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August 29, 2018

Ms. Marlene H. Dortch  
Secretary  
Federal Communications Commission  
445 15<sup>th</sup> Street, SW  
Washington, DC 20554

**Re: *Promoting Investment in the 3550-3700 MHz Band, GN Docket No. 17-258; and Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550-3650 MHz Band, GN Docket No. 12-354.***

Dear Ms. Dortch,

Midcontinent Communications (Midco) supports the Commission's efforts to promote investment in the 3.5 GHz, Citizens Broadband Radio Service (CBRS) band, and has made suggestions herein to ensure that the valuable CBRS band can be used to further broadband access for rural America. Specifically, the Commission should issue county-sized or smaller priority access licenses (PALs); consider similar rules for the CBRS PALs and the 2.5 Educational Broadband Services (EBS) white space; institute performance requirements if longer-termed PALs are authorized; and require all providers to use the Spectrum Access Systems (SASs).

#### **Background on Midco**

Midco has provided wired internet to the Upper Midwest since 1996, and currently serves over 385,000 internet customers in South Dakota, North Dakota, Minnesota, Wisconsin, and the Lawrence area in Kansas. To better serve rural customers where the topography or economics make a fiber build impossible, Midco acquired InvisiMax, Inc., a fixed wireless provider with over 10 years of experience in the Red River Valley in North Dakota and Minnesota. Since March of 2018, Midco has provided over 4,200 rural Americans with fixed wireless internet.

Midco has publicly committed to deploying its fixed wireless product more broadly in the most rural and remote areas of our footprint, starting with South Dakota, North Dakota, and Minnesota.<sup>1</sup> Not only is Midco committed to serving rural areas, but we are also committed to

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<sup>1</sup> Testimony of Justin Forde, Senior Director of Government Relations Midcontinent Communications before the United States House of Representatives (July 17, 2018) at 4-5, <https://docs.house.gov/meetings/IF/IF16/20180717/108547/HHRG-115-IF16-Wstate-FordeJ-20180717-U21.pdf>.

offering the faster speeds desired by customers. To achieve those desired faster speeds, however, Midco needs access to spectrum.

While the Commission has noted that the CBRS band could be used for “5G” purposes and has suggested rules to further “5G,”<sup>2</sup> the CBRS band is incredibly useful for the point-to-multi-point (PTMP) connections in fixed wireless. In fact, the performance characteristics of the CBRS band are unmatched for rural service. Fixed wireless is key to closing the digital divide in rural America. All Americans should have access to broadband before valuable spectrum is allocated to large, national carriers who largely neglect rural America. Midco’s suggestions for the CBRS band, therefore, are directed toward closing the rural digital divide by using the CBRS band to provide fixed wireless internet.

## **I. Create Rules to Encourage Broadband in Rural America**

Midco supports a 5-year or 10-year PAL license term with automatic renewal rights,<sup>3</sup> *but only if* companies committed to servicing rural America have the practical ability to acquire PALs and the Commission institutes performance requirements for the proposed longer-term PALs. Midco has already invested in PTMP and customer premise equipment (CPE) technology that uses the CBRS band, and, from field testing with our 3.5 experimental license (see *Section II(B) infra*), knows that the CBRS band is prime spectrum to deliver high-speed, reliable fixed wireless internet to rural America. A longer PAL term allows Midco the security to build out our fixed wireless network using the CBRS band.

Without the proper safeguards and practical ability to compete for PALs, however, the significant, and continuing, investment necessary to purchase and implement PTMP and CPE equipment using the CBRS band throughout Midco’s fiber footprint in South Dakota, North Dakota, and Minnesota becomes more uncertain. The Commission should issue or revise its rules to promote rural broadband development using the CBRS band. Issuing rules consistent with Midco’s suggestions herein would promote “the development and rapid deployment of new technologies, products, and services to benefit the public, including those residing in rural areas,” would “promot[e] economic opportunity and competition,” and would “disseminat[e] licenses among a wide variety of applicants[.]”<sup>4</sup>

### **A. County-Sized PALs Would Increase Rural Broadband Deployment**

A county-sized PAL, at least in rural areas, is a logical compromise between the proposals for census-tract-sized licenses<sup>5</sup> and partial economic areas (PEA) sized licenses.<sup>6</sup> Rural PEAs are generally large geographic areas. Even though Midco has an expansive fiber network, it could be unreasonable to require Midco to service an entire PEA with fixed wireless using a CBRS PAL.

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<sup>2</sup> *Notice of Proposed Rulemaking and Order Terminating Petitions*, GN Docket No. 17-258 (Oct. 24, 2017) (hereinafter, “2017 NPRM”), ¶¶ 1-4.

<sup>3</sup> 2017 NPRM ¶ 13

<sup>4</sup> 47 U.S.C. § 309(j)(3)(A); *see also* 2017 NPRM ¶ 15 (acknowledging this requirement).

<sup>5</sup> *See* 2017 NPRM ¶ 20 (discussing census tracts as a proposed geographic license area).

<sup>6</sup> *See* 2017 NPRM ¶¶ 20-21 (summarizing commentators’ desire for PEA-sized PALs).



