Attachment A-4

Project name: Chambers County Community Broadband Project
Legal name of entity: Roanoke Telephone Company, Inc.
Mailing address: 236 East Capitol St, Jackson, MS 39201
Name and title of CEO: James Garner, Vice President of Operations
Grant Contact: Lisa Wigington, Vice President of Strategic Operations
Phone: 601-354-9070 Email: LisaW@TEC.com
Autonomous System Number: 17253
List Internet Exchange Membership: Digital Realty Atlanta and Equinix Chicago
PeeringDB entries: https://www.peeringdb.com/asn/17253

Preliminary Technical Evaluation by Certified Engineer
System Design and Cost Estimate

A detailed description of the existing network: TEC has been meeting the communication needs of the rural south since 1923. Roanoke Telephone Company, Inc. (RTC) is a wholly-owned subsidiary of TEC and has provided voice service since 1951 and internet service since 1995. Currently, RTC serves voice to 2,231 customers in its certificated area and internet service to 2,013 customers in Randolph and Chambers counties, AL and has made broadband available to over 98% of the approximately 160 square miles of the incumbent ILEC service area. Currently, RTC passes approximately 10,675 locations with broadband service in Randolph and Chambers counties in Alabama. With RTC's highly skilled and experienced customer care and technical staff of 11 employees located in Roanoke, AL, the company is positioned to give superior service to customers and has the tier two support from the TEC corporate office located in Jackson, MS for design and construction of fiber plant and maintenance of the network.

Standards based, RUS approved, technology is used, and the network has been constructed using RUS standard construction practices. RTC currently has 31 remote concentrators (Adtran TA5000) positioned throughout its network, which are served as fiber to the node (FTTN). Approximately 70% of the cable plant is copper. Utilizing ADSL2+ and VDSL technology in the remotes, this copper plant is being bonded to provide 25.0/3.0 broadband service up to 8,000 feet of the remote concentrators. Each serving remote has been constructed with carrier grade DC power plants and batteries with at least 8 hours of backup in the event of a long-term power outage. All sites are monitored by remote alarm systems and alarms are responded to 24X7 by on-call and network operations center (NOC) personnel. If the commercial power were to be affected for an even longer period, TEC can provide longer-term temporary power via fixed or portable generators as necessary. A detailed disaster recovery plan is on file and updated annually.

Approximately 30% of the cable is fiber and provides the fiber to the home network design. The equipment strategy for any expansion project is to leverage existing fiber as much as possible to deploy a Gigabit Passive Optical Network (GPON) Fiber to the Home (FTTH) solution using the

Adtran TA5000 platform. Customers served by a GPON connection will have a 2.4Gbps/1.2Gbps GPON connection from the Optical Network Terminal (ONT) at their home through distributed 1:32 optical splitters to the serving remote Optical Line Terminal (OLT). The Roanoke Community Project will not require upgrades to the existing network, but will be an extension of that network utilizing the FTTH network design described here.

This GPON capacity will easily scale to provide Gigabit service for these customers. However, if more bandwidth were to be required, NG-PON2 or XGS-PON at 10Gbps or Point to Point 10Gbps connections or higher could be deployed on an as-needed basis over the proposed Fiber optic cable. Latency within the proposed Adtran FTTH equipment ranges from microseconds to around 3-5ms, depending on location.

A centralized network operations center (NOC) is located in Jackson, MS and operated by another wholly owned subsidiary (LecNet, Inc.) of RTC's parent company, Telephone Electronics Corporation (TEC) and has multiple 10 GB redundant transport routes from the company to the NOC. LecNet's Internet peering connections and routers are monitored by the NOC personnel and three upstream providers, Cogent, CenturyLink and AT&T, to ensure redundancy and adequate bandwidth and IP addresses are available to our broadband customers. LecNet also peers at 350 East Cermak (Chicago) and 56 Marietta (Atlanta) via multiple CSpire 10 Gbps transit links. Additionally, LecNet hosts Netflix, Google and Akimai caching servers at the NOC in order to minimize streaming congestion on the network. In total, LecNet has 50 Gbps of internet transport and transit bandwidth, with the ability to scale it higher as bandwidth usage grows. This network facilitates excellent response times across the network with minimal latency. Overall latency from LecNet's network edge to our Internet peering locations is typically well below 20ms.

