

NUSF-131 2022 Reverse Auction Pre-Auction Application Form

Section I: Applicant Details

1. Applicant/Entity name:	
2. Applicant NE Code:	
3. NETC Status: NOTE: Post auction, winning bidders must pursue any ETC application/amendment process that may need to be completed prior to support authorization.	
4. Applicant address:	
4a. Applicant city:	
4b. Applicant state:	
4c. Applicant zip code:	
5. Applicant contact (first and last name):	
6. Applicant e-mail:	
7. Applicant phone number:	
8. Legal representative name (must be an attorney licensed to practice law in Nebraska):	
9. Legal representative e-mail:	
10. Legal representative phone number:	

Section II: Bidding Details

11. Indicate the speed tier or tiers in which applicant intends to bid, and the proposed technology for the respective speed tier. Technologies other than fiber to the premise need to provide supporting documentation, including speed tests, proving that the technology can meet the required speed thresholds:

A. Baseline: $\geq 100/100$ Mbps; - Low Latency (≤ 100 ms)	Yes	No
Technology for Baseline tier		
B. Gigabit ≥ 1 Gbps/500 Mbps; - Low Latency (≤ 100 ms)	Yes	No
Technology for Gigabit tier		

12. Please provide the names and email addresses of the bidders authorized to bid (up to 3 bidders per applicant/entity allowed):

	Name of Bidder (Last, First)	E-mail Address
Authorized Bidder 1:		
Authorized Bidder 2:		
Authorized Bidder 3:		

Attach/Include:

Please label attachments as follows: “[Applicant Name]_[Attachment Letter].” If it is necessary to submit multiple attachments under one attachment letter category, label the attachments to identify the separate attachments. Ex. “[Applicant Name]_[Attachment Letter]_1”, “[Applicant Name]_[Attachment Letter]_2”, etc.

- Technical Capability: Attach a detailed network proposal in addition to documents showing a demonstrated history of at least two (2) years of service at the speeds for which the applicant proposes to bid and with the technology to be used to complete the proposed deployment. (Attachment Letter: A)
- Financial Capacity: Attach documentation of financial information showing the applicant’s financial capability to bid on the proposed service areas. This should include audited financial statements along with an opinion letter when the applicant or its parent company are audited in the ordinary course of business. If the company is not audited in the ordinary course of business, unaudited financial statements from the prior fiscal year must be provided. If unaudited financial statements are provided with the pre-auction application, the applicant must also provide a statement certifying that if it is identified as a winning bidder, the audited financial statements and opinion letter will be provided with the post-auction commitment form. (Attachment Letter: B)
- Operational Capacity: Provide subscribership information for an existing network that currently provides the speeds in which the applicant intends to bid are currently being offered to customers. This information is required to demonstrate the ability of the applicant to run a successful broadband operation and serve its customers. Applicant should identify existing services in Nebraska, and the number of customers that subscribe to their services, separated by exchange. (Attachment Letter: C)
- The proposed Lifeline service plans of the applicant. (Attachment Letter: D)
- Information relative to whether the applicant participates in the FCC’s Affordable Connectivity Program (formerly Emergency Broadband Benefit Program) and how that participation may impact proposed service offerings to subscribers in auctioned areas. (Attachment Letter: E)
- Applications proposing to use technology other than fiber or proposing to use a combination of fiber and other technologies, must include an attestation from a qualified engineer describing the speed capabilities of the proposed technology, as well as speed test data from existing deployments that support the capability claim. (Attachment Letter: F)
- Attach documentation with details of the standalone voice plan and service plan currently offered by the application that provides broadband at the relevant performance tier and latency requirements at rates that are reasonably comparable to rates offered in urban areas. (Attachment Letter: G)