For example, assume that Midco desired to expand our internet services in International Falls, MN and offer fixed wireless and backhaul that service to our fiber. *See Figure 1.*<sup>7</sup> While Midco would be interested, and willing, to use a PAL to service the entire county around International Falls with fixed wireless, Midco could not currently service the entire PEA and backhaul that service to our fiber (our fixed wireless product must be backhauled within 30-50 miles of our fiber). Depending on the Commission's final rules and performance requirements, that either leaves Midco in a difficult position to meet performance requirements, or results in inefficient spectrum use. Indeed, the Commission's questions on the possibility of partitioning a PEA or EA into smaller licenses<sup>8</sup> acknowledge the reality that a PEA, EA, or BTA is too large of a geographic area for a PAL.<sup>9</sup>

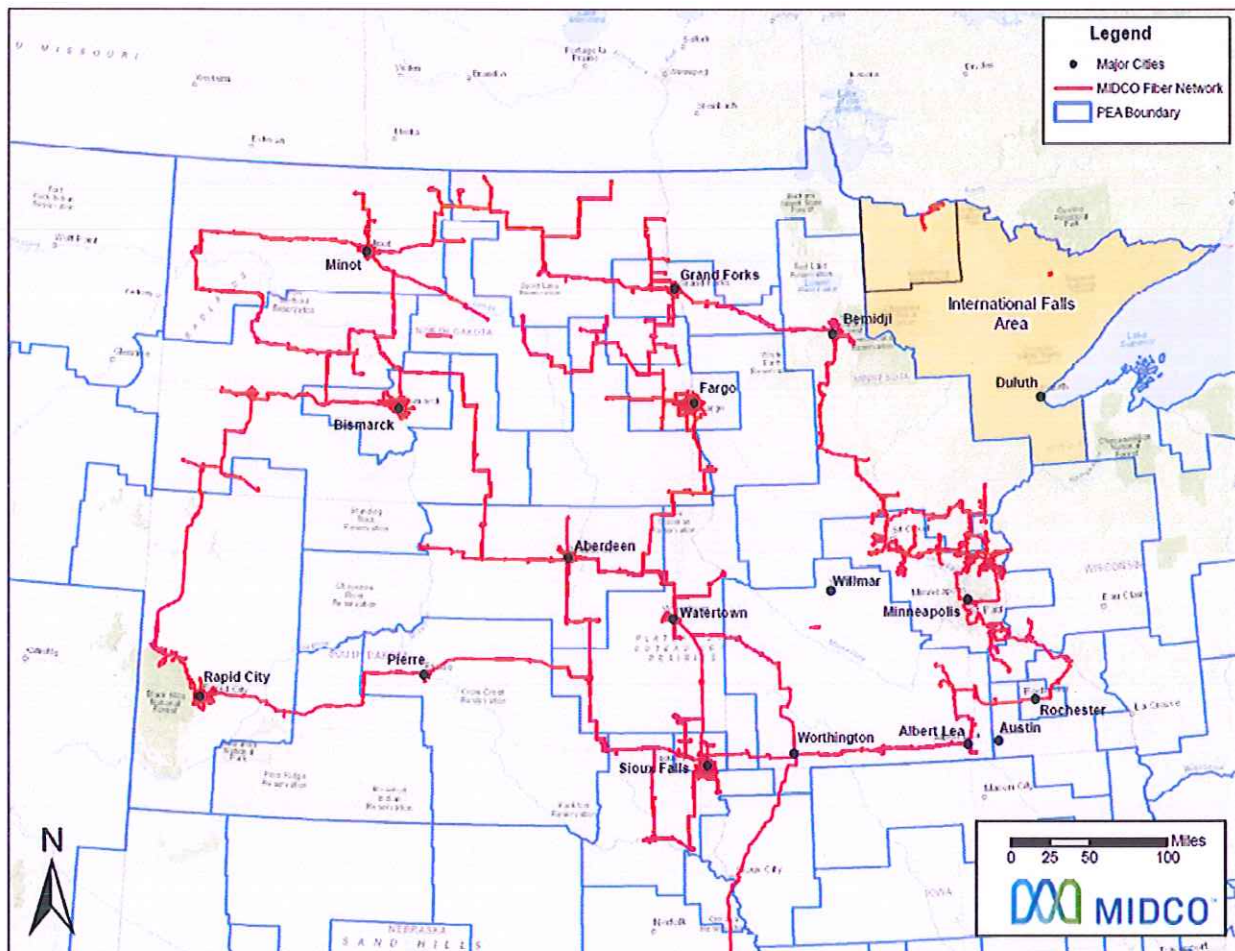


Figure 1: International Falls, MN PEA Example

<sup>7</sup> Although Midco has operations in Wisconsin and the Lawrence area in Kansas, for simplicity, Midco is focusing on its network in South Dakota, North Dakota, and Minnesota. Full-size copies of the maps contained herein are attached as Appendix 1.

<sup>8</sup> 2017 NPRM ¶ 24.

<sup>9</sup> Other large economic areas used for past spectrum auctions, such as BTAs and EAs, would yield similar results.



