned).

North Dakota DOT, Vermont Agency of Transportation (VTrans), and Michigan DOT noted that their agencies do not participate in any fiber sharing arrangements. In North Dakota, fiber optic infrastructure development is controlled by local Lignite Energy Councils, who created a statewide system called Dakota Carrier Network (DCN). The State Information Technology (IT) Department in North Dakota contracts with DCN for access to fiber infrastructure. Michigan DOT noted a lack of personnel to manage a fiber sharing program, lack of fiber management application, inability to ingest profit funds from other entities, and concerns with network security risks.

In October 2016, the Vermont Agency of Transportation posted a Request for Proposals[16] to enter into a Fiber Optic Shared Resources Agreement (SRA) or Public Private Partnership (P3) to deploy fiber optic facilities longitudinally along all or a portion of VTrans interstate ROW. The Fiber Optic SRA or P3 (Project) will be in the form of a lease, under which VTrans will make its interstate ROW available to the lessee (Provider) for the installation and operation of fiber optic facilities. VTrans may also consider making other highway ROW available to the Provider under the terms of the lease, or under other

arrangements available or to be made available to telecommunications providers generally for the use of these non-interstate ROWs.

The agencies that participate in fiber sharing arrangements noted sharing with the following entities:

- Telecom providers (9 respondents)
- University (8 respondents)
- City (7 respondents)
- County (4 respondents)
- Municipal (3 respondents)
- State agencies (3 respondents)
- Port authorities (1 respondents)
- Local Sheriff's Department (1 respondent)
- 911 Center (1 respondent)

Many agencies noted that the entities they commonly share fiber with are telecom providers, universities and local units of government (cities and counties).

Fiber maintenance and cost sharing varies by transportation agency. Following is a summary of responses received noting maintenance and cost sharing practices:

- Iowa DOT does not maintain, locate, or repair any fiber. Through these public-private partnerships, maintaining, locating and repairing fiber is part of the "value" provided to the DOT.
- Louisiana Department of Transportation and Development (DOTD) waives the permit fee in exchange for fiber sharing. The fiber is maintained by the owner and there is no cost sharing.
- In most cases in Oklahoma, the telecom providers have the responsibility for locating, maintaining, and relocation on the fiber at their cost. However, public-public partnerships at the Oklahoma DOT (ODOT) are typically shared cost based on asset percentage. Each agreement is tailored based on assets received for the states use and location on fiber.
- The Ontario Ministry of Transportation provides only dark fibers, and each agency is responsible for maintenance and equipment.
- At the Wyoming DOT (WYDOT), companies must agree to work together now and in the future to allow additional fiber in the conduits and all costs are negotiated between companies.
- At the Virginia DOT (VDOT), the provider owns and maintains the fiber, however, VDOT is responsible for any cost to connect to the fiber. In some cases, VDOT may allow the telecom provider to use a spare VDOT conduit in exchange for fiber resources in the telecom provider's network. In this case, VDOT is responsible for the maintenance (repair and restoration as well) of VDOT-owned conduits.
- For the Pennsylvania DOT, a system to receive notifications when IT issues occur as well as a system to track each fiber allocation is needed.

Six (6) respondents noted that have established policies the govern fiber sharing arrangements. Following are comments from respondents on their agencies' policy on fiber sharing:

- Iowa DOT's current legal opinion is that sharing infrastructure with private parties is a non-competitive business opportunity and not allowed.
- The Louisiana DOTD waives the permit fee in exchange for fiber sharing.

- ODOT's policy for accommodation of utility facilities within Interstate and Controlled Access Highways is on a justifiable hardship case exception basis only. Due to the increasing demand to upgrade ITS infrastructure, communication systems, and to keep up with emerging technology, ODOT may accommodate fiber optic installations within Interstate and Controlled Access Highways. When deemed appropriate and of direct benefit, and producing assets for the DOT, the ROW & Utilities Division's policy will allow for the placement of fiber optic cable and adjacent structures as necessary to facilitate the usual functions of such installations within the limits of controlled access ROW. These installations will be placed at specific, approved locations and be allowed access by drives and/or gates as directed by ODOT's representative. The representative will have full authority to contract and negotiate with outside parties on behalf and for the direct benefit of ODOT. Through public-private partnerships, ODOT has gained 26,000 linear miles of fiber optics for ITS and state use.
- In Virginia, fiber sharing is covered in the Land Use Policy which governs the use of the ROW and permits. It specifically allows for resource sharing for limited access ROW access. VDOT has acquired the use of over 3,000 miles of fiber across the Commonwealth that supports ITS, traffic signals, center-to-center between traffic operation centers and advance technology such as connected vehicles.
- At WYDOT, companies must sign a shared resource agreements and show how their project will benefit the state of Wyoming.
- In Wisconsin, fiber is typically shared when there is an opportunity to obtain mutual benefits as in attempting to fill gaps in ITS infrastructure while at the same time not competing against the private sector.
- In Kansas, there is no formal policy, however, consideration of partnerships have been limited to government agencies.

