Navajo Arcadian Fiber Project (US 160)

Part C – Project Narrative

Executive Summary

ABDG Funding Will Leverage Significant Other Past and Future Investments

Arcadian Infracom ("Arcadian") is seeking approximately [redacted] in partial funding for a [redacted] project to build fiber from Tuba City to Teec Nos Pos (the AZ/NM state line) then on to Farmington, traversing the Navajo Nation in Arizona. The [redacted] project is part of a larger [redacted] project to build fiber from Tuba City to Farmington to Denver. Arcadian itself has already invested over [redacted] into the Navajo Arcadian Fiber Project and has TIAA as a financial sponsor, who have a rich history of patient investments and bring significant financial stability to Arcadian's sustainable, commercial customer-based business plan.

A Well-Developed Project Plan

This Navajo Arcadian Fiber Project (US 160) ("Navajo Arcadian Fiber Project" or "Project") will enable robust broadband access services to unserved residences, businesses and anchor facilities interconnected to the Arcadian route. The Project is a long-planned, highly coordinated effort based on 2018 and 2020 Navajo legislation, conceived by Navajo Nation leaders and Arcadian. The separate but synergistic Arcadian route from Phoenix to Tuba City to Salt Lake City is engineering complete, materials have been ordered and is awaiting only a key federal permit to enable Summer 2022 construction kickoff, subject to final financial approval based on signed customer contracts and any other available funding support for that route.

An Experienced Execution Team

The Arcadian leadership team has 300+ years of collective experience having built, bought or operated 350,000+ miles of fiber networks across the globe. See attached resumes for the Arcadian team in Part G.

A Sustainable, Non-Discriminatory Access Business That Improves Rural & Tribal Broadband

Arcadian purposefully routes its new fiber routes away from existing internet backbone routes to create geographically diverse fiber routes to keep its commercial customers' data centers connected when existing fiber routes get cut. As a result, the Arcadian commercial business model naturally brings affordable high speed broadband access closer to remote rural and tribal communities currently far from existing internet backbones. When combined with Arcadian's non-discriminatory access policy at over 210 locations along this route, Arcadian expects to greatly improve access to broadband in these communities.

Project Completion Makes New Investments in FTTH Networks Technically and Economically Feasible

Currently, broadband providers in smaller communities far from existing internet backbones pay 10x to 100x more for internet access than they would in major markets. With affordable connectivity back to these major markets, remote communities can now provide affordable, scalable broadband services within their communities. With this lower cost, scalable connectivity to major markets, new local fiber network investments become newly technically and economically viable due to the Arcadian network.

Narrative

ABDG Grant Would Accelerate Connectivity for this Region by Years.
Arcadian proposes to build an interim partial fiber solution from Tuba City to Teec Nos Pass to Farmington because completed the route to Denver will be at least two years delayed due to a pending CDOT build project across Wolf Creek Pass. CDOT's speed of progress is understandably limited since fiber construction can occur only a few short weeks per year due to weather conditions. However, existing fiber routes in the region converge in Farmington (Farmington has fiber connectivity to Albuquerque), making Farmington an ideal interim connectivity end point for fiber expansion in the region until the longer-term fiber build to Denver can be completed.

A Map for Easier Understanding
The map for this Project in Part H depicts the proposed route for the route for which ABDG funding is sought, as well as the longer-term connectivity plan for this region. This will be the first ever long-haul fiber network to major internet access markets that has been built across the Navajo Nation. Moreover, all the routes in Arizona for Arcadian's middle mile network are conspicuously diverse from existing fiber routes within the State. A map illustrating Arcadian's planned middle mile network within the state of Arizona also is included in Part H of this application.

Fiber Networks Analogous to Highway Systems
As indicated on the maps noted above, the Navajo Arcadian Fiber Project offers new middle mile capacity in many remote markets and true bandwidth scalability and diversity in other markets. Arizona's broadband fiber infrastructure is like a highway system. Last mile service providers, both wired and wireless (like a town's streets and roads), connect all the households, businesses, and anchor institutions within and near to a community to one another. But that local network must ultimately be connected to the existing global internet backbone in sometimes distant major markets like Salt Lake City, Denver, Dallas, and Phoenix. If that connectivity to the backbone is not affordable and scalable, the services on those local networks will not be affordable and scalable, creating a digital divide.

