

EXHIBIT E

Radio Frequency Analysis Report

CT1430
43 Osgood Avenue, New Britain, CT



October 23, 2020



C Squared Systems, LLC
65 Dartmouth Drive, A3
Auburn, NH 03032

Phone: (603) 644-2800
Fax: (603) 644-2801
Support@csquaredsystems.com

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1. Overview

C Squared Systems was retained by New Cingular Wireless PCS, LLC (“AT&T”) to evaluate the proposed wireless communications facility at 43 Osgood Avenue, New Britain, CT at 100 feet AGL, hereinafter referred to as “CT1430”.

AT&T is licensed by the FCC to provide wireless communications services throughout the State of Connecticut including the Town of New Britain where the proposed facility would be located. The proposed facility has been selected as suitable for implementation of the National Public Safety Broadband Network (“NPSBN”), while also addressing a substantial gap in 4G LTE coverage for AT&T’s network.

This report addresses AT&T’s need for the proposed wireless facility and confirms that there are no other suitable existing structures that could address the coverage gaps in their wireless communications network.

The coverage analysis completed by C Squared Systems confirms: AT&T has a gap in reliable service in New Britain, and that Candidate “CT1430” provides AT&T with coverage in that service gap. Included as attachments in this report are coverage maps detailing the existing network and expected coverage from the proposed facility, pertinent site information, terrain and network layout maps.

2. Technology Advances & Design Evolution

AT&T provides digital voice and data services using 3rd Generation (3G) UMTS technology in the 800 MHz and 1900 MHz frequency band, and advanced 4th Generation (4G) services over LTE technology in the 700 MHz and 1900 MHz frequency bands as allocated by the FCC. These data networks are used by mobile devices for fast web browsing, media streaming, and other applications that require broadband connections. The mobile devices that benefit from these advanced data networks are not limited to basic handheld phones, but also include devices such as smartphones, PDA’s, tablets, and laptop air-cards. 4G LTE services and devices have enabled AT&T customers to have even faster connections to people, information, and entertainment.

AT&T will also deploy FirstNet services from this facility. FirstNet is a federal agency with a mandate to create a nationwide, interoperable public safety broadband network for first responders. First responders across the country currently rely on more than 10,000 separate radio networks which oftentimes do not interoperate with one another. By deploying a nationwide broadband public safety network built specifically to meet the communications needs of first responders, the FirstNet network will provide a solution to the decades-long interoperability and communications challenges first responders have experienced, and which was highlighted by the 9/11 Commission’s 2004 Final Report.

FirstNet selected AT&T to build, manage and operate the National Public Safety Broadband Network (“NPSBN”) using FirstNet’s Band 14 spectrum (Call Sign WQQE234, 20 MHz of the 700 MHz spectrum), together with AT&T’s own wireless network. Using a combination of new and existing wireless facilities, AT&T provides prioritized, preemptive wireless services for first responders across Connecticut, New England and nationwide, while also improving 4G LTE coverage for AT&T customers.

It is important to note that with AT&T’s migration from 3G to 4G services come changes in the base station infrastructure and resultant changes in the operating thresholds required by the LTE network. In the past, AT&T has presented receive signal thresholds of -74 dBm for their in-building coverage threshold and -82 dBm for their in-vehicle coverage threshold. Those thresholds were based on network requirements to support 2G/3G data speeds and past usage demand. Today, customers expect low latency and faster data speeds as evidenced by increasing data usage trends and customer demand.

AT&T's 4G LTE technology is designed to thresholds of -83 dBm and -93 dBm for their 700 MHz LTE and -86 dBm and -96 dBm for their 1900 MHz LTE.¹ The stronger thresholds (-83 dBm and -86 dBm) yield greater throughputs and improved customer experience. The -93 dBm and -96 dBm thresholds are the minimum acceptable levels required to meet customer expectations for 4G service.