Overall comments on fiber sharing noted by respondents included the following:

- Establishing a policy provides the ability to share the document with all agency levels to alleviate questions on how the program works.
- Keep the main policy as simple and broad as possible and use agreements to provide details.
- As-built documentation can be a struggle to gather and maintain.
- Leveraging the ROW for state fiber assets has allowed the ITS and state fiber networks to expand much quicker with partnerships.
- Constant and upfront communications between all parties is essential in developing agreements accurately. Avoid agreements that lock in all parties for more than 20 years, but offer an option to renew for a subsequent term.

4.0 Fiber Sharing Practices

From the review of the documented studies and resources in Section 2.0 and the review of the survey responses in Section 3.0 as well as input from the ENTERPRISE members the following four agencies were contacted to request an interview to collect additional information on their current fiber sharing arrangements.

- Iowa DOT
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- Utah DOT
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One hour phone interviews were conducted in November 2016 with these four state DOTs and a summary of each discussion is provided below. The summaries below often include hyperlinks to agency policies or relevant state laws. Additionally, sample agreements from these agencies are described in the summaries below and are also provided on the ENTERPRISE[17] project website.

4.1 Iowa DOT

Iowa DOT currently shares fiber resources with the following entities:

- Private entities (Two agreements in place, but no longer permitted to share with private entities)
- Iowa Communications Network[18], an independent state agency that administers Iowa's statewide fiber optic telecommunications network
- Local municipalities and counties
- Universities: Iowa State University and University of Iowa

Laws, Policies, and Guidance

Iowa DOT's Utility Accommodation Policy[19], which is based on Iowa Administrative Code (Chapter 306A Controlled-Access Highways)[20], states that utility owners must pay a fee to Iowa DOT in order to gain access to install underground facilities longitudinally to the interstate on DOT ROW. As stated in in Section 115.16(8) of the policy, the fee is $7,250 per mile of cable for multiduct systems and $2,500 per mile for all other installations (or a flat fee, whichever is greater), with annual increases as specified. Because this fee is high, few fiber communications providers are willing to pay for access; rather, they will buy or lease on private property. In the past, Iowa DOT was permitted to share fiber resources with

private entities (two such agreements are in place); however, due to current interpretation of state law, this practice is no longer allowed.

Iowa DOT is permitted to share fiber resources with public-based entities. No formal internal DOT policy exists to guide these sharing arrangements.

Arrangements with Private Entities

Iowa DOT currently has agreements with two private providers of communications services: Fibercomm and Long Lines Broadband. Fibercomm provided 25 MB of internet service to Iowa DOT at no charge (and does locates), in exchange for access to install within DOT-owned ROW along I-29 and US 20. In an agreement with Long Lines Broadband, a resource "trade" occurred. Long Lines Broadband provided fiber to Iowa DOT in exchange for access to DOT-installed conduit. Because these agreements were in place prior to current interpretation of state law, they are still in effect. At this time, Iowa DOT is no longer able enter into these types of agreements with private entities.

Arrangements with Iowa Communications Network, Local Municipalities, Counties, and Universities

Iowa DOT shares resources with the Iowa Communications Network (ICN), a state agency that serves as a communications provider for state and federal government, K-12 schools, higher education, hospitals, National Guard armories, and libraries. The exchange is two-way in that Iowa DOT shares its fiber with ICN and vice versa. When ICN uses DOT-owned fiber, ICN provides internet and Ethernet circuits and performs locates with no cost to the DOT. ICN maintains (such as locating and monitoring) DOT-owned fiber at no cost to the DOT. However, Iowa DOT will pay a direct cost to ICN related to damage to fiber. Iowa DOT also utilizes several miles of fiber owned by ICN, which has allowed the DOT to connect between TMC facilities and provide service to rest areas and maintenance facilities.

Sharing fiber resources with local municipalities and counties can include sharing video feeds from traffic cameras, trading the use of strands, or the providing strands in exchange for use of conduit. The city or county agencies will typically locate and maintain the fiber as part of the value they obtain from the exchange, or the maintenance responsibilities are transferred to ICN. Fiber sharing arrangements with universities vary in type but have included DOT access to university-owned property for fiber installation in exchange for the DOT providing strands within their conduit. Typically, no funds are exchanged via these arrangements.

Agreement Format(s)

Iowa DOT utilizes formal agreements which are used to outline the terms and conditions of sharing arrangements. The agreements with ICN utilize a master agreement format to outline basic terms and conditions, with amendments to specify the specific sharing terms as arrangements are negotiated. Agreements are typically 20 years in duration, this duration works well when estimating the equivalent value of a fiber resource. Sometimes, perpetual agreements (no end date) with public entities are utilized. Sample agreements provided by Iowa DOT for this project are located on the ENTERPRISE[21] website and listed in **Table 3**.