The Interstates and Local Roads are Both Necessary
Arcadian's middle mile network is the multilane interstate highway that connects all these local community networks (serving the buildings and neighborhoods within the community) to the rest of the digital world. This Project will make it possible to connect:

1) the local fiber roadway systems that connect directly to the residences and businesses in rural and tribal communities directly to,

2) the global fiber backbone that exists in the major end point markets (Phoenix, Salt Lake City, Denver).

Ultimately, both local and interstate (middle mile) roadways are necessary to provide an affordable and scalable high-speed fiber network in a remote, smaller community. While the last mile fiber facilities ensure all end users have equal access to the local broadband network, Arcadian's middle mile interstate backbone is essential to ensure that these local networks have equal access to the existing internet backbone that each user is really accessing.

Local FTTH Investments Will Not Be Successful Without Associated Middle Mile Investments.
Last mile FTTH projects cannot be successful and historically have not been initiated due to the lack of access to affordable and scalable internet backbone services from the major markets where the internet backbone currently resides. Private investors and local network operators/service providers have not and will not undertake the significant investment required to build superfast local broadband networks that

then just hit a narrow bandwidth bottleneck at the town border where backbone connectivity is limited or unaffordable.

Without middle mile connectivity local broadband providers and their customers will have no reliable, scalable, affordable pathway to the worldwide internet that currently exists in the distant major markets. Arcadian is the first high-speed broadband network provider to build fiber optic infrastructure that passes through Northern Arizona's more rural and/or tribal regions and will be openly available to all buyers and service providers. As a result, the Navajo Arcadian Fiber Project will enable vital broadband access services to be provided by local, last mile service providers – and ultimately to Arizona's rural and tribal broadband end users.

Project Description and Timeline

Nature of the Improvements

Arcadian proposes to build fiber infrastructure that directly aligns with the Arizona Broadband Development Grant ("ABDG") policy goals of enabling affordable, scalable high speed broadband services through even remote Arizona communities. The Project is a 158-mile construction project to be built along the US 160 Right-of-Way ("ROW") and will span the Navajo Nation from Tuba City to the Arizona/New Mexico state line east of Teec Nos Pos. This middle mile network will continue through New Mexico to Farmington and ultimately become part of a larger Phoenix to Denver long haul fiber route providing services to businesses and rural and tribal communities along this larger Arcadian route. This middle mile network will consist of a network containing at least a 288-count fiber cable in one inner duct and six additional inner ducts to allow for decades of fiber capacity growth into the region. Arcadian's middle mile transport equipment is intended to support extremely large bandwidth applications (15.6 Terabyte capacity per fiber pair) for providing the international, regional and local carrier community with bandwidth that can then be utilized in each of those Arcadian customers' businesses and last mile providers to provide enhanced broadband services to communities along the Arcadian fiber route.

Arcadian's Commitment to the Broadband Needs of Rural Communities

The Navajo Arcadian Fiber Project will provide a long-term sustainable fiber solution essential for all local broadband services (whether wireless, wired or through any future technology). This long-term commercial and technical sustainability is a result of:

- An underlying economically sustainable commercial business that will fund the millions of dollars of annual costs to maintain this network after construction,
- Having users of this network who include the largest, best funded technology companies on the planet who provide advanced broadband and IT services,
- A policy of non-discriminatory sales and access to Arcadian's customer base that is hard-wired into its business plan as an infrastructure provider, who makes money only by selling to all service providers rather than as a service provider who may have conflicting business priorities when selling to competing service providers,
- A customer driver requirement that Arcadian have direct operational and physical control over the fiber facilities to ensure the resulting network solutions can meet stringent service quality requirements imposed on it by its key customers.