APPLICANT CERTIFICATION: By signing this statement, the applicant certifies that the information submitted on the application and all supporting documents are true and correct. The applicant agrees to refrain from any discussion of eligible areas, bids, bidding strategies, or agreements to bid or not bid on eligible areas with other participants at any point during the auction. The applicant agrees to perform and adhere to all requirements for funding, and to comply with all state and federal regulations and requirements pertaining to this program. The applicant agrees not to use equipment prohibited by the FCC within the network, to offer rates in the project area that are comparable to the rates offered by the applicant in urban areas outside the project area and as compared to the FCC’s national rate survey, to submit network performance (speed and latency) testing information as prescribed by the Commission, and to complete the project build within two (2) years following the grant award unless granted an extension. The applicant acknowledges that failure to comply with the requirements of the Auction may result in civil penalties pursuant to Neb. Rev. Stat. § 75-156.

Printed Name of Authorized Person

Date

Title of Authorized Person



Signature of Authorized Person

CONFIDENTIAL

Resound Networks
100 N. Cuyler St
Pampa, TX 79065
800-806-1719

resound

Technical Capability: Attach a detailed network proposal in addition to documents showing a demonstrated history of at least two (2) years of service at the speeds for which the applicant proposes to bid and with the technology to be used to complete the proposed deployment. (Attachment Letter: A)

Experience and Capability

Resound Networks is a Texas-based internet service provider with a focus on rural communities and service coverage throughout Texas and the Midwest. Resound Networks provides high-speed Internet and voice services to 125+ communities utilizing cutting-edge fiber to the home, fixed wireless, and advanced network technology. Resound Networks' current customer base includes residential, private businesses, government entities (such as municipal and county offices), and public service industry heroes (fire department, police department, hospitals). Since its inception in 2015, Resound Networks has grown exponentially but remains focused on providing affordable and reliable internet service to unserved areas throughout rural Texas.

In the FCC's RDOF Phase I Auction, Resound was proven to be capable of providing 1000/500 service with both fixed wireless and fiber technologies. Resound was provisionally awarded more than 200,000 locations throughout Arizona, Arkansas, Colorado, Kansas, New Mexico, Oklahoma, and Texas to be served at the gigabit tier with our unique hybrid network approach. Resound has worked tirelessly with the FCC's engineering teams to prove out and ensure that 1000/500 (as well as 100/100) speeds are achievable with fixed wireless and hybrid network designs at scale.

History & Methodology Providing 100/100 & 1000/500

Beginning in July 2020 Resound Networks deployed multiple fixed wireless technologies that are providing gigabit tier and low latency standards to customers in our existing network proving that the gigabit tier and low latency standards can be met at scale with fixed wireless. Fixed wireless deployments will also greatly increase the speed with which we are able to provide coverage to the locations that we intend to serve resulting in underserved rural Nebraskans receiving high speed broadband as quickly as possible.

In the most densely populated MBUs, customers requiring gigabit tier throughput will be serviced with fiber to the home. In moderately populated MBUs last mile customers requiring gigabit tier throughput are serviced with small cell deployments using 57-71GHz nodes. Customer premise locations beyond the range of small cell connectivity in sparsely populated areas are connected using unlicensed or licensed point to point fixed wireless links and dynamic spectrum sharing point to multipoint fixed wireless access points. Resound Networks intends to use fixed wireless as a complement to our fiber to the home deployment to extend the reach of our network in the most sparsely populated rural areas. Fixed wireless allows customers to access gigabit speeds in areas that are unfeasible to cover with a traditional fiber network. Resound Networks intends to use fixed wireless in

CONFIDENTIAL

Resound Networks
100 N. Cuyler St
Pampa, TX 79065
800-806-1719

resound

areas with a relatively flat topography and sparse foliage. Recent technological advances and the economics of fixed wireless open vast new areas up to the opportunity of receiving broadband speeds that were previously unavailable.

Frequencies used in point to multipoint deployments to achieve gigabit tier and latency obligations range from mid-band spectrum to millimeter wave (mmwave). Resound Networks also intends to use a variety of unlicensed and licensed spectrum bands to achieve gigabit tier and low latency obligations. Specifically, Resound Networks intends to use 5GHz, 6GHz, 57-71GHz and 70/80/90GHz in point to multipoint deployments to achieve gigabit tier obligations. Resound Networks has experience utilizing licensed and unlicensed spectrum bands efficiently to achieve very high throughput internet connectivity at long range and will continue to deploy wireless infrastructure in newly allocated frequency bands as additional spectrum becomes available.