Contrastingly, census tracks vary significantly in size, even in rural areas. *See* Figure 2. Census tracks are also oddly shaped, and could yield licensed spectrum holdings in an inconsistent pattern, thereby making engineering more difficult.

Counties, at least in our rural areas, are a logical compromise between these two extremes. As Figure 3 demonstrates, rural counties vary less in size and shape than census tracks. Not only do county-sized PALs in rural areas make logical sense, they also would, as noted by other commentators, balance relatively low economic barriers to entry to the valuable CBRS spectrum, while minimizing the administrative burdens of the SASs.<sup>10</sup>

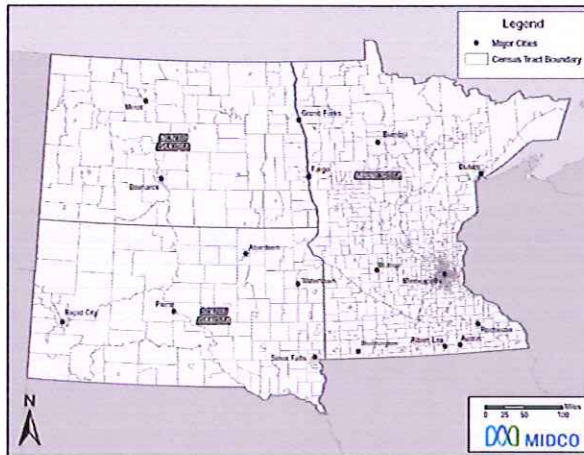


Figure 2: Census Tract Boundaries in Midco's Footprint

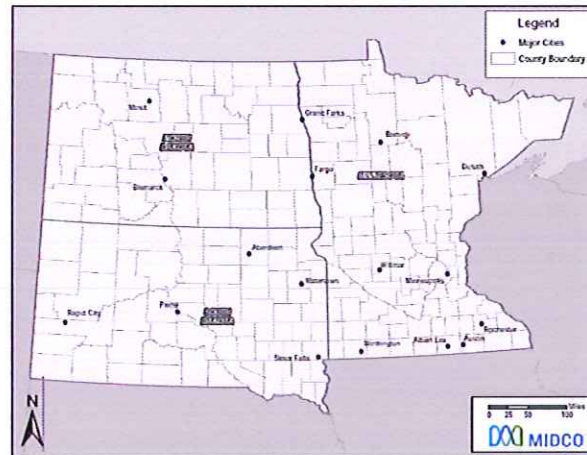
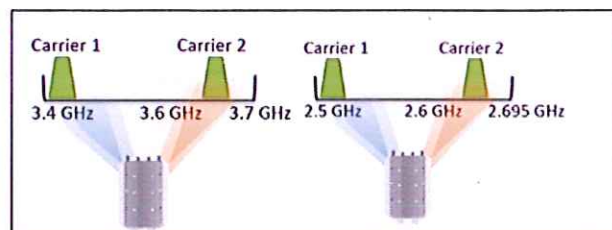


Figure 3: County Boundaries in Midco's Footprint

## B. The Commission Should Issue Similarly-Sized CBRS and EBS Licenses

Both the CBRS and EBS bands can be used to provide the PTMP connections in a fixed wireless network. Midco, therefore, urges the Commission to consider issuing similarly sized CBRS PALs and EBS white space licenses, if those licenses are county-sized or smaller.

In recent testing completed by Midco using carrier aggregation technology (the first such testing in the United States), Midco achieved speeds of over 200 Mbps download and 20 Mbps upload using 80 MHz of spectrum from Midco's 3.65 GHz nationwide non-exclusive and experimental 3.5 GHz licenses and towers that were 7-8 miles apart.<sup>11</sup> According to other testing completed by the manufacturer, Midco could achieve similar speeds using the 2.5 GHz band.<sup>12</sup> While Midco can aggregate between channels to achieve the required 80 MHz of spectrum in either the CBRS or the EBS bands,



<sup>10</sup> 2017 NPRM ¶ 22.

<sup>11</sup> Midco tested this carrier aggregation technology using our 3.65 GHz nationwide non-exclusive license (File No. 8088440) and our 3.5 GHz experimental license (WJ2XG; File No. 0001-EX-AL-2018). While Midco can aggregate spectrum channels, it is currently technically more efficient to engineer a fixed wireless network when the spectrum is contiguous. Midco, therefore, supports the Commission's proposals to make the PALs contiguous.

<sup>12</sup> *See* Telrad, White Paper, attached hereto as Appendix 2.



current technology does not support aggregation between the two bands. A fixed wireless provider, therefore, has to deploy different equipment to operate in the CBRS and EBS bands.

The CBRS spectrum can be used in most areas in Midco's footprint, but there are areas that may require EBS spectrum. As explained in Midco's comments in the 2.5 GHz docket, the propagation characteristics of the 2.5 GHz band make it appealing to Midco in near-line of site areas, such as in the forests of northern Minnesota.<sup>13</sup> Therefore, Midco, like many other fixed wireless providers, may need to use a combination of CBRS and EBS spectrum to provide fixed wireless services, depending on the topography of the area to be serviced. Given the potential use of both the CBRS and EBS bands to provide rural broadband, the two bands should be licensed in the same geographically sized license. Midco could engineer for licenses in either census tract or county sizes, but would prefer county-sized licenses.