As a result, the Arcadian business model requires that Arcadian itself design, construct, own and have direct operational control over the Arcadian long-haul fiber backbone routes. Consequently, Arcadian will create a stable and sustainable network that will focus on delivering the middle mile infrastructure

necessary to enable public and private operators to deliver innovative last mile networks throughout Navajo tribal and other rural communities at affordable rates.

Non-Discriminatory Access At Over 210 Locations
Arcadian will provide extensive access to the Project's fibers at 209 handholes within Arizona on this route as well as at the four equipment huts installed along the US 160 corridor within the state. Arcadian's readily accessible middle mile broadband network will enable opportunities for last mile service providers to offer broadband services in unserved tribal and rural communities that either completely lack qualified broadband service or lack in a choice of affordable, scalable, reliable services.

Population/Households to be Served

The 158-mile route for the Navajo Arcadian Fiber Project lies within the US 160 ROW and cuts across the state from the intersection of US Highways 89 and 160 at Tuba City to the Arizona/New Mexico state line east of Teec Nos Pos. This route consists of areas within Coconino, Navajo and Apache counties. Engineering for this route has already begun and was funded by Arcadian. The proposed route includes installation of conduit within eight possible census tracts, as specified in Part H of this application.

Project Provides Robust Access Where No Qualified Broadband Service Is Currently Available
Utilizing NTIA's Indicators of Broadband Need Map, *not even one* of these eight census tracts have qualified (25/3) broadband service as recorded by the Ookla Speedtest Median, corroborating the acute need for broadband connectivity from the Navajo Nation to the rest of the world. NTIA's Indicators of Broadband Need Map records the 2019 Census Tract Data total population for these eight census tracts as 32,955. Arcadian's Navajo Nation middle mile route touches at least five cities and towns as well as a few populated places (for which demographic data is not available). The 2021 data from the Arizona Gazetteer indicates population within these cities and towns (not including the populated places) is 16,883 with the number of households recorded as 4,483[1]. The exact number of businesses and anchor institutions within this area is unknown. However, it should be noted that, as this Project proposes middle mile infrastructure, the serving area is not limited merely to the cities, towns, and populated places along the route. In fact, this Project may provide high-speed broadband service to any Arizona resident anywhere along the route where a provider interconnects with the Arcadian fiber route. This includes not only the residents within the Navajo Nation but also members of the Hopi Tribe.

Anticipated Economic Development Benefits Achieved by Completion of the Project

Rural and tribal communities were bypassed during the long-haul fiber route builds that occurred in the late 1990's and early 2000's. Connecting those communities was too costly, took too long to build or represented too small of a market to serve. Completion of the Navajo Arcadian Fiber Project will enable accessible, reliable and affordable broadband service to these communities and will also generate positive social and economic impact to community residents. Broadband unlocks barriers to communication and creates access to knowledge. Middle mile fiber is the most basic building block that empowers these communities. Any community without reliable middle mile connectivity remains digitally isolated from the rest of the world.

From an economic development perspective, the Project will be a game changer for the future of the bypassed Navajo tribal and other rural communities. Recognized economic and social impacts of the Project are noted below. None of these capabilities are currently possible since current local fiber network

[1] Population and household data includes the cities/towns of Tuba City, Red Lake/Tonalea, Kayenta, Dennehotso and Teec Nos Pos.

investments have not been made, in part, due to the lack of affordable middle mile connectivity to the more affordable internet access services available only in major markets where the global core internet access backbone services exist.