Table 3: Sample Fiber Sharing Agreements provided by Iowa DOT

Agreement	Agreement Entities	Description
Cooperative Agreement	Iowa DOT and City	Iowa DOT granted city access to the DOT ITS network in exchange for electrical service to cameras, sensors, and ITS equipment and the ability for the city to install cameras and ITS devices on the DOT ITS network.
ICN DOT Agreement and Amendments for ITS	Iowa DOT and ICN	Agreement relating to the installation, use, and maintenance of fiber optic cable and communications services. Amendment examples provided ICN with installation design and project oversight for ITS project along interstate corridor and established maintenance responsibilities and enabled DOT to utilize ICN's Fiber Management Software System to design, plan, and manage fiber optic network and related infrastructure.
Agreement with FiberComm	Iowa DOT and FiberComm	Allowed Iowa DOT to install a fiber optic cable network for ITS project while FiberComm maintains existing fiber optic network and provides technical support and public internet bandwidth to DOT

Process

When working with its public sector partners, fiber installations are often part of large projects. The Iowa DOT made a decision after deployments in 2006 to use only state funding for ITS/fiber deployments. An abbreviated systems engineering process is followed to engage stakeholders to coordinate needs; which helps to establish relationships that often result in future opportunities for sharing or exchanging resources.

Typically, there are no issues with security when sharing fiber.

Successes and Lessons Learned

Agreements with public entities have been quite successful. Because of these sharing arrangements, Iowa DOT is typically not responsible for locates, maintenance or repair of their fiber facilities.

Multiple parties (both public and private) are willing and able to leverage DOT assets (e.g., conduit systems, existing fiber cable, ROW, vertical infrastructure) to provide benefits to all involved. State legislation is currently the biggest hurdle to sharing fiber with private entities. Iowa DOT has declined access to privately-owned fiber infrastructure, which would be exchanged for access to interstate ROW, because it is currently viewed as a no-bid opportunity and it is viewed as circumventing the utility access policy's fee requirement Iowa Code 314.20 Utility on Highway Right-of-Way[22] as noted below.

> *The department shall develop an accommodation plan for the longitudinal utility use of freeway ROW, in consultation with the utilities board. The plan shall be consistent with the rules of the federal highway administration of the United States department of*

transportation and shall be submitted to the federal highway administration for its approval by January 1, 1989. In developing the plan, the department shall provide for extended payment and lease agreements to provide continuous funding for the living roadway trust fund. The plan shall provide for charges for the use of the ROW and all moneys collected shall be credited to the living roadway trust fund established under section 314.21.

4.2 Utah DOT

Utah DOT (UDOT) shares fiber resources the following entities:

- Telecom providers
- City agencies
- Utah Transit Authority

Arrangements with Telecom Providers

The goal of arrangements with telecom providers is to exchange facilities. No funds are typically exchanged. For example, UDOT may allow telecom providers to install fiber facilities on DOT ROW in exchange for use of fiber resources owned by the provider. The ROW value is determined by UDOT based on the fair market value or rent of highway ROW, on a per mile basis. Use of facilities by UDOT in exchange may or may not be in the location of the negotiated installation. Another type of arrangement is trading the use of DOT-owned fiber strands in exchange for use of strands owned by a telecom provider. UDOT maintains a balance sheet to track sharing arrangements and values associated with resource exchanges.

Ownership and maintenance varies and is determined on a case-by-case basis. Telcom providers and UDOT both own and maintain fiber resources throughout the state. It is important to note that UDOT does not act in the role of a service provider when sharing its facilities.

Arrangements with City Agencies and Utah Transit Authority

UDOT shares fiber resources with public entities such as cities and the Utah Transit Authority. These arrangements include trading of resources, and no funds are exchanged. Each arrangement is different, as it varies by agency and situation. Ownership and maintenance varies on a case by case basis.

Agreement Format(s)

Contract agreements are used to outline terms and conditions of fiber resource sharing with telecom providers. Agreements are 30 years in duration, with automatic 5-year renewals. An agreement template has been developed and is updated annually to adjust agreement language as needed.

Inter-local cooperative agreements are utilized for sharing with public entities such as cities. These agreements are also 30 years in duration.

Process

UDOT plays a strong role in coordinating with partners to facilitate statewide expansion of the broadband network for the benefit of transportation operations, and will work with any provider,

enabling fair and open practices. UDOT meets regularly with telecom providers to discuss broadband projects. UDOT maintains a list/map of areas where gaps in coverage to its devices and facilities exist; this is shared with providers to facilitate project development.

Other tools and mechanisms complement UDOT's coordination efforts. The State of Utah's Automated Geographic Reference Center (AGRC)[23] provides online access to broadband location maps, DOT route locations, and ROW information that can be used by telecom providers. The Utah Broadband Advisory Council[24] is in place to coordinate on broadband deployment efforts and to provide the recommendations and policy guidance. These efforts facilitate coordinated deployments, expansion, and sharing of resources.