Even if PTMP technology could aggregate channels between the CBRS and EBS bands, having consistently-sized licenses between the CBRS and EBS bands ensures the most efficient spectrum use of these valuable bands. Assume, for example, that Midco won PALs for Cass, Hubbard, and Becker counties in Minnesota at auction, but later needed EBS spectrum due to the

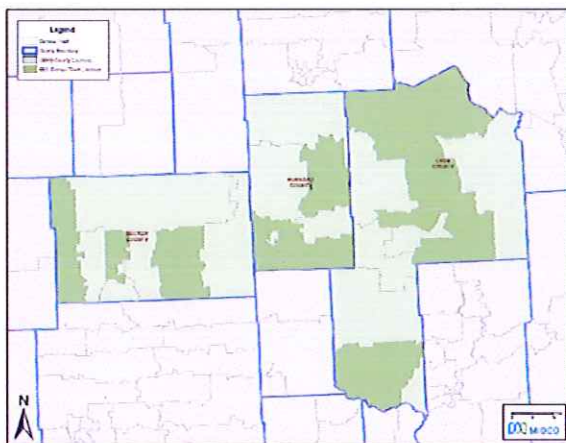


Figure 4: Example of CBRS and EBS Licenses

topography of certain areas of these counties (i.e., heavily forested areas). If the Commission did not license the PALs and EBS white space in the same geographic size, Midco would have overlapping CBRS and EBS spectrum and a patchwork spectrum map. See Figure 4. Other providers would face a similar problem if the CBRS and EBS bands are licensed differently, and, therefore, the Commission should use the same-sized licenses for PALs and EBS white space licenses.

### C. The Commission Should Consider Performance Requirements if Longer-Term PALs are Allowed

The Commission is correct to question whether it should institute performance or construction requirements if it allows longer-term PALs.<sup>14</sup> While current rules allow another provider to use the CBRS band if the PAL holder is not using the spectrum (rules which the Commission should not alter), a longer-term PAL creates the possibility of spectrum squatting. To deter such squatting, the Commission should consider similar performance requirements such as those in the Upper Microwave Flexible Use Service, or those that the Commission institutes for the EBS white space licenses. A licensee should be required to meet the performance requirements at the end of the initial PAL license period, and each renewal period thereafter,

<sup>13</sup> Comments of Midcontinent Communications, WT Docket No. 18-120 at 3-4.

<sup>14</sup> 2017 NPRM ¶ 17.



possibly scaling up on the required percentage of buildout per population or geography.<sup>15</sup> By requiring actual spectrum use, the Commission can ensure “efficient and intensive use” of the CBRS band.<sup>16</sup>

By instituting performance requirements, however, the Commission should still maintain its “lose it or use it” rules for PALs. If a licensee is not using its PAL spectrum, another provider should be allowed to use that spectrum.

Additionally, if the Commission institutes performance requirements for longer-termed PALs and if the PAL geographic size is county-sized or smaller, Midco supports an auction or assignment of PALs if only one applicant has applied for the PAL.<sup>17</sup> Awarding PEA-sized PALs without competition would result in a spectrum windfall to the winning bidder, which would most likely be a large, national company that is not invested in building out rural broadband. Similarly, awarding a PAL where no competition exists and not requiring performance benchmarks would lead to spectrum squatting. Midco believes that a county-sized PAL, with required performance benchmarks if the Commission issues a longer-term license, would ensure that the CBRS band is being efficiently used, even when only one company bids on a PAL.<sup>18</sup>

## **II. Midco Supports Required Use of the SASs**

The Commission has created a revolutionary spectrum management system with the SASs.<sup>19</sup> Midco commends the Commission for taking spectrum management seriously, and Midco is likewise committed to monitoring shared access through the proposed SASs. As the Commission finalizes the SAS rules, Midco urges the Commission to continue its requirement that providers using the CBRS band use at least one of the SASs.

In the past, the lack of a centralized and automatic spectrum monitoring system has created issues in our fixed wireless footprint. For example, a public radio station in a small town in Minnesota allowed its spectrum license to lapse. When Midco’s fixed wireless network administrators deployed PTMP on our 3.65 nationwide non-exclusive license (and registered the links as required), the radio station lost its signal. While the situation resolved itself, and the radio station is now a fixed wireless customer, interference events like this will become regular, rather than isolated, events as more, and varied, providers use the CBRS band.

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<sup>15</sup> See 2017 NPRM ¶ 18 (seeking comment on performance requirements). With a bidding credit and support for rural providers, Midco could alternatively support an auction format in which an incumbent would bid for renewal of its PAL. See *id.* ¶ 19.

<sup>16</sup> 47 U.S.C. § 309(j)(3)(A).

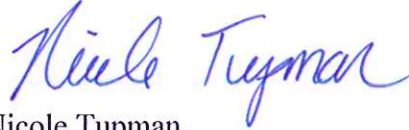
<sup>17</sup> 2017 NPRM ¶¶ 40-45.

