Exh. 1

Isotrope WIRELESS

Thinking outside the sphere

ASSESSMENT OF OPTIONS FOR THE PLACEMENT OF A WIRELESS FACILITY IN THE VICINITY OF NORTH MIANUS IN GREENWICH, CONNECTICUT

February 28, 2011

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INTRODUCTION

BACKGROUND

Wireless "cellular" communications have been part of our technological landscape since the 1980's. The two original cellular companies in each market area launched competitive services. Policymakers in Washington, DC recognized the tremendous potential of wireless communications and decided to foster a more competitive marketplace. In the late 1990's in addition to the radio spectrum already assigned to cellular services, the Federal Communications Commission put another piece of the radio spectrum up for auction. This was called Personal Communications Service ("PCS"). Billions of dollars were put into the US Treasury by incumbent carriers and by new companies entering the wireless marketplace. This additional spectrum and competition, in conjunction with the newly arrived all-digital wireless technology, turned the heat up on the marketplace.

In 1996, Congress passed the Telecommunications Act of 1996 ("TCA"), an omnibus change to telecommunications regulations nationwide, designed to foster growth and competition both in wireless and in land-line telecommunications. The most salient part of the TCA for the purposes of this report is the fact that the TCA explicitly balances two competing policy objectives. The TCA states clearly that the federal government does not preempt local zoning authority. However, the TCA makes it clear that while local (and state) zoning can regulate the placement, construction and modification of wireless facilities, state and local authorities may not be so restrictive as to "effectively prohibit the provision of personal wireless services." Further, local (and state) zoning may not regulate the placement of wireless facilities on the basis of their radio wave emissions, as long as the facilities comply with federal standards.

The federal policy goal of a robust, competitive marketplace of wireless services available to nearly all people is bearing out. Recent statistics from governmental and industry sources paint a bright picture for wireless communications. Those households with no wireless subscriptions are reported to be less than 20% of all USA households. At the same time, another segment of the marketplace, also about 20% of households, and growing, has no traditional telephone "land line" at home. As of two years ago, there

were 280 million subscribed wireless telephone numbers in the USA. Even allowing for some of those phone numbers to be for business or industrial applications, it is sobering to realize that the population of the USA is around 310 million, a 90% penetration ratio. Further, it is reported that more than 70% of all wireless data traffic comes from inside a building. The FCC reported last year that penetration of wireless phones among teenagers nationwide was about 80%.

Data is the new driver of wireless telecommunications growth. Smart phones are flying off the shelves. New models are announced almost weekly. Subscribers are texting, tweeting, friending, emailing, browsing, playing, streaming, downloading, skyping and searching with their wireless devices. Depending on the source, smartphone penetration is said to be at 30 to 50% of all subscribers in the USA and wireless data traffic is on a steep growth curve, nearly tripling in usage each year.

It is in light of this explosion of consumer use of wireless communications that presents a challenge to municipalities in the coming years. PWS providers are working to provide better coverage to residential areas, schools and businesses for these reasons:

- Better signal quality is needed to reach inside buildings more reliably;
- Residential phone and data use shows continuing steep growth;
- Providers need to keep up with exploding data capacity demands;
- Parents want their children to be able to call home from school or after-school activities;
- Wireless carriers are under a federal mandate to provide phone locations when 911 is dialed.

The Town of Greenwich has embarked on the path of smart-growth planning for the placement of wireless facilities. This report is the result of one of the Town's initiatives to grasp the issues and guide the development of low-to-no impact wireless facilities in Greenwich.

PROJECT

Isotrope, LLC was engaged by the Town of Greenwich, Connecticut ("Town") to provide an assessment of personal wireless service facility siting opportunities in and near North Mianus. Licensed personal wireless service ("PWS") provider, T-Mobile, is preparing to apply to the Connecticut Siting Council to place an 80 foot tall monopole structure for the installation of a PWS facility ("PWSF") on a privately owned parcel at 328 Palmer Hill Road ("328 Palmer Site"). T-Mobile has a lease option with the property owner.

Some residents of the Town have raised objections to the placement of the proposed PWSF at the 328 Palmer Site. The Town conducted a preliminary search for potential alternative locations, and conferred with T-Mobile on the issue. A potential alternative was identified on a Town-owned site ("129 Bible St Site") ¾ mile west-south-west of the 328 Palmer Site. T-Mobile indicated a 160 foot tall tower would be necessary at the 129 Bible St Site to compensate for the ¾ mile distance and the intervening terrain between the 328 Palmer Site and the 129 Bible St Site.

The Town sought independent expert review of the PWS coverage options for the North Mianus area. While there is a focus on the 129 Bible St Site, because there has been dialog with T-Mobile on it, the Town sought expert advice not only on the 328 Palmer Hill and 129 Bible St Sites, but also on other potential ways of placing one or more PWSFs to address T-Mobile's coverage objectives in and around North Mianus with the least adverse impacts possible.