4.3 Virginia DOT

Virginia DOT (VDOT) shares fiber resources with the following entities:

- Telecom providers
- City agencies (transportation departments)

Laws, Policies, and Guidance

The Virginia DOT Land Use Policy[25], which governs the use of ROW and permits, states that utilities may not be built longitudinal on interstates. However, the policy specifically calls out an exception allowing utility access to limited access ROW via resource sharing, thereby allowing for Virginia DOT to share fiber infrastructure with other entities.

VDOT has a formal program to guide fiber resource sharing. The Fiber Optic Resource Sharing Program has been in place since the early 1990s, at which time the agency developed agreement language and a template for fiber sharing agreements. An overview of the VDOT Fiber Optic Resource Sharing Program can be found in Appendix A. VDOT is in the process of developing an Informational Instructional Memorandum (an internal VDOT policy) to document details for the resource sharing process. This will be used as an educational tool to help ensure that the program is executed consistently.

Arrangements with Telecom Providers

In typical arrangements with telecom providers, providers allow VDOT exclusive use of fiber resources in exchange for access to install within DOT-owned limited access and non-limited access ROW. The telecom provider is responsible for ownership, maintenance, and relocation of this shared fiber. VDOT is responsible for the cost to connect into to the main fiber line (e.g. lateral builds or splices). In addition, VDOT agrees that the fiber they use is for their use only.

In some cases, VDOT may allow a telecom provider to use a spare VDOT conduit in exchange for fiber resources within the telecom provider's network. In these cases, VDOT is responsible for the maintenance of the VDOT-owned conduits.

Typically, no funds are exchanged, unless the agreement builds in an option to lease additional fiber or to purchase additional assets to help meet VDOT resource needs.

Arrangements with City Agencies

VDOT enters into agreements with city agencies, specifically working with their transportation departments, to share or exchange fiber resources. This can include VDOT-owned fiber being shared with a city in exchange for access to fiber within the city's network, or vice versa. No funds are exchanged via these agreements. In general, the agency that owns the fiber resource is responsible for maintaining it.

When VDOT gains access to city-owned fiber, this exchange typically includes access to "dark fibers" to help VDOT build out its infrastructure. An additional operational benefit is gained when the resulting access allows VDOT traffic management center operators to view local agencies' traffic cameras, assisting with overall traffic management operations.

Agreement Format(s)

Memoranda of Understanding (MOU) are used to govern the terms and conditions of sharing arrangements with telecom providers and city agencies. MOUs have a 25-year initial term, with an option for an additional 25-year renewal. A MOU template provided by VDOT can be found on the ENTERPRISE[26] website. Each agreement is negotiated for specific requirements, terms, and conditions.

The VDOT Central Office Operations Division is responsible for developing the MOUs, with involvement from the appropriate DOT regional operations staff, local and statewide permitting offices, and executive staff. FHWA has a role in reviewing MOUs when the agreement pertains to interstate ROW. The Office of the Attorney General reviews and approves all agreements prior to execution.

Process

VDOT works with more than a dozen telecom providers. VDOT does not approach providers to discuss potential agreements, nor do they show preference to one provider over another. Rather, VDOT will work with any provider on a case by case basis, as approached. Agreements with telecom providers are negotiated during the permitting process. The agreement and implementation processes have typically been successful, with very few issues. Renegotiation can sometimes be difficult, as DOT fiber resource needs (and the associated value to VDOT) may change over a 25-year contracting period, leading to revised terms during renegotiation.

VDOT does not place a specific cost value on access to the ROW when negotiating fiber sharing arrangements as the value may vary depending on the area of the state. Negotiations are based on location and VDOT's current and future needs for fiber infrastructure at the time the agreement is developed.

To date, security has not been an issue for VDOT. Entities entering into agreements with VDOT are required to sign a non-disclosure agreement prior to viewing VDOT's fiber plans. In addition, specific fiber route information is exempt from the Freedom of Information Act as this is covered under the definition of "critical infrastructure."

Successes and Lessons Learned

The overall importance of reliable communications resources (i.e., fiber optic infrastructure) is increasing rapidly. Dial-up communication is becoming increasingly insufficient for transferring information to/from field devices, and leased services are costly. This importance is amplified with the emergence of connected vehicles.

VDOT has acquired the use of over 3,000 miles of fiber across the Commonwealth that supports ITS, traffic signals, communications between traffic operation centers and to advance technology such as connected vehicles. For a nominal investment (lateral fiber builds and network equipment), VDOT has built a network that covers much of the Commonwealth without initial capital expense and ongoing maintenance expenses.

Expansion of the Resource Sharing Program has been included as an item in VDOT's Business Plan. Agency leadership sees value in the program, especially as a mechanism to enable connections to VDOT assets in rural areas. The MOU process, which includes several levels of approvals including signature by the VDOT Commissioner, has raised awareness about the program. The Resource Sharing Program has also received an award from ITS America for Innovative Partnerships.