<sup>18</sup> 2017 NPRM ¶ 45.

<sup>19</sup> 2017 NPRM ¶ 5 & ns.10-15 (summarizing the SAS rules evolution).

Midco urges the Commission to continue requiring SAS participation by CBRS users. Doing otherwise risks significant, and potentially disastrous, interference with fixed wireless customers, which, in Midco's network, include rural hospitals, medical clinics, banks, and other businesses where any loss in internet connectivity could be detrimental.

Sincerely,



Nicole Tupman  
Corporate Counsel

cc: Midco Senior Executive Team

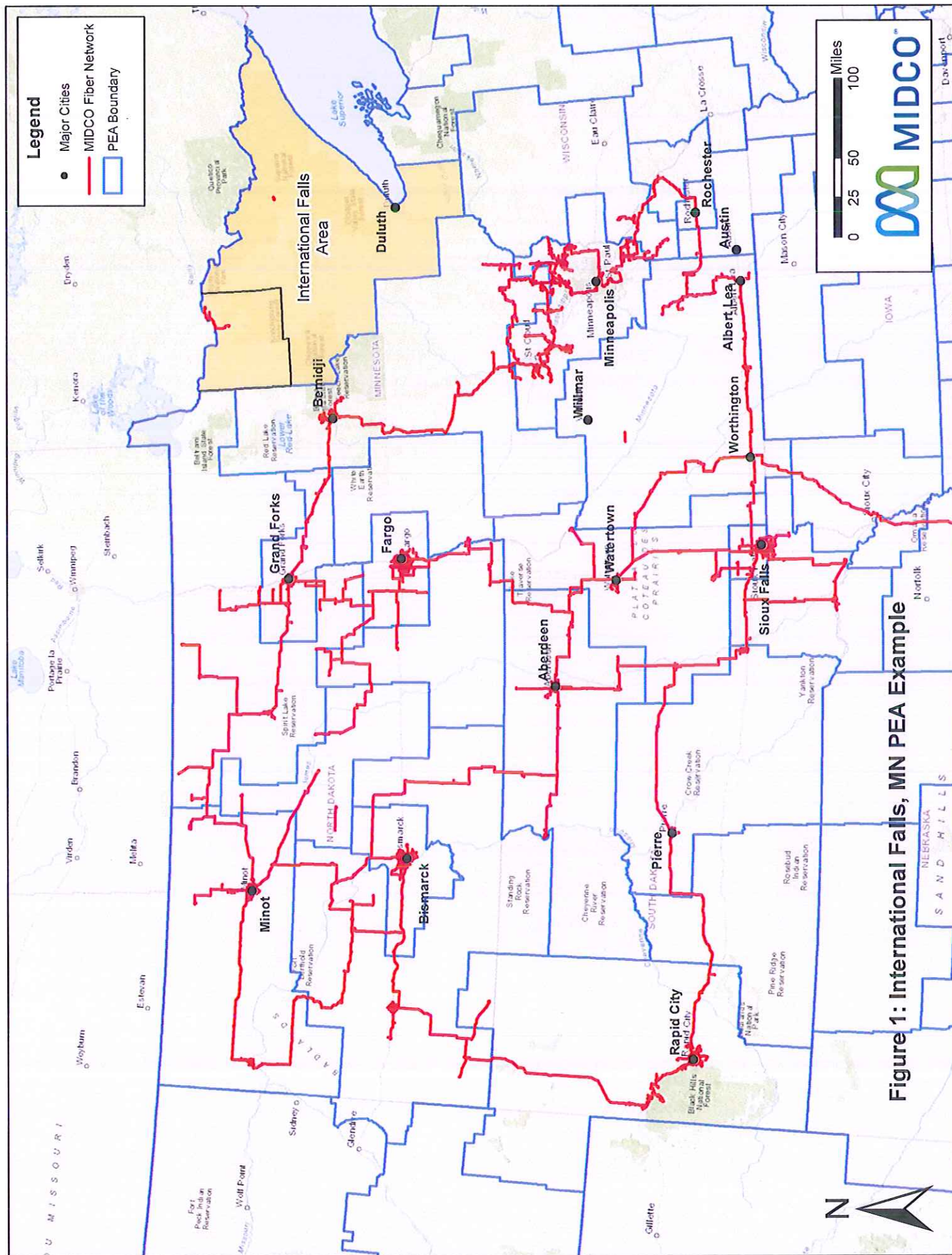
Enclosures: Appendix 1 (full-size maps); Appendix 2 (Telrad white paper)