Core

Resound Networks currently utilizes multi-homed, redundant network core components and diverse interconnectivity partners at enterprise data center locations to guarantee a robust core network. Each component of Resound Networks' network is closely monitored to ensure capacity upgrades occur at no greater than 70% network peak utilization rate. Resound Networks currently partners with a variety of interconnectivity partners for redundant, high-capacity fiber circuit middle mile architecture to tower sites and retransmission locations. Where fiber circuitry is not available, or is not financially feasible, Resound Networks utilizes very high capacity licensed and unlicensed terrestrial fixed wireless point to point links for middle mile connectivity to tower sites and retransmission points. Middle mile point to point links utilize link aggregation grouping (LAG) for bandwidth aggregation and open shortest path first (OSPF)/border gateway protocol (BGP) routing protocols to ensure automatic redundancy failover.

Resound Networks design and implementation practices revolve around network scalability and the ability to scale quickly. As evidenced, using our design and best practices implementation standards, Resound Networks ensures that that any increase in end user requirements for bandwidth, QoS/SLA requirements, and decreased latency is accounted for by:

Top-Down Approach to Network Design and Implementation – Building a strong foundation from the 10/40/100 GB core with full redundancy from transit to through middle mile transport. All switching and routing equipment in the network design will facilitate rapid increase in capacity capabilities as the needs arise. Optics for this network are initially being put into place to accommodate any and all increases in requirements as the needs arise without any hardware changes being necessary. The Juniper MX10003 and all supporting peering, DDOS, QoS, Traffic Prioritization, and diverse middle mile circuitry are part of rapid scalability built into the initial design. These are set up and prepared to accommodate any increase in requirements or decrease in latency requirements from the initial deployment of the network.

CONFIDENTIAL

Resound Networks

100 N. Cuyler St
Pampa, TX 79065
800-806-1719

The logo for Resound Networks, featuring the word "resound" in a bold, blue, lowercase sans-serif font.

Resound Networks deploys DE-CIX in every data center location for peering. DE-CIX offers peering on the most advanced Layer 2 switching platforms in the industry. The GlobePEER service enables networks to peer with hundreds of networks almost instantly via the DE-CIX route servers. The need to negotiate bilateral peering agreements is significantly lower. DE-CIX mitigates the effects of Distributed Denial of Service (DDoS) attacks against their networks. Approximately 50% of Resound's peak network traffic is routed through DE-CIX and other direct peering partnerships such as Netflix. These peering arrangements result in a more robust and responsive internet service to end users, and provides a direct route for Resound's customers to the internet's most in demand content.

Monitoring

Resound Networks' organizational focus to proactively manage and monitor all client services, IT Managed Services, equipment status and performance, bandwidth capacities, arising network related issues, core network equipment performance, and all alert thresholds for the entire networks is the NOC. This will ensure that any increase in demand, decrease in latency, or QoS/SLA related issues are handled proactively, without any negative affect on any end user. The NOC ensures all network operational standards are maintained through all the stages and channels of communication.

This is facilitated on a 24/7 basis with a trained and professional IT staff that is responsible for nothing else but consistent network visual and software-based tool monitoring and management. The NOC personnel adhere to a strict performance metric for all network nodes and related services, including but not limited to:

- Less than 75 ms latency to the end user device
- 50% capacity during peak utilization of all elements of the Transit and Middle Mile Transport Network
- 69% or less capacity usage of any last mile shared resource on the network, from switch ports, access point infrastructure, PtP links to end user locations, XGX-PON infrastructure, and any other shared client resource.
- Monitored End User performance metrics based on service provided.