The following lessons learned were shared:

- An existing challenge is the amount of time needed to negotiate and execute MOUs with telecom providers, including coordination with field staff, executives, and legal teams. Telecom providers are often faced with tight timeframes and may not understand the need to factor in enough time for this process. Communicating this to providers upfront can help manage expectations.
- Agencies should provide desired access locations (signs, cameras, signals, and future locations) to the provider during negotiations to ensure the provider places a hand hole or pull box where it is needed for easy access in the future.
- VDOT has found success with working with telecom providers to engineer and construct lateral builds to VDOT field equipment. VDOT has seen better pricing since the crews are already mobilized and there is no need to coordinate multiple contractors.
- To streamline and standardize the process statewide, agencies should standardize resource sharing process and requirements (MOU template, plan set drawings, access requirements and fiber requirements) and communicate to all internal stakeholders.

4.4 Wisconsin DOT

Wisconsin DOT (WisDOT) shares fiber resources with the following entities:

- Telecom providers
- Wisconsin State Patrol (a separate Division within WisDOT)
- State agencies (Wisconsin Dept. of Administration, Wisconsin Dept. of Military Affairs)
- Local Agencies (Local Sheriffs' Departments)
- Higher Education (University of Wisconsin-Madison, Madison College)

Laws, Policies, and Guidance

Under Wisconsin Statutes 86.07(2)(a)[27] and 84.01(31)[28], WisDOT has authority to require fees or receive communication services in exchange for the longitudinal occupation of controlled-access highway ROW. WisDOT's Utility Accommodation Policy on Controlled-Access Highways Section 09-15-40[29] provides requirements and a fee structure for the longitudinal occupation of controlled-access ROW. The policy has been in existence since the mid-1990s. Fees are determined based on factors that include average daily traffic and installation length, and range from $10,000-$12,000 per centerline mile of installed length. For bridge attachments, fees are based on interstate or non-interstate as well as bridge characteristics such as river crossings and unique bridge locations. The policy is updated periodically to account for emerging and changing technologies (e.g., cellular.) When the policy was initiated, it only allowed access for fiber optic installations. In 2003, the policy was expanded to include electric transmission lines to comply with a change in state law. Water and gas lines may be allowed access, but only as an exception to policy and then in rare circumstances.

Arrangements with Telecom Providers

WisDOT's Utility Accommodation Policy[30] specifies the requirements for telecom providers to locate fiber optic facilities longitudinally on controlled-access highway ROW. In some cases, an exchange of resources (e.g., telecom providers allowing WisDOT access to dark fiber in exchange for ROW occupation) is negotiated in lieu of, or in conjunction with, ROW fees. WisDOT does not charge a ROW fee for longitudinally occupying non controlled-access highways. In instances of a resource exchange, if the telecom provider owns the resource they are responsible maintaining the resource.

Arrangements with State/Local Agencies and Universities

Arrangements with non-commercial entities such as state and local agencies and universities vary widely in scope and terms, but must still follow WisDOT's Utility Accommodation Policy. Arrangements include trading fiber resources on each other's network; providing or allowing access to facilitate increased operational benefits; and leasing arrangements. The following lists examples of these arrangements:

- Wisconsin Department of Administration: Trade fiber resources
- Wisconsin Department of Military Affairs: Trade fiber resources; provide/allow access. WisDOT connected fiber into a Department of Military Affair's building so its state emergency operations center (SEOC) could gain access to all WisDOT traffic camera feeds. The SEOC also has the ability to control the cameras directly (pan-tilt-zoom) if needed to view an ongoing incident.
- University of Wisconsin-Madison: Leases fiber from WisDOT
- Madison College: Trade fiber resources
- Sheriffs' Departments: Trade fiber resources; and provide/allow access. WisDOT provides sheriffs' departments access to DOT traffic camera feeds.

Agreement Format(s)

Agreements with telecom providers are often complex contract agreements that include several permits. WisDOT does not have a prescribed agreement format or template; rather they draw upon language in past agreements when creating new ones. The duration of such agreements is typically 20

years, with an option to renew for an additional 20 years. This agreement duration is based on a 20-year depreciation for a fiber optic facility.

Agreements with state agencies, local agencies, or universities/colleges tend to be less complex than agreements with telecom providers due to their governmental or quasi-governmental status. Because of the operational benefits gained when fiber networks are expanded, WisDOT often works with other agencies to determine infrastructure needs and coordinate planning efforts.

FHWA is not typically involved in the development or approval of specific agreements. WisDOT may notify FHWA as agreements are developed. But because WisDOT has an FHWA-approved utility accommodation policy in place, it can operate within that policy without additional FHWA approvals.

Sample agreements provided by WisDOT are located on the ENTERPRISE[31] website and are summarized in **Table 4** below.