This document reports on the assessment performed by Isotrope, LLC during the month of January 2011. It consists of two major sections: Wireless Coverage and Site Geography. The Wireless Coverage section is first, providing a tutorial on wireless terminology and coverage map reading before delving into the evaluation of existing T-Mobile coverage and new coverage options. The Site Geography section closes the loop. It may be informative to just look at the various coverage options; however, a decision on how to proceed must balance the coverage opportunities with the relative benefits and detriments of the various facility siting options. Site Geography evaluates some of the siting characteristics of each potential site.

The sites considered in both sections of this report are listed in Table 1.

Map Label Name	Site Elevation Ft AMSL	Notes
328 Palmer Site	43	Orange star (Figure 6 - Locations of Sites Considered)
129 Bible St	108	Former vegetation compost area
130 Bible St	109	Site of existing development, land disturbance, and active use
54 Bible Street	30	Ball field, Mianus
Valley Road Water Tank	81	Water treatment plant on Mianus River
1114 East Putnam Avenue (Rt. 1)	74	Across street from existing 1111 East Putnam site
St Catherine	69	A couple of blocks from existing 1111 East Putnam site
Brennan Golf Course	32	Opposite side of ridge, Stamford
DAS Network	N/A	Utilize utility poles to distribute numerous smaller antennas around the area

Table 1 - Sites Considered

WIRELESS COVERAGE

This study concentrates on the area in and around North Mianus. T-Mobile's serious consideration of the 328 Palmer Site for an 80 foot tall PWSF tower instigated the search for alternatives. This Wireless Coverage section assesses potential sites for wireless facilities in terms of their ability to provide wireless coverage to general area of North Mianus.

On a larger scale, the 328 Palmer Site is only one piece of the overall deployment puzzle of the T-Mobile wireless network in Greenwich. In searching for alternatives there are two complementary approaches to consider. First is "substitution" – to look at the locations in Greenwich that the 328 Palmer Site is projected to provide substantially improved coverage to. Then consider ways to place alternative facilities that would substantially substitute for the 328 Palmer Site. The second approach to consider is "reconfiguration" – whether one or more alternative facility placements could provide not only substitution coverage in North Mianus, but also to serve a larger area of Greenwich that T-Mobile will be attempting to improve service to in the future.

The goal of the search for substitution sites is to find the least objectionable way to obtain the improved service in the targeted area. The goal of the reconfiguration search is not only to find the least impactful location for improving service to North Mianus, but also to find the best way to distribute facilities, now and into the future, for overall service to a greater area with the least overall impacts.

TERMINOLOGY

To assist with the common understanding of this report, and wireless issues in general, some definitions will be helpful. At the outset, this report identified two initializations – PWS and PWSF. These terms are the roots of wireless facility siting matters. Under the federal Telecommunications Act of 1996 ("TCA"), a class of services called *personal wireless services* is given some protections in the "placement, construction, and modification" of the *facilities* necessary to provide a robust, competitive and nationwide service.

PWS – Personal Wireless Service. The service regulated by the FCC and granted protections to certain license holders for the provision of service. The TCA specifies that states and their municipalities shall not act to prohibit or effectively prohibit the provision of personal wireless services (PWS). T-Mobile is a PWS provider.

PWSF – Personal Wireless Service Facility. In order to provide PWS to the public, PWS providers must build a network of facilities. The TCA says municipalities may regulate the "placement, construction and modification" of personal wireless service facilities (PWSFs) within certain limits. T-Mobile is considering placing a PWSF at the 328 Palmer Site.

The TCA also precludes unreasonable discrimination against providers of functionally equivalent services. The TCA further precludes regulation of the placement, construction and modification of personal wireless services on the basis of their radio emissions, provided those emissions comply with the FCC safety standards. Otherwise, the TCA explicitly aims to protect the rights of zoning authorities to regulate PWSFs.

The Connecticut Siting Council ("CSC") has jurisdiction in Connecticut over new tower placements for PWSFs. The TCA informs and influences the actions of the CSC. The CSC must comply with the TCA. Judging from the new tower approval/denial ratio of the CSC, it appears the CSC has by and large forestalled federal litigation from wireless carriers by approving or approving with conditions nearly all the proposed PWSF towers that come before the CSC. This relatively permissive approach to new PWSF tower siting in Connecticut avoids testing the limits of the federal TCA and the cumbersome litigation that would result.

This brings the discussion to some other common terminology. People often mistakenly use the term "cell tower" to identify any installation of wireless antennas whether on a tower, a rooftop, in a steeple, or other structure. A better way to identify wireless installations is to use the term "wireless facilities", which is an informal term for PWSFs. Generally, each carrier has a PWSF at a building, structure or a tower site. A tower with six carriers' systems installed on it has six PWSFs.

A tower is a tall structure that is not habitable and is designed for supporting something high above the ground (fire tower, water tower, lookout tower and cell tower, for instance). A cell tower is for PWS antennas. Cell towers are usually a "lattice tower" or a "monopole" (Figure 1). Lattice refers to the familiar open frame structure with legs and cross struts. A monopole is a tower made of a tall tubular steel pole. Monopoles with concealed antennas are often called "unipoles" (See Figure 1, also Figure 24). Monopoles with faux tree branches are often called "monopines."