In the event any network threshold is met or exceeded, to include customer service performance, the NOC personnel follow a strict process to recognize issue, attempt to resolve to RCA, then escalate procedure:

- NOC personnel recognize the related issue.
- NOC personnel attempt to alleviate the issue and document in a FCAPS based ticketing system. If issue is resolved, ticket is closed, and the appropriate documentation is recorded. All necessary personnel are alerted of issue and all related steps to resolve down to root cause analysis. If situation is resolved, but RCA cannot be determined,

CONFIDENTIAL

Resound Networks

100 N. Cuyler St
Pampa, TX 79065
800-806-1719

resound

appropriate System Performance, Network Engineering, or RF Engineering personnel are assigned the ticket through the system and RCA is completed and closed by appropriate department.

- If NOC personnel cannot resolve the issue, On Call appropriate personnel are informed and brought up to speed.
- Issue is then handed off to appropriate department in a Ticket based format so situational documentation can be continued until RCA is complete and ticket is closed.

Sustainability

Resound has implemented a robust disaster recovery plan that encompasses solutions for all foreseeable outage and disaster situations. Redundancy and protection have been implemented throughout the network design, from the data center cores to the customer premise.

Throughout the network design, redundant fiber routes have been planned to protect against fiber cuts. Out of band management is installed at every router site to ensure management and troubleshooting in the event of a total outage. An odd and even VLAN network topology has been implemented for lateral damage protection. Daily core and edge component configuration backups are established to ensure concurrent configurations are stocked in the event a network component swap must take place. Resound also maintains a 24/7 network operations center with continuous real time monitoring and alerting. 24/7 technical support and 24/7 on call field personnel are available to resolve any issues that may arise as expeditiously as possible. In the event of a tower location disaster, Resound maintains a stock of mobile towers to act as immediate tower site replacement. Resound has built out a geographically diverse dedicated hot standby disaster recovery core in the event of a regional outage or disaster scenario.

Data center and core network sites are outfitted with auto-sensing generator backup to prevent outage in the event of a power disruption. Remote relay sites are outfitted with robust battery backup systems to provide multiple days of battery backup power. Core and edge network components are configured with dual power supplies to protect against individual hardware component power failure. Hot spare network components are also stocked on-site in the event of total hardware failure. Corero SecureWatch DDOS mitigation is installed at the network edge to prevent DDOS attacks. Each core data center location will have diverse and redundant fiber transit path circuitry. Each Data Center will also have multiple carrier transit scalable circuits prepared for 10/40/100 electronics at the Resound connection point.

Middle mile microwave connections are designed for extremely high availability. This requirement is accomplished by proper RF, antenna and equipment planning. In all cases where a segment of the network is fed primarily via microwave link rather than fiber, multiple microwave links from diverse tower sites are used to feed the site. Microwave links are also used as link aggregation and redundancy at tower sites fed with fiber. By designing a network with diverse microwave links between

CONFIDENTIAL

Resound Networks

100 N. Cuyler St
Pampa, TX 79065
800-806-1719

The logo for Resound Networks, featuring the word "resound" in a bold, blue, lowercase sans-serif font.

sites, reliability of service to the end user is improved dramatically. Development and implementation of a microwave ring or dual-ring topology allows for greater throughput, higher uptime, and reliability. A vast majority of our proposed network is designed in this fashion to provide the highest quality service to end users.

Resound Networks has worked closely with industry leading manufacturers to exhaustively vet solutions capable of achieving gigabit tier and low latency obligations at scale in all phases of the intended network: core, middle mile and last mile. Additionally, Resound Networks has forged long term partnerships with some of the largest vertical asset, fiber network, RF hardware and contract construction companies in the US. These companies have committed to not only offering Resound Networks their full array of existing products and infrastructure but have committed to making capital investments to build out new products and infrastructure to support Resound's network development.

In all, Resound Networks is committed to closing the digital divide and from the beginning built our entire business model around serving rural America. Resound Networks is honored to partner with the state of Nebraska to make sure all locations within awarded MBUs have access to highspeed broadband and will work tirelessly to achieve high quality coverage as quickly as possible.