Table 4: Sample Fiber Sharing Agreements provided by WisDOT

Agreement	Agreement Entities	Description
Memorandum of Understanding, Amendment and Permit	WisDOT and Other Wisconsin State Department	In-state fiber resource sharing between WisDOT and the Wisconsin Department of Administration.
Lease Agreement and Amendement	WisDOT and University	The University of Wisconsin - Madison leased WisDOT fiber that WisDOT obtained from a Telecom Provider.
Permit and Memorandum of Understanding	WisDOT and Local Police Department	Local police department installed a CCTV camera and shared the video feed with the WisDOT State Traffic Operation Center.
Memorandum of Understanding	WisDOT and Illinois Tollway	The Illinois tollway used existing private fiber for a camera and dynamic message board in Wisconsin and granted video feed access from the camera to the WisDOT State Traffic Operation Center.
Memorandum of Understanding	WisDOT and Telecom Provider	Allowed WisDOT to swap fibers between a telecom provider facility and state-owned facility.
Controlled Access Highway Right-of-Way Occupancy Agreement: Template	WisDOT and Telecom Provider	Telecom provider agreement template.
Right-of-Way Occupancy Agreement	WisDOT and Telecom Provider	Enabled carrier to construct, operate, and maintain fiber optic communication facilities longitudinally within interstate right-of-way in exchange for dark fibers, conduit, handholes, and cash.
Controlled Access Highway Right-of-Way Occupancy Agreement	WisDOT and University and a Telecom Provider	ROW agreement covering 15 counties that provided WisDOT with access to 12-strands of dark fiber on approximately 300 miles of the state highways.

Process

Very few issues have occurred, in terms of implementation of the policy and agreements for installing fiber optics in WisDOT ROW or sharing of resources. Renegotiations may be complicated due to the nature of changes over a 20-year agreement life. For instance, WisDOT recently renewed its first agreement with a telecom provider, which was approved in 1996. The company was acquired by new owners after the original agreement was signed, therefore the new company had no historical knowledge of the original situation or negotiations making renegotiations a bit more challenging.

WisDOT has not experienced issues regarding security when sharing or exchanging resources. However, if a telecom provider owns and maintains a shared fiber resource, WisDOT is not able to prioritize repairs to that fiber if it is damaged, which may impact WisDOT traffic management operations.

The Role of Cellular Communications

WisDOT noted that cellular communications may play as important a role as fiber communications – perhaps even more as cellular technology improves. Some highway authorities are already using traditional cell towers and mini-cell sites for placing their own antennas to transmit ITS information to motorists. This is beneficial when fiber becomes uneconomical to install especially in rural areas where there are few customers and providers find it easier to transmit broadband using cellular infrastructure.

Shared resource projects using, or revenue obtained from, cellular communications in the ROW are just as likely to occur as fiber communications – perhaps even more as mini-cell sites and distributed antenna systems are placed on utility poles and highway agency/municipal infrastructure such as light poles, traffic signals, and camera poles.

Successes and Lessons Learned

Revenue from fee-based agreements is directed toward expansion of WisDOT's fiber network or other ITS infrastructure. In 2000, a state statute change allowed these funds to be spent specifically for ITS infrastructure rather than deposited into WisDOT's general transportation fund. The Governor of Wisconsin has indicated a priority for the deployment of broadband rural areas; having access to dark fiber and having a policy in place to accommodate fiber optic infrastructure on WisDOT ROW are keys to achieving this. WisDOT is pursuing additional uses for fiber across modes and applications such as freight movement and safety. For instance, connecting fiber at rest areas to communicate available truck parking spaces upstream via message boards and for weigh-in motion capability. An emphasis on expansion of the fiber network for multiple uses further elevates the need for continuing current practices in conformance with the policy.

The following lessons learned were shared:

- Keep the main policy as simple and broad as possible. Focus on details during the agreement development process, keeping in mind agency needs and avoiding negative impacts to the safety, maintenance, and operation of the highway system including potential interference with future highway improvement projects.

- Engage DOT staff attorneys to review proposed agreements in detail. For complex agreements, a staff attorney may even lead the agreement development process. Constant and upfront communications among all parties is essential in developing these types of agreements.
- Avoid agreements that lock in all parties for more than 20 years, but offer an option to renew for a subsequent term.

5.0 Summary

The following provides overall highlights from the information gathered for this project.

Studies and Resources

- There are a variety of fiber communication related studies and resources summarized for this project. The dates of documents reviewed for this project range from 2000 to 2016. The review of these documents provides a history of fiber communication and fiber sharing experiences.