3. Coverage Objective

There is a significant coverage deficiency in the existing AT&T wireless communications network along Farmington Avenue and Eddy Glover Boulevard and the neighboring residential and business/retail areas in New Britain, referred to herein as the "targeted area". A deficiency in coverage is evidenced by the inability to adequately and reliably transmit/receive quality calls and/or utilize data services offered by the network. Seamless reliable coverage provides users with the ability to successfully originate, receive, and maintain quality calls and data applications throughout a service area. Appropriate overlapping coverage is required for users to be able to move throughout the service area and reliably "hand-off" between cells to maintain uninterrupted connections.

AT&T is expanding and enhancing their 4G LTE high-speed wireless broadband services throughout New England by filling in existing coverage gaps and addressing capacity, interference, and high-speed broadband issues. In addition to improving 4G LTE coverage for AT&T customers, AT&T is also building, managing and operating the National Public Safety Broadband Network using FirstNet's 700 MHz Band 14 spectrum, in order to provide prioritized, preemptive wireless services for first responders across Connecticut, New England and nationwide.

Due to terrain characteristics and the distance between the targeted coverage area and the existing sites, AT&T's options to provide services in this area are quite limited (maps of the terrain in this area and the distance to neighboring AT&T sites from the proposed site are included as Attachments 1 & 2, respectively). AT&T's network requires deployment of antennas throughout the area to be covered. These antennas are connected to receivers and transmitters that operate in a limited geographic area known as a "cell." AT&T's wireless network, including their wireless handsets and devices, operate by transmitting and receiving low power radio frequency signals to and from these cell sites. The signals are transferred to and from the landline telephone network and routed to their destinations by sophisticated electronic equipment. The size of the area served by each cell site is dependent on several factors, including the number of antennas used, the height at which the antennas are deployed, the topography of the land, vegetative cover and natural or man-made obstructions in the area. As customers move throughout the service area, the transmission from the portable devices is automatically transferred to the AT&T facility with the best connection to the device, without interruption in service provided that there is overlapping coverage from the cells.

In order to define the extent of the coverage gap to be filled, both propagation modeling and real-world drive testing has been conducted in the area of New Britain. Propagation modeling uses PC software to determine the network coverage based on the specific technical parameters of each site including, but not limited to, location, ground elevation, antenna models, antenna heights, and also databases of terrain and ground cover in the area. Drive testing consists of traveling along area roadways in a vehicle equipped with a sophisticated setup of test devices and receivers that collect a variety of network performance metrics. The data are then processed and mapped in conjunction with the propagation modeling to determine the coverage gaps.

¹ The threshold range differences between the 700 MHz and 1900 MHz frequency bands directly correlates to the type branch diversity receivers deployed in AT&T's receiver design.

Analysis of the propagation modeling and drive testing in New Britain reveal that AT&T's network is unreliable throughout much of the area due to gaps in coverage, and that there is a service deficiency as a result. In order to fill in these coverage gaps and improve the network reliability to New Britain, a new facility is needed in the area.

Included in this report are Attachments 1 through 5, which are explained below to help describe AT&T's 4G network deployment in and around New Britain, and the need for the proposed facility.

- Attachment 1: "*CT1430 Area Terrain Map*" details the terrain features around the area of deficient service being targeted by the proposed site in New Britain. These terrain features play a key role in determining site designs and dictating the unique coverage achieved from a given location. This map is included to provide a visual representation of the ridges and valleys that must be considered when siting a wireless facility. The darker green and blue shades correspond to lower elevations, whereas the orange, red and white shades indicate higher elevations.
- Attachment 1: "*CT1430 Neighbor Site Data*" provides site specific information of existing neighboring sites used to perform the coverage analysis provided in Attachments 1 and 4.
- Attachment 3: "*CT1430 Existing 700 MHz LTE Coverage*" for the Current AT&T Network depicts 700 MHz LTE coverage from existing sites and demonstrates that there are currently gaps in 700 MHz LTE coverage effecting service within the targeted area. The coverage shown is where the signal strengths are: > -83 dBm (minimum level required reliable, high quality service and performance at 700 MHz) and, > -93 dBm (minimum required for adequate level of service at 700 MHz). In an effort to provide the required levels of coverage to these areas, AT&T is proposing to install a wireless facility at the Osgood Avenue location.
- Attachment 4: "*CT1430 Existing 700 MHz LTE Coverage with Proposed Site*" shows how this proposed site would fill in the existing coverage gaps and improve AT&T's 700 MHz LTE network.
- Attachment 5: *Connecticut DOT Average Annual Daily Traffic Data* – New Britain shows the available vehicular traffic volume data for the subject area from the Connecticut Department of Transportation. This data shows as many as 9,200 vehicles per day passing through Farmington Avenue adjacent to the proposed site.