Staffing

Resound Networks is prepared to establish to 3 field office locations throughout Nebraska to support the design, engineering, construction, deployment and long-term support of Resound's Nebraska network. Each regional network office will employ up to 8 full-time employees each.

CONFIDENTIAL

Resound Networks

100 N. Cuyler St
Pampa, TX 79065
800-806-1719

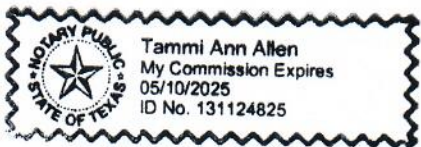
resound

I, Jordan Pruett, certify that if Resound Networks is identified as a winning bidder in NUSF-131 Nebraska's 2022 Reverse Auction, Resound Networks will provide audited financial statements and opinion letter to the Nebraska Public Service Commission along with the post-auction commitment form.

Jordan Pruett

Jordan Pruett

SUBSCRIBED AND SWORN to me before this 15 day of July, 2022 by Jordan Pruett



Tammi Ann Allen

Notary Public

My Commission Expires: 05/10/2025

Operational Capacity: Provide subscribership information for an existing network that currently provides the speeds in which the applicant intends to bid are currently being offered to customers. This information is required to demonstrate the ability of the applicant to run a successful broadband operation and serve its customers. Applicant should identify existing services in Nebraska, and the number of customers that subscribe to their services, separated by exchange. (Attachment Letter: C)

Resound Network's current network serves tens of thousands of customers with service coverage to more than 400,000 locations. Resound is currently installing hundreds of new customers a month through aggressive organic growth and deployments in existing obligation areas. An analysis of Resound's existing network shows that 12% of our current customer base subscribes to service packages at 100Mbps speeds or higher. Resound's existing network provides coverage to over 100K homes where 1000/500 is currently available. Resound does not currently operate or provide service in Nebraska.

CONFIDENTIAL

Resound Networks

100 N. Cuyler St
Pampa, TX 79065
800-806-1719

The logo for Resound Networks, featuring the word "resound" in a bold, blue, lowercase sans-serif font.

The proposed Lifeline service plans of the applicant. (Attachment Letter: D)

Resound Networks' lifeline service plans offered at award tiers throughout awarded MBUs are as follows, Resound will offer the Lifeline discount to all packages offered in MBUs:

Voice Plan

Resound will offer standalone voice service to all locations in awarded MBUs at the following price points: \$36.60

Broadband Plans:

Resound will offer 100/100 service to all locations in awarded MBUs at the following price points:

100/100: \$90.70

Resound will offer 1000/500 service to all locations in awarded MBUs at the following price points:

1000/500: \$150.70

Non-award tiers honoring Lifeline discount:

10/3: \$30.74

25/5: \$50.74

50/10: \$70.74

100/25: \$90.74

Information relative to whether the applicant participates in the FCC's Affordable Connectivity Program (formerly Emergency Broadband Benefit Program) and how that participation may impact proposed service offerings to subscribers in auctioned areas.

(Attachment Letter: E)

Resound Networks was a proud participant of the FCC's Emergency Broadband Benefit Program and continues to be a participant in the FCC's Affordable Connectivity Program since its inception. Resound Networks will offer a low-cost broadband plan at 25 Mbps/5 Mbps for \$49.95 a month throughout any awarded MBU locations. This low-cost program will result in a \$19.95 total out-of-pocket cost for qualifying ACP customers. Resound Networks promotes the ACP program to our current and prospective customer base at every opportunity. Resound advertises our participation in the ACP program in English and Spanish, in physical advertisements such as billboards and mailers, as well as virtual advertisement campaigns via e-mail and social media engagement.

