ATTACHMENT 3

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AT&T – Proposed Tower Alternatives
171 Short Beach Road, Branford, CT
Or 82 Short Beach Road, East Haven, CT

DAS Suitability Analysis

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1. Introduction

C Squared Systems, LLC has been asked to consider the application of a Distributed Antenna System ("DAS") as an alternative to a more traditional tower facility ("macro-site") to serve the coverage needs in Branford and East Haven, CT. Presented below is a discussion of DAS in general, and its relation to the specific coverage objectives within the Town of Branford and Town of East Haven.

As the name implies, a DAS utilizes multiple antennas distributed over an area to provide coverage from one or multiple base stations. In order to connect the remote locations (nodes) to the centralized base station, these systems typically convert RF (radio frequency) signals into light signals, and use fiber optic cables as a means for transport throughout the system. The remote nodes consist of equipment needed to convert the optical signals back to RF, along with coaxial cables and antennas to transmit the RF into the surrounding area.

The DAS and associated equipment is usually designed and maintained by a neutral hosting company to support multiple wireless carriers interested in serving a given area. This is accomplished with a centralized Hub location where the various carriers install their base station and "plug" into the DAS.

A DAS is commonly used by the Cellular and PCS wireless carriers as a solution to serve discreet, hard to reach areas with large call volume that cannot be covered with traditional outdoor macro sites. Examples of such typical applications are stadiums, large office complexes, University campuses, and select portions of major roadways and transportation tunnels.

2. Wide Area Outdoor DAS Infrastructure Requirements

A wide area outdoor DAS introduces additional challenges over those presented in the typical DAS applications mentioned above. The DAS objective will be spread out over a greater region than a system designed to cover a concentrated area. Therefore, the remote node locations will range over a larger area and require both a support structure and rights to access/install the equipment at each location. Both of these challenges can be addressed by entering into an agreement with a municipality or utility company to make use of their existing public rights-of-way to mount the remote equipment directly onto support structures such as light poles or utility poles. In some cases, structurally insufficient utility poles may have to be replaced or new ones built in the right-of-way to accommodate the additional load of the DAS node equipment, coaxial cables, and antennas. Areas without utility poles would require new structures to support the equipment.

A centralized Hub location is also needed for locating the carrier base stations and DAS "head-end" equipment to distribute base station signals to the remote nodes.

In addition to securing access to appropriate Hub and node locations, fiber optic cable is needed to connect each remote unit to the Hub equipment. In many cases, fiber optic cable is not available; therefore new cable may need to be installed for the DAS.

3. Macro-Site Comparison to Theoretical DAS Application for East Haven and Branford, CT

North Atlantic Towers is proposing to construct a wireless facility within East Haven or Branford, CT to serve a wireless coverage gap that spans significant portions of both Towns. The facility would consist of a monopole or other support structure within a fenced compound designed to accommodate multiple wireless carriers serving the area. This type of installation is commonly referred to as a "macro-site" in the sense that a singular site is used to provide coverage over a broad area. The proposal is intended to provide wireless service to areas of western Branford and eastern East Haven presently underserved from existing wireless facilities. The areas of interest include Rt. 142, Alps Road and the surrounding neighborhoods, and neighborhoods along the shoreline.

The central idea of an outdoor DAS is to utilize numerous smaller structures to provide comparable coverage to that of a taller macro-site. However, in some cases, limitations of an outdoor DAS will prevent it from providing the same coverage as a macro-site. As indicated above, a DAS will typically use utility structures to support the node equipment with antennas mounted to the top of the poles. Generally speaking, this limits the antenna height to approximately 30'-35' AGL. In an area such as Branford or East Haven, this would place the antennas below the tree-line and drastically hinder the coverage provided from each node location. The utility and light poles are located directly along the roadways therefore, the coverage from each node would be somewhat restricted to line-of-sight areas along the roads only, and would be severely limited to homes and other buildings set back from the tree-lined roads.

This height limitation becomes a key drawback to using a DAS as a substitute to a macro-site. A properly designed macro-site will be tall enough to support antennas at heights above the surrounding trees and other obstructions. This is necessary to cover a broad area by allowing the RF signals to reach distant areas without being attenuated by the nearby, surrounding obstructions. In the case of antennas mounted on utility poles in a suburban area, the typical tree heights and the heights of some structures will limit the coverage provided from the nodes to directions that are unobstructed, i.e. directly up and down the adjacent roadways.

Because the coverage objectives of the proposed macro-site is to provide needed service to a broad geographic area and not limited to just one or two roadways, a wide area DAS is likely to create coverage gaps to many residents throughout town, as well as secondary streets.

In addition to the coverage differences, there is also the obvious trade-off in the overall visibility of the two different types of coverage solutions. As previously mentioned, each node requires its own set of equipment to convert the optical signals from the Hub, into the RF signals communicating with the end users. This equipment consists mainly of an equipment box typically mounted directly to the utility pole, one or multiple antennas mounted above the top of the pole, and coaxial cables connecting the transmitters in the equipment box to the antenna(s). Shown below in Figures 1 & 2 are photos from existing DAS nodes in Andover, MA and are representative of what these remote nodes typically look like. The particular set of equipment shown supports technologies at both cellular and PCS frequencies. As next generation networks such as WiMAX (Worldwide Interoperability for Microwave Access) and LTE (Long Term Evolution) are deployed at different frequency bands by the carriers, additional or larger boxes would be needed to support these services. Additionally, technologies such as LTE require multiple antennas in order to maximize the use of this technology. This could require either more nodes or antennas with significant separation on the pole. Comparable photo simulations of the proposed macro-sites are included as part of this Application and therefore have not been included here.

Figure 1: Typical DAS Node[1]

[1] This installation includes 2 separate antennas for the tenants' different operating frequencies. Some DAS configurations may use a single, multi-band antenna to accommodate the different frequencies in use by the tenants.

Figure 2: Typical DAS Node Equipment

Due to the overall coverage limitations of the nodes created by the limited power and height, they must be strategically located to deliver the largest extent of coverage to the objective as possible, while minimizing the overall number of nodes required in doing so. Depending on the specific area being covered, the nodes could be located anywhere from sparsely populated sections of the roadways of interest, to immediately adjacent to residential properties.

Other variables and criteria for the DAS could eaily increase the number of nodes that are required. For example, including other frequency bands that are licensed by many of the major wireless providers will add more antenna nodes locations to overcome the higher path loss associated with PCS, AWS and WiMAX frequency bands. In addition, since the available power at each node needs to be shared by all carriers on the DAS, including other carriers that would be looking to provide service to this same area would drastically reduce the coverage range from each node; resulting in an even higher number of nodes being required. The uncertainty of these variables makes a DAS solution in East Haven and Branford, CT an unrealistic option to satisfy the numerous coverage objectives.

4. Summary

The coverage needs within East Haven and Branford, CT encompass a broad area that includes Rt. 142, secondary streets such as Double Beach Rd. and Alps Rd., as well as the adjacent residential dwellings. As previously explained, a properly located macro-site facility on Short Beach Rd will cover much of the deficient service areas in south-western Branford. Because of the coverage limitations inherent to typical outdoor DAS systems explained above, the resulting coverage provided would be mainly restricted to immediately along the roadways where the individual nodes are located. In light of these factors with respect to the broad area coverage requirements, it is our opinion that a DAS solution would not be appropriate to address the coverage needs in East Haven and Branford or in other areas with similar characteristics and coverage needs.

5. Statement of Certification

I have reviewed this report and hereby certify that the methods used to produce the conclusions in this report are in accordance with standard industry practices.

Tony Wells
C Squared Systems

March 23, 2012
Date