A detailed description of the proposed network: The equipment strategy for this expansion project is to leverage existing fiber to deploy a Gigabit Passive Optical Network (GPON) Fiber to the Home (FTTH) solution using the Adtran TA5000 platform. Customers served by a GPON connection will have a 2.4Gbps/1.2Gbps GPON connection from the Optical Network Terminal (ONT) at their home through multiple distributed 1:32 optical splitters to the serving remote Optical Line Terminal (OLT). The Roanoke Community Project will not require upgrades to the existing network but will be an extension of that network utilizing the FTTH network design described here. This GPON capacity will easily scale to provide Gigabit service for these customers. However, if more bandwidth were to be required, NG-PON2 or XGS-PON at 10 Gbps or Point to Point 10 Gbps connections or higher could be deployed on an as-needed basis over the proposed Fiber optic cable. Latency within the proposed Adtran FTTH equipment ranges from microseconds to around 3-5ms, depending on location.

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The proposed plan is to connect to the fiber Office located on CR 286 and build .4 miles to reach the PFSA as unfunded. The funded area will begin at the intersection of CR 286 and CR 266 and 8.3 miles of core fiber will be constructed to serve all of the locations inside the shaded serving area. An OLT will be installed in an existing remote office location to feed the PFSA and an LCP cabinet and two distributed 1:32 pole mounted optical splitters have been planned to be placed strategically in the proposed funded service area to ensure scalability. This proposed design will deploy single mode fiber optic cables constructed utilizing RUS approved construction techniques. All the fiber will be buried and placed in existing previously disturbed public rights-of-ways. To provide a more secure reliable fiber footprint all the buried fiber will be placed at a minimum depth of 36 inches unless other depths are required by the affected highway, railroad, municipalities or other authorities. The two methods of buried construction that will be utilized are predominately plowing with directional boring utilized when road or stream or other types of crossings are required. Directional boring will also be utilized when it is not possible to plow or boring is more feasible construction. Along the buried fiber route, flush-mounted handholes will be deployed with the proposed fiber being accessible at each location. This will allow for easy access to the network and makes future expansions more economical and feasible.

OSP contractors will complete RUS bidder qualification forms and be cleared by engineering to have experience with RUS standards of construction and will construct the middle mile construction. All activity will be supervised by resident engineers and inspectors from Joseph D. Fail Engineering Company (JDFEC), a licensed engineer, a member of ACE, with over 50 years of experience with RUS projects. JDFEC has also reviewed the network diagram and system plan and approved the project.

At the completion of distribution fiber construction, RTC technicians will install the OLT and LCP cabinet. The service will be marketed during the core fiber construction and as the service is sold, local outside plant employees or contractors will bury the drop fiber and install the CPE to turn up the customers. The estimated number of establishments to be served following the distribution fiber build is estimated based on the internet take rate average in rural America, which is 63% per the study released by Pew research' "Digital gap between rural and nonrural America persists", published May 19, 2017. Per the E911 addresses, the establishments passed will be 152 and using a 63% take rate will calculate to be 96. Every household and business within the PFSA will be offered broadband service at 250.0/250.0 or more when the system is complete. The distribution fiber build has been carefully planned to follow the county roads to cover all existing locations and two handholes have been planned every mile with slack fiber to allow for future growth. The LCP cabinet and distributed splitters ensure the fiber scalability for growth or expansion as needed.

The PFSA will be built for up to a Gigabit offering and will not be oversubscribed at all based on the minimum required offering of 50.0/5.0 per user. Standard GPON technology will have virtually no link loss. All systems will maintain a redundant failover to maintain a high state of system availability.

Roanoke Telephone Company, Inc.