Table 1 below lists the coverage statistics compiled for the AT&T's 700 MHz 4G LTE network with the deployment of the Proposed Site.

	Incremental Coverage from Proposed Site (700 MHz)	
Population:²	(\geq -83 dBm)	5,089
	(\geq -93 dBm)	1,456
Business Pops:³		
	(\geq -83 dBm)	410
	(\geq -93 dBm)	86
Area (mi²):		
	(\geq -83 dBm)	0.59
	(\geq -93 dBm)	0.21
Roadway (mi):		
	Main (-93 dBm):	0.3
	Secondary (-93 dBm):	3.9
	Total (-93 dBm):	4.2

Table 1: Coverage Statistics

² Population figures are based upon 2010 US Census Block Data

³ Employee population counts are based upon the 2011 U.S. Census Bureau LEHD database.

4. Conclusion

AT&T has identified an area of deficient coverage affecting a significant portion of New Britain CT, including key traffic corridors through the residential and business/retail areas of the Town. Candidate "CT1430" will bring the needed fill-in coverage to significant portions of Farmington Avenue and Eddy Glover Boulevard and the residential neighborhoods and business/retail areas in the vicinity of the proposed location

No existing structures were identified and available that would be able to satisfy the coverage requirements needed for this area.

As discussed in this report and depicted in the attached plots, the proposed interim AT&T site will provide a substantial portion of the coverage being lost to the "Target Area" while maintaining effective connectivity to the rest of AT&T's existing network. In addition to providing improved LTE service to AT&T's customers throughout the targeted areas of New Britain, AT&T is providing enhanced services for first responders through the implementation of FirstNet's National Public Safety Broadband Network ("NPSBN").

5. Statement of Certification

I certify to the best of my knowledge that the statements in this report are true and accurate.