Applications proposing to use technology other than fiber or proposing to use a combination of fiber and other technologies, must include an attestation from a qualified engineer describing the speed capabilities of the proposed technology, as well as speed test data from existing deployments that support the capability claim. (Attachment Letter: F)

Attestation of Fred Goldstein in support of Resound Networks application

My name is Fred Goldstein, and I have been retained by Resound Networks to validate their ability to provide 1000/500 Mbps and 100/100 Mbps services using fixed wireless technology. I am currently a Principal of Interisle Consulting Group. Previously I have been with Arthur D. Little, BBN Corp., and Digital Equipment Corp. I am a Senior Member of the Institute of Electrical and Electronics Engineers (IEEE). I am the FCC Technical Consultant to the Wireless ISP Association (WISPA) and have been involved in many relevant Commission dockets. I have worked with dozens of service providers, equipment manufacturers, and governments on a range of issues, many relating to bringing service to unserved areas. I have, on behalf of WISPA, been an active participant in the Wireless Innovation Forum's Spectrum Sharing Committee (CBRS) and 6 GHz Committee. I chaired its CBSD-CBSD Task Group (which developed recommendations for the CPE-CBSD KDB). I have also worked with fiber optic designs, including a recent Feasibility Study and preliminary design for the Central Vermont Communications Union District. I earned an FCC First Class Radiotelephone Operator's License in 1970 and have held an Amateur Extra Class license since 1977. I have taught professional development classes in Telecommunications Transmission Systems and related topics at Northeastern University.

In my professional opinion, the network is capable of delivering, to the required number of locations in each area that Resound will be bidding on, voice and broadband service that meets the requisite performance requirements. I come to this conclusion after examining Resound's proposed designs in nearby areas where it has won similar bids, and the types of equipment that it proposes to use to build out if it wins these Nebraska areas.

There is no question that gigabit wireless networks are not yet commonplace, though many have been promised and promoted as part of "5G", which is not proposed herein. The speed at which a network can deliver data is primarily a function of its transmitter EIRP, path loss, occupied bandwidth, external noise, receiver antenna gain, and receiver sensitivity. Most Wireless ISP network today operate on mid-band frequencies, especially the 3.5 GHz CBRS and 5 GHz U-NII bands, where channel width limitations make gigabit service impractical or, in the case of 5 GHz, only possible on a limited, point-to-point basis.

Resound plans to overcome these challenges by combining multiple technical solutions, each selected as locally appropriate, based on population density, distance, and terrain. First, some customers will be

CONFIDENTIAL

Resound Networks

100 N. Cuyler St
Pampa, TX 79065
800-806-1719

The logo for Resound Networks, featuring the word "resound" in a bold, blue, lowercase sans-serif font.

served directly on fiber. There is no question about their ability to receive Gigabit-tier service. Three different types of wireless link will be able to serve the others.

60 GHz Point-to-Multipoint. The 57-71 GHz band (“60 GHz”, also called V-band) is unlicensed. At the 60 GHz frequency, oxygen absorption of dry air is 14 dB/km, limiting its use for longer-range systems. However, the newer 64-71 GHz portion of the band has much lower dry-air absorption making it more desirable. One of Resound’s tools makes use of this band for short-haul PtMP links, not more than 500 meters. This falls within the stated range of the Adtran MetNet devices. MetNet uses 802.11ad modulation and beamforming sectors that can provide up to 4.6 Gbps per sector, though in practice somewhat lower speeds can be expected due to MCS limitations. Customer-side links at gigabit downlink speeds are the norm, potentially limited by the Gigabit Ethernet connection; uplinks are able to deliver 500 Mbps.

MetNet makes use of Self-Organizing Network (SON) meshing to allow clusters of nearby nodes to create wider-coverage systems without discrete backhaul. Clusters of nearby devices can automatically reroute traffic in the event that one link or node fails. Both client and access point devices include beamforming antennas, allowing a 5-degree-wide beam to be formed out of a 90-degree sector, simplifying installation and alignment.

In Resound’s design, MetNet (or another current or future product of equivalent or superior capabilities) will be used in its higher-density locations, such as clusters of houses near rural crossroads or subdivisions, or some now-unserved areas just outside of served towns.