- Cash and Broadband Enabling Assets for Navajo Nation. Under the Navajo enabling Project legislation, Number 0185-20, Arcadian will provide to the Navajo Nation:
    - [redacted]
    - Dedicated dark fibers and collocation on Arcadian routes within the Nation to enable and accelerate local Navajo broadband network, at no cost, and
    - Two terabits of connections to global interconnection cities for backhaul of Navajo broadband services, at no cost.
- Enabling Affordable High-Speed Broadband. Arcadian's core commercial business includes offering access to its network to last mile providers. Because the location of Arcadian middle mile infrastructure uniquely spans more sparsely populated areas, the proximity of this route to previously unserved tribal communities will provide more affordable access to high-speed broadband for any last mile provider, which in turn will facilitate more affordable broadband service to end user consumers.
- Enabling Remote Work-From-Home Capabilities. Direct broadband backbone access for a community offers its residents the ability to work-from-home or to work remotely allowing higher paying jobs with companies that are remote from the Nation.
- Enabling Home-Based Business and Entrepreneurship. Access to affordable, scalable broadband allows uninterrupted service for small business owners and can drive further entrepreneurship within tribal communities. Broadband accessible communities are more likely to start and operate small businesses as primary or secondary income.
- Enabling Remote Learning Capabilities. During the height of the pandemic, students were mandated to participate in a total online curriculum. While this was a temporary solution to an emergency situation, new access, increased speed, capacity and reliability will provide higher quality distance learning opportunities for students even after the end of these emergency conditions, permanently enabling engaged, immersive learning. Parents also will have the ability to access instructional resources as well as the ability to digitally monitor and engage with their students' progress. Aside from elementary and secondary education and degree-earning programs, high-speed broadband access will facilitate workforce development for training and certification courses.
- Enabling Enhanced Telemedicine Capabilities. Telehealth requires adequate service capabilities for both providers and patients. Affordable, scalable, reliable broadband services will provide both healthcare providers and patients uninterrupted access to one another and will nurture telehealth engagement within tribal communities, lessening public and individual exposure to illnesses and easing patient comfort under remote care.
- Enabling Improved Public Safety/911. Dispatchers and first responders in currently unconnected communities will be able to coordinate responsiveness faster and more reliably. Local governments will have the ability to transmit essential information to community members with the understanding that the messages are more likely to be received. This has the potential to directly impact lifesaving and disaster prevention measures.

Physical Description of the Project

As noted above, the portion of the Project to be funded in this application is comprised of 158 miles with a minimum 288-count fiber optic cable positioned along the US 160 ROW. All 158 miles are within the Navajo Nation (150 miles underground and 8 miles aerial – as dictated by geographic conditions). The 150 miles of underground construction consists of one two-inch conduit containing seven smaller innerducts, placed at a depth up to 36 inches. This underground fiber infrastructure facility can ultimately support 3,000+ fiber strands and is configured to allow installation of advanced, future fiber technologies that may emerge over the 40 to 60 year lifecycle of the facility.

There are four planned optical equipment hut ("ILA" or "regen") sites along the route:

- Near Tuba City at the intersection of US Highways 89 and 160;
- Near Shonto and the intersection of US Highways 160 and 98;
- Near Dennehotso; and
- In Teec Nos Pos, near the intersection of US 160 and US Highway 64.

Each ILA site will be located on a lot varying between one-quarter acre and one acre in size and will house Arcadian optical equipment to power the fiber route and provide convenient access points for local providers. For installation of the conduit and fiber, Arcadian will be required to obtain permits and/or easements from Bureau of Indian Affairs ("BIA")-Navajo, BIA-Southwest for Hopi and Navajo Allottees through BIA. To the extent any environmental, biological and cultural studies are required, Arcadian will engage contractors to complete the studies and submit such studies to the appropriate local, state and federal agencies for review. Where terrain or environmental/cultural concerns will not allow placement, the conduit will be routed around the conflict to ensure no negative impacts are created.

Arcadian's Commitment

As set forth above, the Arcadian business model requires that Arcadian itself design, construct, own and have direct operational control over the Arcadian long-haul fiber backbone routes. Arcadian hereby commits to the ACA that it will operate and maintain its Navajo Nation middle mile network for a minimum of five years upon completion of the improvements proposed under this Project. The Arcadian business model is based on a network economic lifecycle of up to 40 to 60 years.

Infrastructure Construction

Arcadian will initiate a competitive bidding process for the construction of the physical infrastructure for the Navajo Arcadian Fiber Project. Only qualified, licensed and bonded contractors will be considered, and all construction will be accomplished in accordance with all applicable Federal, State, local and Tribal laws and regulations. All construction performed by the winning contractor will take place under the supervision and direction of Arcadian.