Chambers County Community Broadband Project

Project Budget-Total Budget for Project

BUDGET	No. of Units	Unit cost	Total	Grant	Cash	Allocation of Engineering	Total by Account	Description
BROADBAND SYSTEM								**Note:** These items are general in nature, applicants should modify as required to describe their specific project.
Electronic Equipment (FTTH)	1	7,500.00	7,500.00	2,625.00	4,875.00	1,299.52	8,799.52	Optical Line Terminal (OLT)
Electronic Equipment (FTTH)	2	750.00	1,500.00	525.00	975.00	259.90	1,759.90	Pole mounted 1:32 Distributed Optical Splitters (units distributed)
Electronic Equipment (FTTH)	1	7,500.00	7,500.00	2,625.00	4,875.00	1,299.52	8,799.52	288 port LCP Cabinet mounted on a on a pole and loaded with fiber tails with connectors
Electronic Equipment (FTTH)	96	375.00	36,000.00	12,600.00	23,400.00	6,237.68	42,237.68	Includes an Optical Network Terminal (ONT), Fiber NID and Uninterrupted Power Source (UPS)
Outside plant (fiber) - Distribution fiber	8.3	41,000.00	340,300.00	119,105.00	221,195.00	58,963.39	399,263.39	Proposing 96 and 144 count fiber of buried/plowed, bored or aerial fiber (unit cost includes fiber, fiber pedestals, and handholes with slack fiber and cost of contractor for direct bury or boring as needed, as well as, a contingency to go aerial in spans that cannot be feasibly plowed).
Customer premises equipment	96	125.00	12,000.00	4,200.00	7,800.00		12,000.00	CPE includes a Smart RG Modem
Outside plant (fiber) - Drop fiber	96	825.00	79,200.00	27,720.00	51,480.00		79,200.00	Drop assumes an average of 550 feet from the road to the home or business and the slack box mounted (fiber and labor price)
Contingency (add to Construction)			0.00	-	0.00			Contingency on fiber and contractor pricing, as well as, hiring contract labor to complete all installations
Buildings – new construction			0.00	-				
Collocation Costs			0.00	-				
Site preparation			0.00	-				
Engineering			68,060.00	23,821.00	44,239.00			Includes staking, right-of-way permits, contractor negotiation, onsite resident engineer for project, cut sheets and testing
Total Broadband System in Application			**552,060.00**	**193,221.00**	**358,839.00**	**68,060.00**	**552,060.00**	
Per application guide round up to the nearest $1000								
Percentage				**35.0%**	**65.0%**			
Broadband System			552,060.00	193,221.00	358,839.00			
			392,800.00	193,221.00	358,839.00		-	
				Allocation of Engineering Summarized				
				Electronics		9,096.61	61,596.61	
				Outside Plant		58,963.39	478,463.39	
				CPE		0.00	12,000.00	
						68,060.00	552,060.00	
				0.35				

Roanoke Telephone Company, Inc.

Chambers County Community Broadband Project

Construction Build-out And Project Milestones

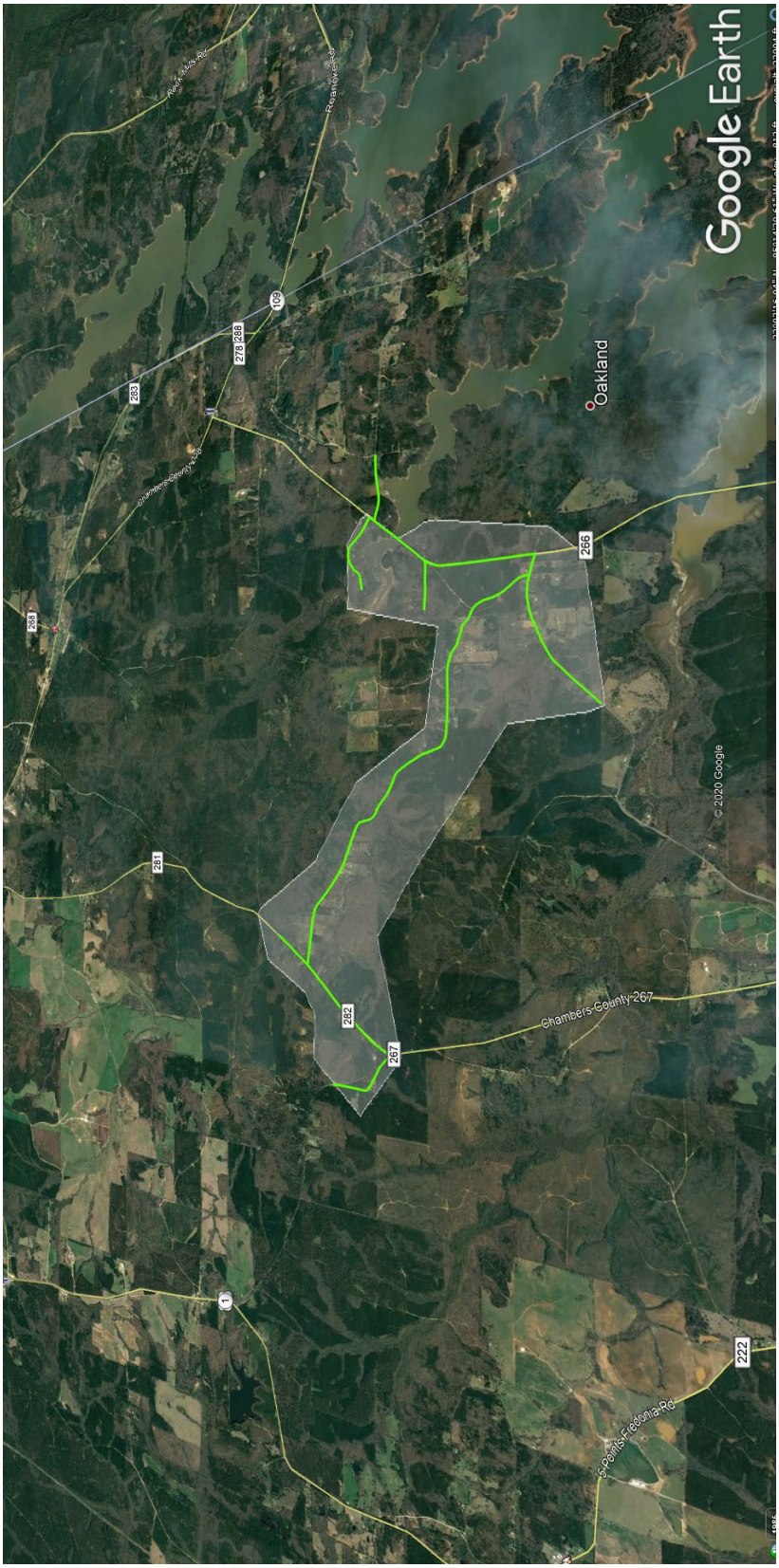
Project Objectives and Activities	Year 1 - 2021				Year 2 - 2022			
	Qtr. 1	Qtr. 2	Qtr. 3	Qtr. 4	Qtr. 1	Qtr. 2	Qtr. 3	Qtr. 4
Begin project on April 1, 2021 (estimated date)		X						
Staking and Engineering Design by JDFEC Engineering Company		X						
TEC orders network equipment and JDFEC Engineering completes Contracts for bid with Contractor		X						
Contractor - Direct bury, string aerial and/or bore core fiber			X	X				
Contractor - Buries drops to all active subscribers and pre-sold locations				X	X	X		
TEC runs a marketing campaign "fiber is coming to "X Community"			X	X	X	X		
Splicing and testing (JDFEC, Contractor and TEC) at completion of each PSA				X				
TEC or Contractor installs CPE for locations requesting service (after drop is completed by contractor)				X	X	X		
Project Complete						X		