The bulk of Resound’s target area is in the low-rain areas designated Rain Zone E by the ITU (rainfall rate exceeds 22 mm/hr no more than .01% of the time). Hence the short ranges of these connections should remain usable with at worst only rare, brief outages. 60-80 GHz is also highly sensitive to clutter, but the areas planned for 60-80 GHz are, in general, free from clutter higher than rooftop level. Most of it is semi-arid and croplands; vegetation tends to be short, lower than the planned nodes. Resound will be able to use 10-meter clutter data as well as 10-meter (1/3-arc second) terrain data to validate its millimeter wave coverage areas, and 30-meter clutter data for midband (5/6 GHz) PtMP.

5/6 GHz point-to-multipoint. The bulk of the geographic coverage planned for wireless Gigabit or 100 Mbps connectivity will be served via the 5 and 6 GHz U-NII bands, including the 6 GHz frequencies soon becoming available as an unlicensed underlay. 100 Mbps connections are quite routine today on the 5 GHz band, and easily work beyond a 5 mile radius. Existing radio systems including the Cambium ePMP 3000 and Mimosa A5c operate at a burst rate of 400 Mbps on a 40 MHz channel which can be set up for asymmetric or symmetric capacity, and 80 MHz channels can also be configured if required.

Resound plans to use Cambium Networks ePMP 4k-series (802.11ax-derived) devices to extend U-NII spectrum from 5 GHz into the 6 GHz bands that will be available for standard-power outdoor use by 2023, as the Automated Frequency Coordination (AFC) systems come on line. Standard-power outdoor access points on U-NII-5 and U-NII-7 will be permitted the same 36 dBm EIRP as now allowed on U-NII-1 and U-NII-3. While Cambium’s already-announced Force 400/425 CPE is nominally stated to reach 6135 MHz

CONFIDENTIAL

Resound Networks

100 N. Cuyler St
Pampa, TX 79065
800-806-1719

The logo for Resound Networks, featuring the word "resound" in a bold, blue, lowercase sans-serif font.

(i.e., frequencies now available for licensed use in some countries), Cambium has provided Resound with prototypes of both an access point and CPE versions that are able to use the full available range of 6 GHz standard-power frequencies (850 MHz), as well as the existing 5 GHz bands. These have been tested by Resound, under a Special Temporary Authority license, with 160-MHz wide channels providing 1000/500 Mbps speeds up to a distance of 3.5 miles. Cambium states that the maximum PHY capacity of a sector is 9.7 Gbps. While this is more than a bit optimistic at gigabit speeds, the design center of the Cambium 4000 series is gigabit connections. I also expect Cambium's competitors to have similar products on the market by early 2023, and even more flexible products using 802.11be (Wi-Fi 7's basis) semiconductors later in 2023. Additionally, the Mimosa by Airspan A6/C6 product prototypes have been tested under STA and are also capable of providing gigabit services using the 6 GHz U-NII-5 band.

The 6 GHz band is of course well-utilized for protected microwave links in many areas and thus the AFC will not authorize use of the full band where it could pose conflicts with incumbents. Resound's planned 6 GHz operations are, in general, in rural areas outside of the key urban areas and key intercity corridors where the band is most heavily utilized. I thus expect that it should be able to find at minimum a sufficiency of 5 GHz and 6 GHz frequencies to achieve the required performance. Its point-to-multipoint coverage polygons are computed with a target signal strength of -61 dBm, which is sufficient to achieve high modulation rates (at least 256 QAM) that maximize the efficiency of the sector.

80 GHz point-to-point. The 70/80 GHz band ("80 GHz", also called E-band) is available under Part 101 using a lightly-licensed, coordinated point-to-point model. Resound plans to use this band for point-to-point links to some customer locations beyond the range of point-to-multipoint systems. It can also be used for high-capacity backhaul, as radios on this band are available with 10 Gbps capacity.