Intended Use of ABDG Rural Funds

Arcadian intends to use any ABDG rural funds awarded as reimbursement for [redacted] of the total qualifying cost of materials, engineering and construction costs for the Project. The budget details for these and all other elements of the Navajo Arcadian Fiber Project are provided in Part D.

Timeline for Completion of the Project

Provided below is a graphic representation of the activities of and estimated timelines/milestones for the Navajo Arcadian Fiber Project from the route planning, which is currently in the process, to the completion of the Project and deployment of the operational network. As illustrated on this timeline, many of the activities will be performed concurrently. Even given the complexity and scale of the Project, the date that Arcadian's broadband network is estimated to become operational will be within eight quarters or

24 months after route kickoff, pending award of funding and commercial viability. In addition, a Gantt chart timeline (using July 1, 2022 as the estimated start date) for the development of this Project is provided as Appendix 1 to this application.

Navajo Arcadian Fiber Project (US-160)

[redacted]

Cash Match Contribution

The full cost of the Phoenix to Denver build is estimated to exceed [redacted], and the estimated cost for the Tuba City to Farmington, New Mexico build is [redacted], with the cost of the 158 route miles of the Navajo Arcadian Fiber Project in Arizona estimated at [redacted]. If awarded ABDG funding of [redacted], Arcadian can immediately commence final engineering and permitting process (estimated to take 12 to 16 months given the complexities of this route). Arcadian can start construction of this route only after completion of those Navajo and BIA final approval processes plus reaching a point of financial viability to fund the remaining construction costs based on commercial customer interest (which will be very limited until the Wolf Creek Pass fiber project is completed) plus the availability of other non-commercial funding sources such as additional grants which grant opportunities are numerous. Arcadian expects to work cooperatively on multiple Tribal and non-tribal grant submissions to close that funding gap and is already in discussions with multiple grant partners to that end. Arcadian has already submitted two significant grant applications to the NTIA with other tribal partners for other portions of the Arcadian network.

Project Description and Timeline – Development

Nature and Scope of the Project

Arcadian proposes to build fiber infrastructure that directly aligns with the Arizona Broadband Development Grant policy goal – to help Arizona communities establish and accelerate the enhancement

of broadband infrastructure that strengthens their capacity and competitiveness for economic growth and thereby ultimately improves economic conditions and quality of life in rural/tribal Arizona. The Navajo Arcadian Fiber Project is a 158-mile construction project to be built along the US 160 ROW and will provide access to high-speed broadband services to residents of the Navajo Nation from Tuba City to the Arizona/New Mexico border east of Teec Nos Pos. Route details are as follows: beginning at the Tuba City ILA facility at the intersection of US Highways 69 and 160, proceeding east on US 160 for 158 miles to the New Mexico state line. This middle mile network will continue to Farmington, New Mexico and eventually become part of a larger Phoenix to Denver long haul fiber route providing services to businesses and rural and tribal communities along this larger Arcadian route. This middle mile network will consist of a network containing at least a 288-count fiber cable, which will assure these communities of quality, high-speed broadband services for the foreseeable future.

In addition, Arcadian will provide full end-to-end project management services for the final design, engineering, rights of way acquisition, inspection and construction of the middle mile infrastructure facilities that will connect the local end user service providers to the existing internet backbone.

Technology Utilized

There are many advantages associated with a fiber network, beginning with its reliability, scalability and flexibility. While the "core" of fiber optic cable has not changed over the years, new technology in the manufacturing processes has driven the size and weight of the cable down dramatically. These manufacturing changes mean that Arcadian can install higher fiber count cables in the same size inner ducts and conduits, allowing more capacity to be installed in the Project over the multi-decade lifetime of the Project.

Signals are transmitted across fiber by 'lighting' the fiber with lasers on both ends of the fiber. These lasers use multiple colors of light to multiply the capacity of each fiber strand through dense wavelength-division multiplexing ("DWDM"). Arcadian intends to use 400 gigabit wavelength (or higher) equipment in its network.