Datapoints for Milestones:	Miles	Days	Months (if 18 viable staking days)		Total Estimated Staking Months
Staking and Design	8.7	3.48	0.19		0.19
Assume 18 viable staking days in a month considering weather					
Two man crew stakes 2.5 miles per day					
Design - 30 days					1.00
Contract and bid package - 15 days					0.50
Estimate for Engineering Staking, Design and Bid Package/Contract Completion - Months					**2.00**

	Miles	Days	Months (if 18 viable construction days)	Testing and Splicing in Months	Total Estimated Construction Months for Core Fiber Build
Contractor Core Fiber Build	8.7	17.4	0.97	0.5	1.47
Assume 18 viable construction days in a month considering weather					
For one crew:					
Aerial elash 1 mile per day					
Aerial placing strand and lashing ½ mile per day					
Plowing ½ mile per day					
Boring 1500' per day					
These are all best case scenarios. Soil conditions and terrain and length of bores can affect the production.					
Add two weeks on average for splicing and testing.					
This does not include rock. There are too many variables to consider. We've had a crew spend two days on one bore before.					
			Fiber Drops	**Days**	**Months**
Contractor drop construction					
Estimated 5 drops per day barring rock or if a bore is required			96	19.20	
Assume 18 viable construction days in a month considering weather					1.07
Estimate Total Time for Construction by Contractor					**3.00**
Installation of CPE and Turn Up of Customers			**Customers**	**Weeks**	**Months**
Estimate installers can turn up 20 customers per week;			96	4.80	
Estimate in months for local installers to turn up customers					**2.00**
Total Timeline in Months					**7.00**

Note: Assumptions include building the core fiber for the unfunded area at the same time as the funded, drops and cpe for unfunded will be scheduled with RTC labor and is not in the timeline.

Image of Proposed Service Area



Professional Engineer Certification

I the undersigned, certify that the proposed project, "Chambers County Community Broadband Project", will work as described in the foregoing Technical Evaluation, and can deliver the proposed services outlined in the Service Tier section to all premises in the proposed service area(s). The project cost estimate and schedule are typical and customary for the proposed service area(s). Moreover, the proposed system can meet the proposed timeline and major project milestones and be completed within the two years.

February 3, 2021

(Date)

(Certifying Engineer's Signature)

Roy Glenn

Name (Printed)

Professional Engineer

Title

Joseph D. Fail Engineering Company

Company

Registration Number: 14545-E

State of Registration: AL