Martin J. Lavin
C Squared Systems, LLC

October 23, 2020

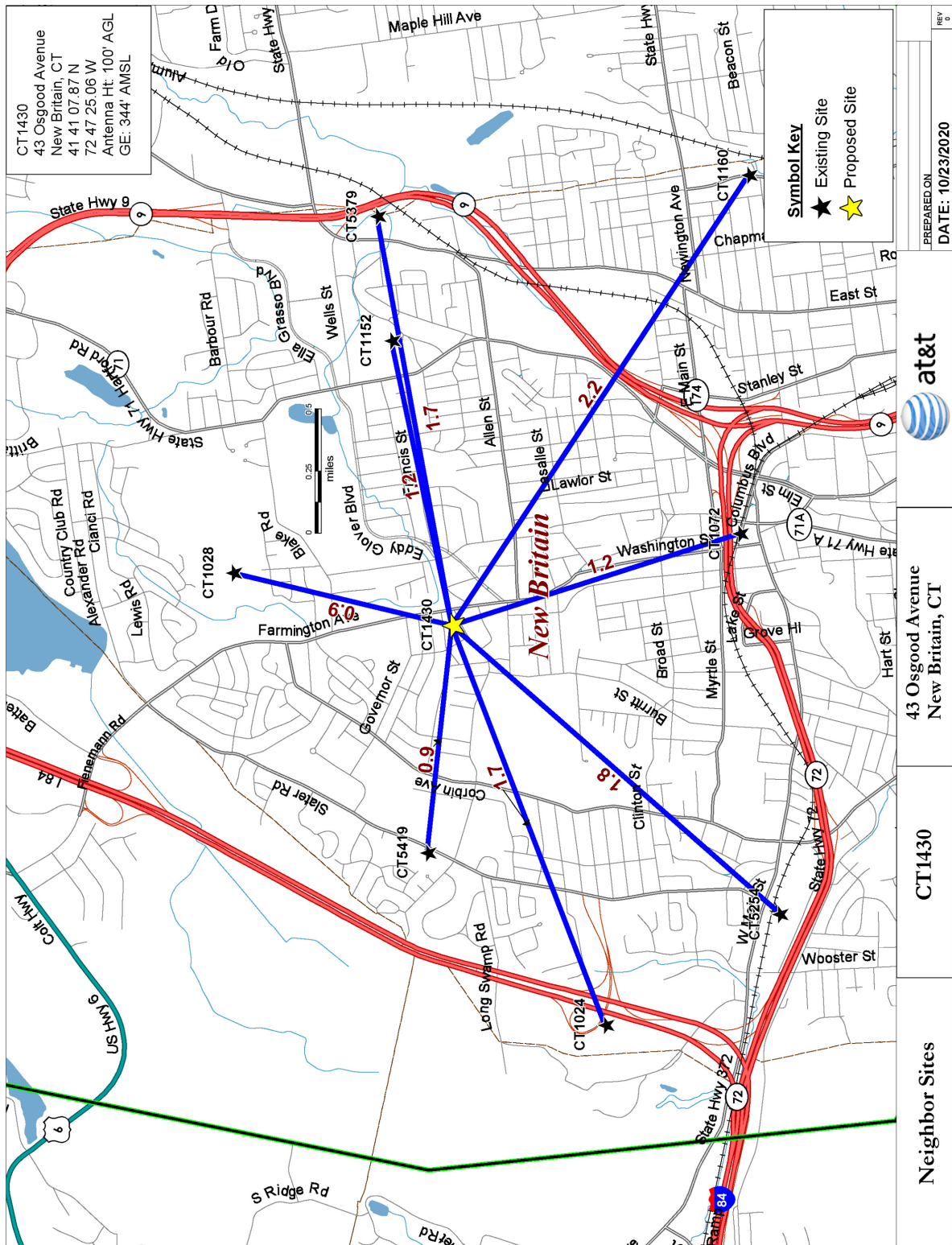
Date

6. Attachments

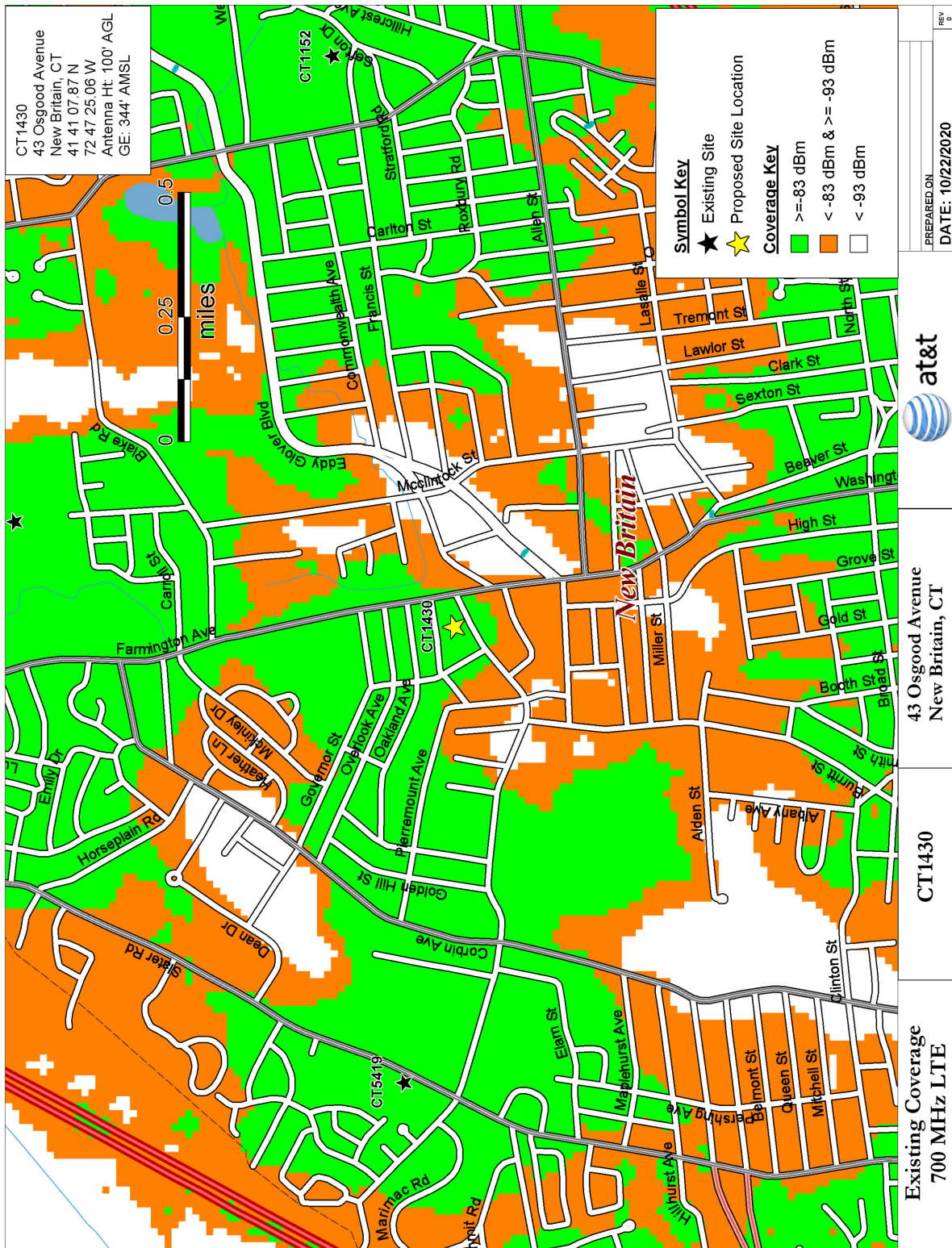


Attachment 1: CT1430 Area Terrain Map

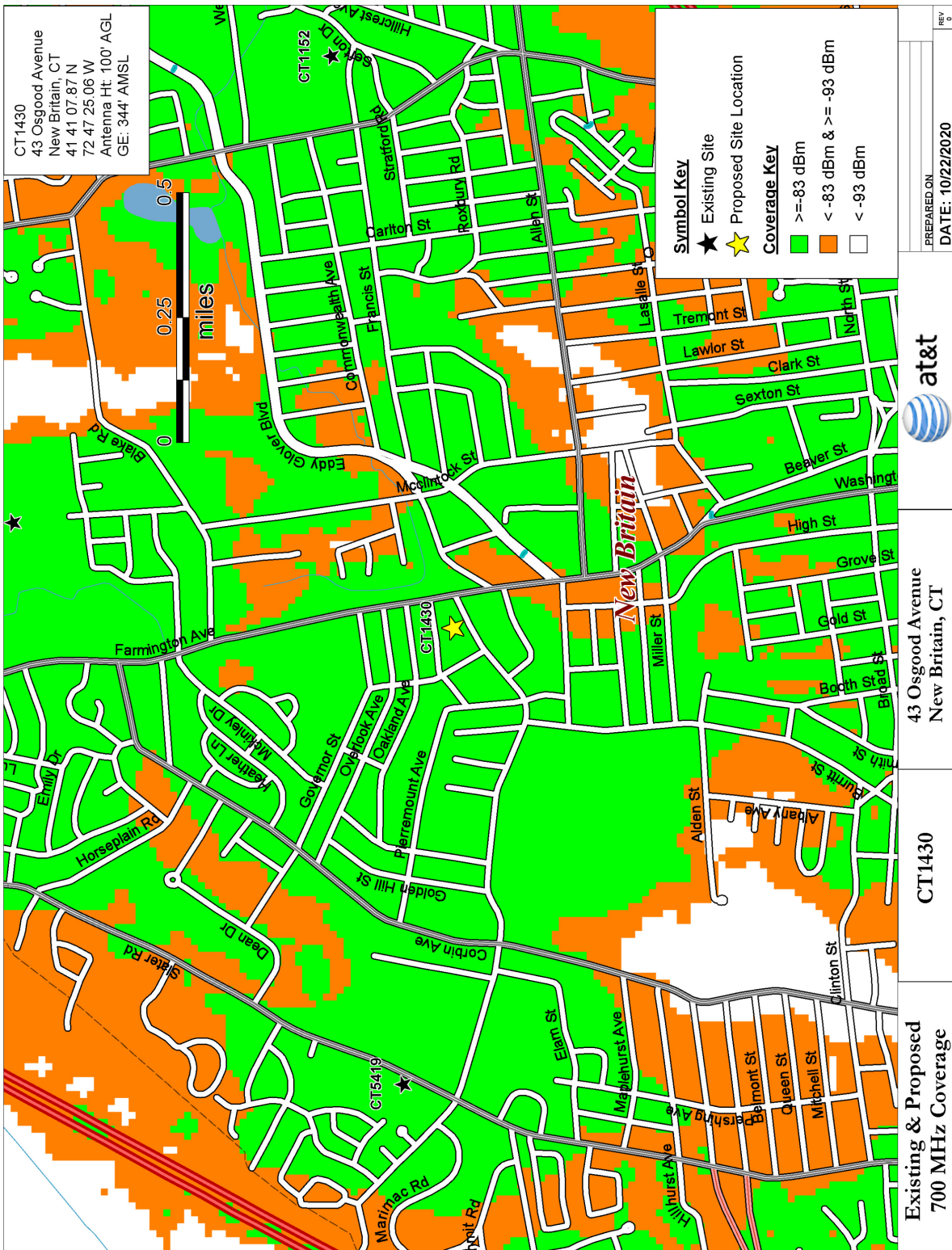
Site Name	Address	City/State	Location		Antenna Height (ft AGL)	Ground Elevation (feet)
			Latitude	Longitude		
CT1024	10 Loon Lake Road	New Britain	41.6766	-72.8214	100	350
CT1028	723 Farmington Avenue	New Britain	41.6983	-72.7862	98	306
CT1072	35 Washington Street (Columbus Boulevard)	New Britain	41.6687	-72.7831	116	180
CT1104	45 Maple Ridge Drive	Farmington	41.7180	-72.7693	88	233
CT1152	60 Paul Manafort Drive	New Britain	41.6889	-72.7685	84	154
CT1160	Belden Street	New Britain	41.6682	-72.7552	114	56
CT2337	263 Farmington Avenue DUP 1	Farmington	41.7299	-72.7904	150	421
CT2585	1500 New Britain Ave	West Hartford	41.7230	-72.7627	52	185
CT5194	200 Stanley Street	New Britain	41.6539	-72.7693	195	104
CT5254	1 Hartford Square	New Britain	41.6664	-72.8128	162	237
CT5255	130 Birdseye Road	Farmington	41.7158	-72.8106	131	413
CT5379	178 Lester Street	New Britain	41.6899	-72.7584	189	86
CT5403	605 Willard Avenue	Newington	41.6994	-72.7366	157	112
CT5419	732 Slater Road	New Britain	41.6862	-72.8086	51	403