This technology allows the Arcadian middle mile transport equipment to support extremely large bandwidth applications (15.6 Terabyte capacity per pair) for providing the international, regional and local carrier community with bandwidth. This bandwidth can then be utilized in each of those Arcadian customers' businesses and last mile providers to provide enhanced broadband services to communities along the Arcadian fiber route. This infrastructure will be capable of serving end users at advertised broadband speeds in excess of 100 Mbps download and 100 Mbps upload - but is entirely dependent upon a local service provider's local fiber network capability and not upon Arcadian's big pipe capacities. Arcadian has the capacity to deliver as much bandwidth as that local provider can consume.

Method of Construction Undertaken

As set forth above, approximately 95% - or 150 miles - of the Project's infrastructure will be installed underground. The precise method utilized for each mile of the underground installation placed along the Navajo Arcadian Fiber Project route is itemized as follows:

- 24 miles will be constructed through simple underground trenching;
- 31 miles will be constructed through underground boring;
- 91 miles will be constructed through plowing;
- 3 miles will be constructed through various complex underground construction techniques used in metropolitan areas; and
- An aggregate of 1 mile of construction will be through specialty crossing techniques for bridge crossings, interstates, river and gorge crossings and tunnels.

While all buried fiber infrastructure builds are inherently expensive, the rocky landscape in this region creates an especially challenging build environment. As a result, of the 150 underground miles described herein, 52 of these miles require very expensive rock boring techniques. Underground conduit will be placed up to a depth of 36 inches along the right of way. To the extent environmental, biological and cultural studies are required, Arcadian will complete the studies and submit such studies to the appropriate local, state and federal agencies for review. Up to eight miles of Arcadian's infrastructure may be aerial construction, and half of the budgeted aerial plant will be on newly placed poles and the other half on existing pole lines. The environmental impact for placement of cable on aerial plant is minimal.

Qualifications of Vendors/Contractors

As set forth above, Arcadian will conduct a competitive bidding process for a qualified construction contractor for the Navajo Arcadian Fiber Project. Arcadian only entertains bids from qualified vendors that have the experience with comparable projects and are of an appropriate size to handle the work. Our contractors must offer quality turnkey services and demonstrate a commitment to safety.

Engineering Analysis

The engineering analysis is completed in stages, beginning with a high level "desktop" review of the route. This desktop review consists of mapping tools and online research to determine the most efficient route to construct and includes estimated average costs for the route to determine the scope of the project. After this initial step, further reviews and analysis will include a physical survey of the route (ride out), which further identifies problem areas that must be worked around and will result in a more well-defined cost estimate. For this Project, Arcadian has completed all of this work up and through the ride-out activities. The final engineering analysis is the full detailed Outside Plant ("OSP") design of the route, which defines the precise location within the right-of-way in which conduit and cable will be placed (i.e. – "5 feet from the back of the right of way"), resulting in permittable designs to be submitted to permitting agencies for construction.

Project Approach

Arcadian will approach this project in an aggressive manner to ensure rapid completion (within 24 months from financial viability to full completion). This is done by performing various tasks simultaneously to shorten the full schedule of construction.

Whereas a standard method of implementation is to work in a linear fashion (e.g., engineering work is complete before right of way acquisition is undertaken, and construction is not started until a significant portion of the permits are in hand for a route), Arcadian will perform ROW acquisition and engineering simultaneously, will secure permits for construction as manageable spans are ready and begin construction when permits and ROW are secured for large spans of the route, subject to project financial feasibility. This presents an opportunity, with detailed planning efforts leading the way, to be placing conduit and fiber on the route before all permits are secured, knowing that permits will be received on planned dates. This project approach also allows Arcadian to turn up smaller spans of the route as they are ready, providing connectivity to those nearby communities along the route earlier, thus relieving some of the broadband availability struggles for those communities prior to full completion of the Project.