Fiber Sharing and Resource Exchange Practices

- There are agencies for example, Michigan DOT (MDOT), Vermont Agency of Transportation (VTrans), and North Dakota DOT, which do not participate in any fiber sharing agreements. However, in October 2016, VTrans posted a RFP to enter into a Fiber Optic Shared Resources Agreement or Public Private Partnership to deploy fiber optic facilities longitudinally along all or a portion of VTrans' interstate ROW. At MDOT it was noted that there is a lack of personnel to manage a fiber sharing program, lack of fiber management application, inability to ingest profit funds from other entities, and concerns with network security risks.
- Some agencies, such as Iowa DOT, are not allowed to share fiber resources with private entities due to interpretation of state law. Several agencies have successfully completed efforts to change state statutes in order to allow resource sharing, while others are in the process of doing so.
- Transportation agencies that participate in fiber sharing arrangements most commonly share fiber with telecom providers, universities and local government agencies (e.g. cities and counties).
- Arrangements that provide transportation agencies with access to fiber infrastructure that they do not build or own can take several forms, including gaining access to a telecom provider's fiber network in exchange for occupation of highway ROW or trading access to fiber on each other's network. Public-public sharing arrangements rarely include exchange of funds and are often seen as mutually beneficial to improving traffic operations by connecting traffic control devices and ITS assets.
- Some transportation agencies, such as Wisconsin DOT (WisDOT), may charge a fee for occupation of fiber infrastructure on interstate ROW. Revenues from these fees are directed toward investments in ITS infrastructure at WisDOT.

Capital Investments and Maintenance

- Fiber maintenance and cost sharing varies by agency and typically is determined on a case by case basis. The Louisiana Department of Transportation and Development waives the permit fee in exchange for fiber sharing. The fiber is maintained by the owner.
- In Oklahoma, the telecom providers have the responsibility for locating, maintaining, and relocation on the fiber at their cost. Public-public partnerships at the Oklahoma DOT are typically shared cost based on asset percentage. Each agreement is tailored based on assets received for the states use and location on fiber.

Policies and Programs

- Many transportation agencies have established policies that govern fiber sharing arrangements. For example, in Virginia fiber sharing is covered in the Land Use Policy which governs the use of the ROW and permits. It specifically allows for resource sharing for limited access ROW access. Through Virginia DOT's formal resource sharing program, it has acquired the use of over 3,000 miles of fiber across the Commonwealth that supports ITS, traffic signals, communications between traffic operations centers, and advance technology such as connected vehicles.
- Establishing a fiber sharing policy provides consistent information throughout a state. The policy can also be shared with all levels of an agency to alleviate questions regarding how the sharing arrangements are structured and agreements are negotiated.

The Role of Cellular Communications

WisDOT noted that cellular communications may play as important a role as fiber communications – perhaps even more as cellular technology improves. Shared resource projects using, or revenue obtained from, cellular communications in the ROW are just as likely to occur as fiber communications – perhaps even more as mini-cell sites and distributed antenna systems are placed on utility poles and highway agency/municipal infrastructure such as light poles, traffic signals, and camera poles.

Sample Fiber Sharing Agreements

There were several fiber sharing agreement examples made available to the project as listed in the table below. Hyperlinks to each sample agreement are provided on the ENTERPRISE[32] website. These resources were gathered for ENTERPRISE members to learn from as well as to use as a model when developing fiber sharing agreements.

Table 5: Sample Fiber Sharing Agreements provided by Iowa DOT, Virginia DOT, and WisDOT

Agreement	Agreement Entities	Description
Cooperative Agreement	Iowa DOT and City	Iowa DOT granted city access to the DOT ITS network in exchange for electrical service to cameras, sensors, and ITS equipment and the ability for the city to install cameras and ITS devices on the DOT ITS network.
Iowa Communications Network (ICN) DOT Agreement and Amendments for ITS	Iowa DOT and ICN	Agreement relating to the installation, use, and maintenance of fiber optic cable and communications services. In addition, amendments for ITS are provided.
Agreement with FiberComm	Iowa DOT and FiberComm	Allowed Iowa DOT to install a fiber optic cable network for ITS project while FiberComm maintains existing fiber optic network and provides technical support and public internet bandwidth to DOT
Memorandum of Understanding (MOU) Template	Virginia DOT and Telecom Provider or City	Template to govern the terms and conditions of sharing arrangements. Each agreement is negotiated for specific requirements, terms, and conditions.
MOU, Amendment and Permit	WisDOT and Other Wisconsin State Department	In-state fiber resource sharing between WisDOT and the Wisconsin Department of Administration.

Agreement	Agreement Entities	Description
Lease Agreement and Amendment	WisDOT and University	The University of Wisconsin - Madison leased WisDOT fiber that WisDOT obtained from a Telecom Provider.
Permit and MOU	WisDOT and Local Police Department	Local police department installed a CCTV camera and shared the video feed with the WisDOT State Traffic Operation Center.
MOU	WisDOT and Illinois Tollway	The Illinois tollway used existing private fiber for a camera and dynamic message board in Wisconsin and granted video feed access from the camera to the WisDOT State Traffic Operation Center.
MOU	WisDOT and Telecom Provider	Allowed WisDOT to swap fibers between a telecom provider facility and state-owned facility.
Controlled Access Highway ROW Occupancy Agreement: Template	WisDOT and Telecom Provider	Telecom provider agreement template.
ROW Occupancy Agreement	WisDOT and Telecom Provider	Enabled carrier to construct, operate, and maintain fiber optic communication facilities longitudinally within interstate right-of-way in exchange for dark fibers, conduit, handholes, and cash.
Controlled Access Highway ROW Occupancy Agreement	WisDOT and University and a Telecom Provider	ROW agreement covering 15 counties that provided WisDOT with access to 12-strands of dark fiber on approximately 300 miles of the state highways.