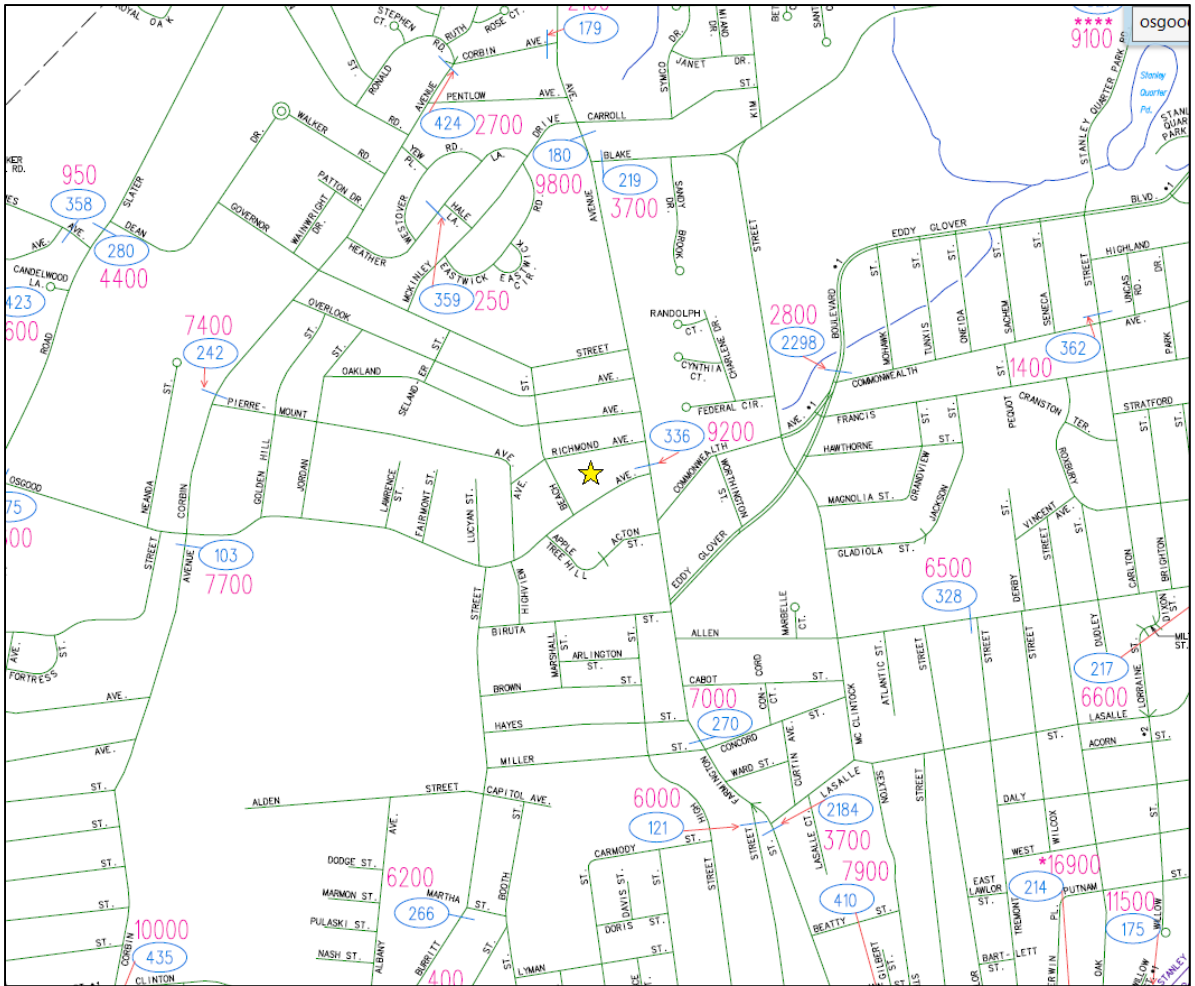
Attachment 2: CT1430 Neighbor Site Data



Attachment 3: CT1430 Existing 700 MHz LTE Coverage for the Current AT&T Network



Attachment 4: CT1430 Existing 700 MHz LTE Coverage with Proposed Site for the AT&T Network



Attachment 5: CT1430 Connecticut DOT Average Annual Daily Traffic Data – New Britain