Resound plans to use the Siklu EH-2500FX or similar radios to reach distant subscribers. Rain fade is the dominant impairment on this band. With a 49 dB (2') antenna, this model radio is rated by its manufacturer as capable of delivering gigabit speeds for about 14 km in the absence of rain, though Resound does not plan to use it for such long distances; links in the 10 km range are planned for some low-rain areas. These distances have been validated by Siklu. Of course rain does occur, even in Resound's planned build-out areas in relatively dry Rain Zone E. Full capacity, then, may only be available on the order of 99% of the time, which does meet FCC Gigabit-tier requirements. During periods of rain, shorter links will continue to operate on 80 GHz adaptively, using lower modulation and coding schemes. Longer links will need to switch to a mid-band backup, which will be provided.

Siklu does not provide an internal lower-frequency backup, but it does provide a novel accommodation: Its 2' dish accommodates both 80 GHz and 5 GHz feeds, and a built-in switch in the EH-2500FX will relay the data stream to a separate 5 GHz backup radio when its own path fails. A third-party 5 GHz point-to-point radio then maintains service, albeit at less than full gigabit speeds. Any number of 5 GHz connectorized radios are suitable for that purpose (e.g., Cambium PTP670 or Force 400C, Mimosa B5c). Conflict between multiple TDD devices on a tower is then limited by their use of GPS synchronization.

CONFIDENTIAL

Resound Networks

100 N. Cuyler St
Pampa, TX 79065
800-806-1719

The logo for Resound Networks, featuring the word "resound" in a bold, blue, lowercase sans-serif font.

An additional identified tool is the Globtel AIR Gigaray 70/80 GHz system, which is a hybrid of the 60 GHz unlicensed and 80 GHz licensed bands. This system uses the upper end of the 57-71 GHz band for a point-to-multipoint sector downlink and the 80 GHz band for subscriber uplinks. Resound has tested this to a range of more than 6 miles at gigabit speeds (930 Mbps downlink, 500 Mbps uplink net of protocol overhead), though it will only use this at much shorter ranges because of rain fade.

Backhaul within the Resound network will be a mix of fiber and microwave. The 11 GHz band will be used for the bulk of longer microwave links. Currently available licensed Part 101 radios can provide over 2.5 Gbps of FDD capacity by using two 80 MHz channel pairs and two polarizations (XPIC). While the channels need to be coordinated, the remote locations of most of these links makes it unlikely that coordination will be a problem. A 2.5 Gbps FDD backhaul capacity is sufficient to support a cluster of Gigabit-tier subscribers. Even with an increase of average per-customer traffic to several times Resound's current level, none of these links should saturate on route to the nearest fiber point.

Latency should not be a problem. None of the devices planned for this network have high latency. The network is entirely terrestrial, and even the multi-hop microwave and millimeter-wave paths add only a few milliseconds of delay. The millimeter-wave SON mesh networks are only a few hops from a low-latency backhaul path. Packet loss should also be low. Voice traffic can also be prioritized. Thus telephone services should not be significantly degraded when carried over the wireless portions of the network.

Thus in my professional opinion, the network is capable of delivering voice and broadband service that meets the requisite performance requirements.

A handwritten signature in black ink that reads "Fred R. Goldstein".

Fred R. Goldstein 12 July 2022

CONFIDENTIAL

Resound Networks

100 N. Cuyler St
Pampa, TX 79065
800-806-1719

The logo for Resound Networks, featuring the word "resound" in a bold, blue, lowercase sans-serif font.

Attach documentation with details of the standalone voice plan and service plan currently offered by the application that provides broadband at the relevant performance tier and latency requirements at rates that are reasonably comparable to rates offered in urban areas. (Attachment Letter: G)

Voice Plan

Resound will offer standalone voice service to all locations in awarded MBUs at the following price points: \$45.85

Broadband Plans:

Resound will offer 100/100 service to all locations in awarded MBUs at the following price points:

100/100: \$99

Resound will offer 1000/500 service to all locations in awarded MBUs at the following price points:

1000/500: \$159