Appendix A: Virginia DOT Fiber Optic Resource Sharing Program Overview

VDOT Virginia Department of Transportation

Operations Division

Fiber Optic Resource Sharing Program Overview

❖ ***Background***

Fiber optic resource sharing has been pursued in many states across the U.S. since 1996 with support from the Federal Highway Administration (FHWA) and the American Association of State Highway and Transportation Officials (AASHTO). In 1995, AASHTO published a resolution endorsing the installation of fiber optic cable along freeway rights-of-way. Since then, many states have allowed exceptions to their utility accommodation policies through resource sharing agreements. These agreements allow communications providers to install fiber optic networks along limited access rights-of-way, and in exchange, the company provides the DOT with a portion of fiber resources. VDOT has been actively engaged in fiber optic resource sharing since 1998.

❖ ***Benefits***

VDOT operates an extensive Intelligent Transportation System (ITS) network utilizing a combination of dedicated fiber optic cables, wireless communications and leased telecommunication services that provide connectivity to its transportation operations centers (TOCs) and ITS devices statewide. With the continued expansion of VDOT's Operations program, the demand on VDOT's communications resources will also continue to increase.

The Fiber Optic Resource Sharing Program supports and expands VDOT's Operations program and ITS Network, without the significant cost and duration associated with VDOT having to construct and maintain the network. VDOT currently has partnerships with 17 communications providers and cooperatives providing nearly 3,200 miles of fiber cable enabling communications between VDOT's TOCs and ITS devices.

Fiber sharing benefits VDOT not only in terms of cost savings and increased communications capacity, but also increases the sharing of information among the TOCs providing greater operational coordination and center-to-center communications. A dedicated fiber optic network delivers the necessary levels of security, reliability, manageability, scalability, and operational redundancy in a cost effective manner.

❖ ***The Process***

VDOT's Operations Division, in coordination with the Transportation Mobility and Planning Division, and Regional and District staff, assess proposed routes from communications providers to determine if VDOT's Operations program would derive sufficient benefit from the fiber route. When there is sufficient benefit, VDOT negotiates

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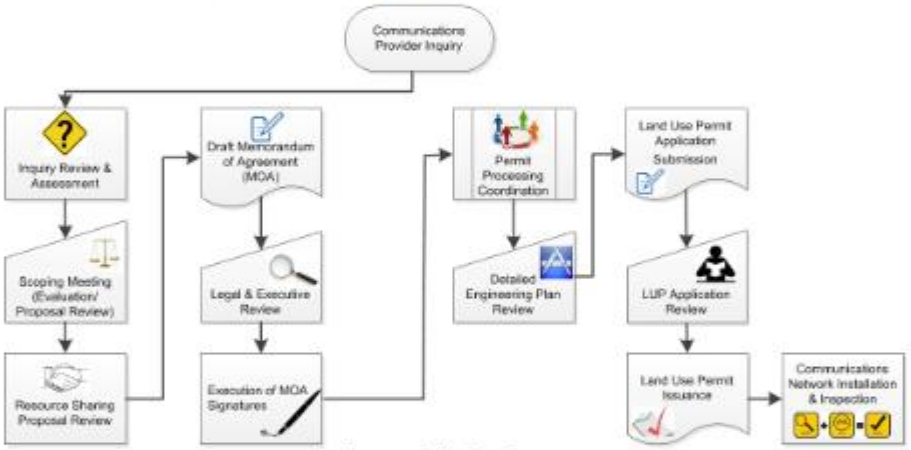
a fair exchange of service (e.g., dark fiber, conduit) and enters into a resource sharing agreement. Fiber obtained through the resource sharing program is only used for VDOT purposes and is not leased, sold or given to other entities or agencies.

The time associated with each step of the resource sharing agreement process can vary depending on reviews, amendments, permits, staff schedules, time of year, and corresponding projects of equal importance. While a Fiber Optic Resource Sharing template (Memorandum of Agreement) has been developed to ensure consistency in terms and conditions, each Agreement is individually negotiated to obtain the maximum benefit for VDOT. Often, VDOT must act quickly on resource sharing opportunities as providers are under tight schedules and are actively evaluating alternative easements to construct their networks. VDOT has negotiated a number of innovative exchanges to secure resource sharing agreements and ensure both parties receive mutual benefit.



Resource Sharing Process

The resource sharing process involves several areas of VDOT, as depicted above. Coordination between all stakeholders is key to ensuring a successful project and partnership. Once a resource sharing agreement has been established between VDOT and the communications provider, expansion routes may be evaluated and added through amendments to the base agreement. The amendment goes through the same review and approval process outlined above.

For more information, please email: FORSProgram@vdot.virginia.gov

Links to Referenced Sources

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