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## **Appendix 1**

### **Full-Size Midco Maps**







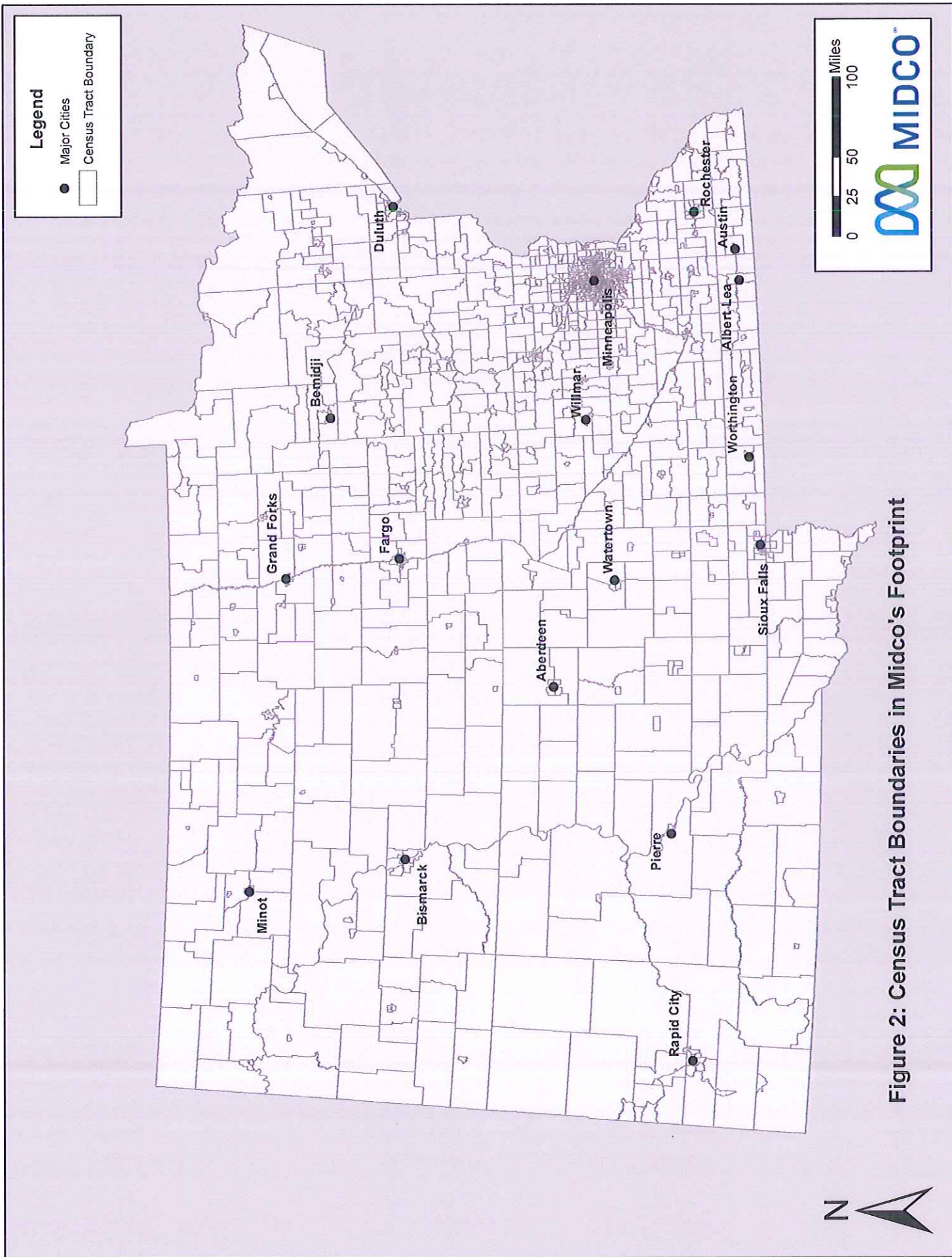


Figure 2: Census Tract Boundaries in Midco's Footprint



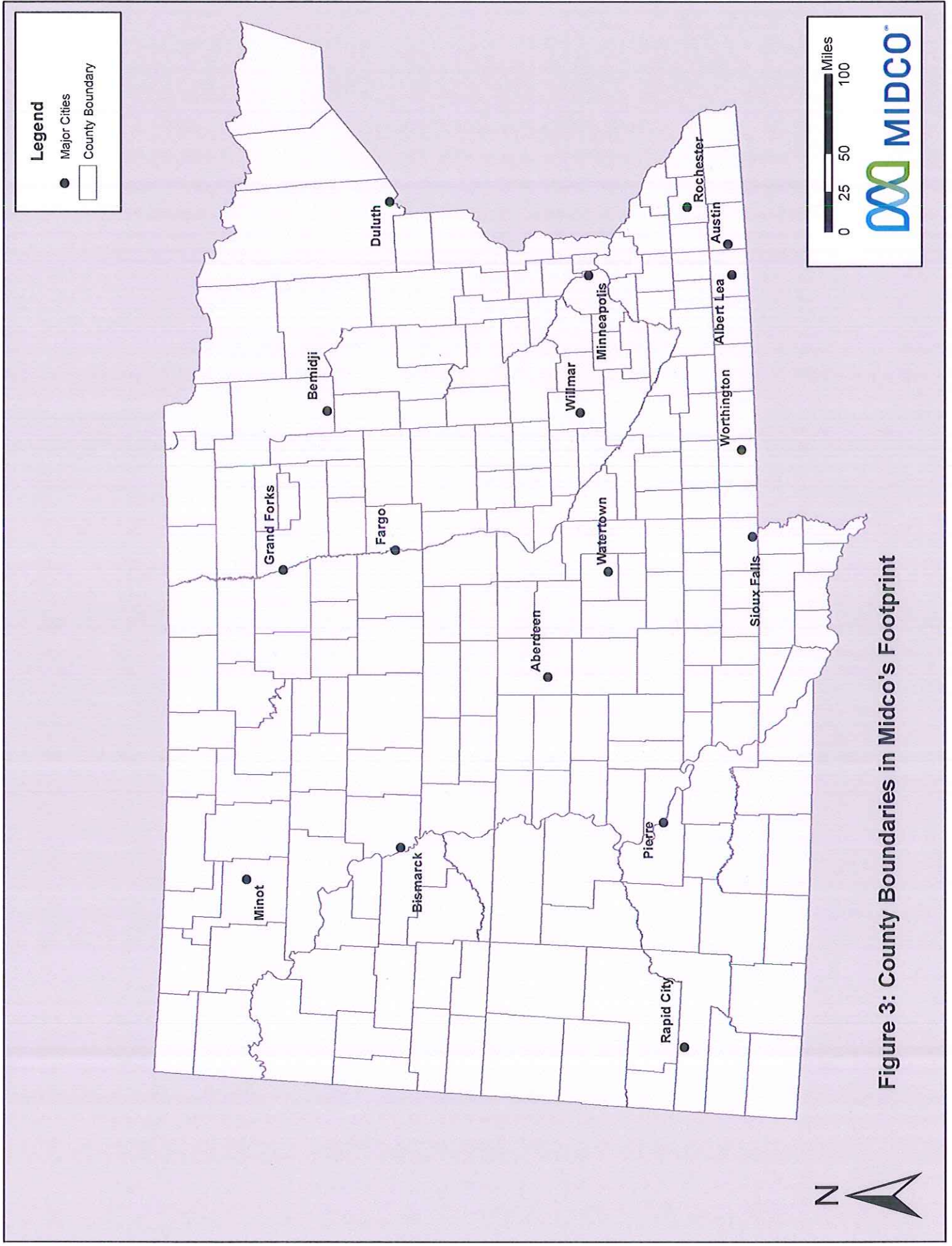


Figure 3: County Boundaries in Midco's Footprint

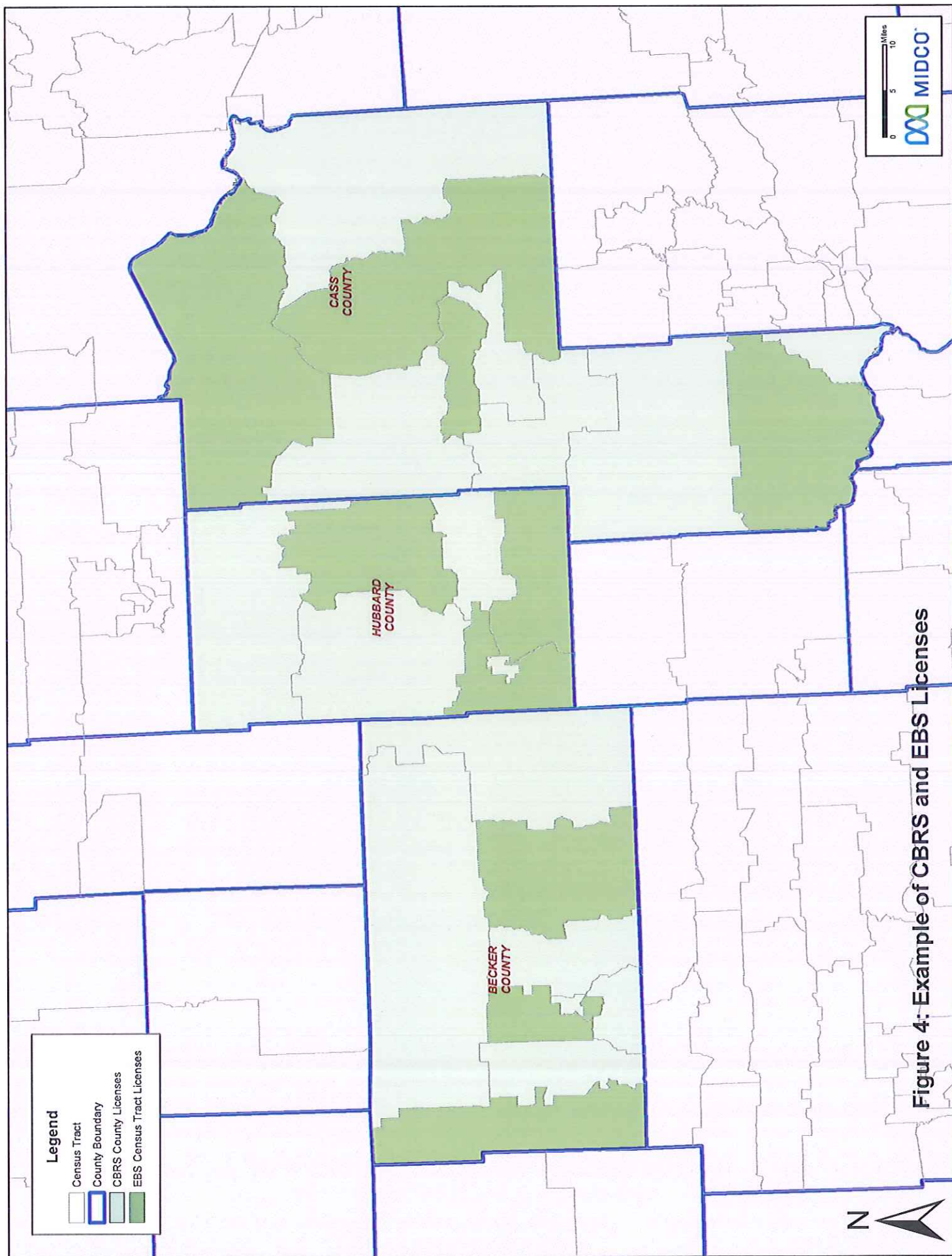


Figure 4: Example of CBRS and EBS Licenses



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## **Appendix 2**

# **Telrad White Paper on Carrier Aggregation**

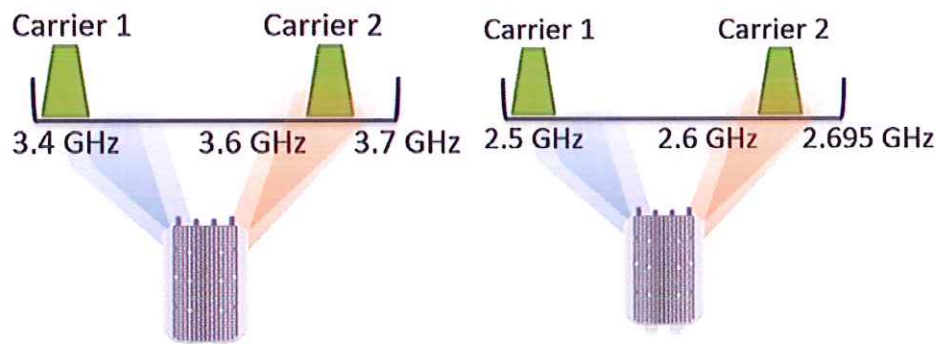
## LTE-Advanced Carrier Aggregation(CA)

As part of Telrad's Breeze COMPACT platform release 7.0, the carrier aggregation feature becomes available. Carrier aggregation allows for the combining of radio channels up to 20MHz in width. The benefit of such feature is to increase the peak throughput capability per user with the use of a category 6 or higher UE. Note the CPE 9000 is a category 6 UE.



With the use of carrier aggregation each individual carrier becomes known as a component carrier. Legacy UE (pre-category 6) will have full backward compatibility and continue to be serviceable by the LTE-Advanced eNodeB, they will