Background of Project

In 2017, the Navajo Nation was informed the Navajo Generating Station ("NGS") coal-fired power plant on their land would be closing in 2019. NGS represented a significant portion of Navajo gross domestic product ("GDP") and provided employment for an estimated 3,000 workers. The loss for the Navajo Nation would be tremendous. Representatives of the Navajo Nation approached the founders of Arcadian Infracom about a unique partnership possibility. Arcadian began quietly working with the Navajo Nation

to develop a plan to bring fiber to and through their nation to support the Navajo goals of economic development, expanding access to modern online educational opportunities, and providing greater access to healthcare through telemedicine that is possible only with robust fiber connectivity. In 2018, and again in 2020, Navajo legislation was passed solidifying the Arcadian partnership with the Navajo Nation allowing Arcadian access to unique rights-of-way across Navajo land. As part of the resolution, the Navajo Nation will obtain a pro-rata gross percentage of the revenue that the new fiber network will generate. This revenue-sharing can help to offset the closure of the NGS.

Population/Households to be Served

As set forth in this section above on page 4 of this narrative, the total population for the census tracts touched by the Project is 32,955, based on NTIA's Indicators of Broadband Need Map, the 2019 Census Tract Data. Arcadian's Navajo Nation middle mile route touches at least five cities and towns as well as a few populated places, and the 2021 data from the Arizona Gazetteer indicates population within these cities and towns (not including the populated places) is 16,883 with the number of households recorded as 4,483. The exact number of businesses and anchor institutions within this area is unknown. However, it should be noted that, as this Project proposes middle mile infrastructure, the serving area is not limited merely to the cities, towns, census tracts or even counties included in the route. In fact, this Project will provide high-speed broadband service to any Arizona resident in a community that connects to the Arcadian network.

Redundancy, Reliability and Sustainability

Creating multiple fiber paths between end points on a fiber network is a way of putting failover redundancy into a network. Fiber cuts (even of underground fiber) does occur despite best efforts of providers to patrol their routes and prevent third party damage to the network. By adding multiple fiber paths between major market end points which are geographically distant from each other, customer networks experience higher 'up-times' and users experience fewer service outages that can occur when a fiber route is damaged. This Project creates a diverse connectivity pathway back to the major market internet access points for any broadband provider using Arcadian's network. Arcadian's fiber facilities and the physical diversity from existing or other soon-to-be constructed fiber routes that will be used by Arcadian customers will offer a reliable network with long-term technical and economic sustainability.

The broadband infrastructure proposed by the Navajo Arcadian Fiber Project should have a lifetime of economic impact, exceeding 40 and perhaps 60 years, depending upon future technology innovations. However, the concept of project sustainability involves more than life cycle. A sustainable project should: minimize the impact on the environment; support social development; and ensure the business remains profitable.

As noted in a previous section, this Project will have a minimal effect on the environment, since nearly all of the fiber infrastructure will be installed along existing roadway rights of way. As described above, improved social and economic opportunities will be a byproduct of the newly enabled broadband access along the Arcadian fiber routes, where currently households and businesses have limited or no access at all. Finally, given that Arcadian commits to own, operate and maintain its Navajo Nation middle mile network for a period of at least five years (and more likely across multiple decades), Arcadian has the ability to ensure its network facilities remains a positive economic force within the communities located along its routes.

Part H

CENSUS TRACTS AND MAPS

1 Census Tract Data

2 Navajo Arcadian Fiber Project (US 160) Route – Arizona Only

3 US 160 Extended Route

4 Overview of Navajo Arcadian Fiber Routes – Arizona Only

5 Overview of Arcadian Extended Routes

Census Tract	County	State	POP 2019	Ookla Speedtest Median	
				Download	Upload
4005944900	Coconino	AZ	4690	4.8	1.6
4005945100	Coconino	AZ	4793	6.8	1.9
4005942201	Coconino	AZ	5087	7.4	1.9
4017942300	Navajo	AZ	2686	8.1	2.2
4017942400	Navajo	AZ	2910	7	2
4017942500	Navajo	AZ	5218	6.5	1.6
4001942600	Apache	AZ	1690	6.2	2
4001942700	Apache	AZ	5881	7.1	2
			32955		