however remain limited to a single component carrier. Category 6 UE can aggregate multiple component carriers and exploit peak rates equivalent to the max sum of the aggregated carriers

The Breeze COMPACT platform allows for the aggregation of up to 2 carriers. The carriers can be any of the following bandwidths. 5MHz, 10MHz, 15MHz, 20MHz. There is no requirement for channels be contiguous as the Compact supports intra-band aggregation of both contiguous and non-contiguous carriers



With the use of Breeze Compact Carrier aggregation feature, operators gain the ability to demonstrate higher peak rates upward to the theoretical capacity of 2x20MHz channels. In terms of throughput examples, the capabilities should be considered as one of two TDD split scenarios based on uplink to downlink requirements.

Subframe allocation (SA) 1 is known as 2:2 and Subframe Allocation 2 is known as 3:1.

Relevant throughputs for the different ratios are as follows

20MHz SA1 = 75.67Mbps Downlink and 27.88Mbps Uplink  
 20MHz SA2 = 105.03Mbps Downlink and 13.94Mbps Uplink

The current Carrier aggregation implementation is downlink only therefore the peak capacity listed for 20MHz can be doubled only on the downlink per user with the use of CA. In the future with the introduction of 256QAM the downlink may increase further up to 33% with the use of a next generation UE



This translates to the following max theoretical throughput per user with the use of CA  
 20MHz+20MHz SA1 = 151.34Mbps Downlink and 27.88Mbps Uplink  
 20MHz+20MHz SA2 = 210.06Mbps Downlink and 13.94Mbps Uplink

With target offering such as  
 10Mbps DL 1Mbps UL  
 25Mbps DL 3Mbps UL  
 100Mbps DL 20Mbps UL

*The following blends of service offerings would be feasible within a typical oversubscription model as is used in many networks today (10:1).*

*Note calculations shown here are based on MAX modulation and coding scheme (MCS). Real world results are subject to an MCS distribution based on Installation and RF conditions. To increase likelihood of max MCS consider 22dB CINR or better as an installation threshold.*

#### SA1

	SLA downlink (Mbps)	SLA Uplink (Mbps)	# of users
Service plan 1	10	1	20
Service plan 2	25	3	15
Service plan 3	100	20	5
			40

#### SA2

	SLA downlink (Mbps)	SLA Uplink (Mbps)	# of users
Service plan 1	10	1	50
Service plan 2	25	3	40
Service plan 3	100	20	0
			90