Not all PWSFs utilize towers. In fact, as the wireless industry continues its rapid market growth rate, more and more PWSFs are installed at existing structures. The coverage areas of new PWSFs are often sandwiched between coverage areas of existing facilities. Consequently, the height of a local structure may be sufficient to obtain the desired coverage without resorting to a new tower.

When towers or existing structures are utilized for the placement of one or more PWSFs, the FCC refers to this as "collocation." This definition applies to any existing structure, whether or not there is a PWSF already on site. For example, "that wireless carrier will be the first carrier to collocate on the steeple."

In municipal regulations, a variant of the word is often used with a slightly different meaning: "Co-location" is often defined as the use of a particular structure with 2 or more PWSFs. Each carrier on that structure is said to co-locate on the structure with other carriers.

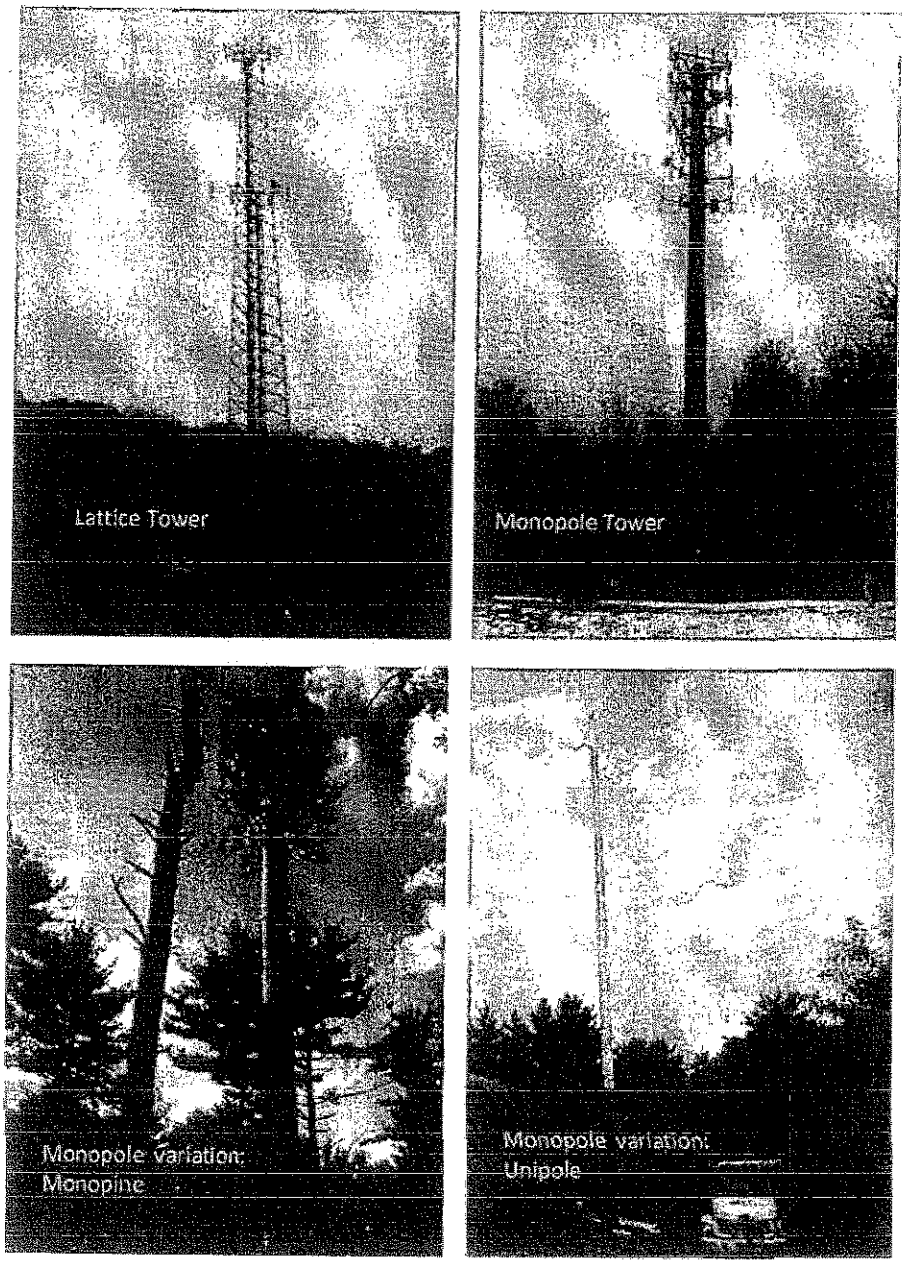

Figure 1 – Common Types of Cell Towers

Because this ambiguity is sometimes confusing in an application processes, Isotrope recommends that the municipal meaning of co-location be retired, and to use a new, self-evident term – "Site-Sharing." For example, "the new wireless carrier proposes to Site-Share on the existing cell tower that already has two carriers."

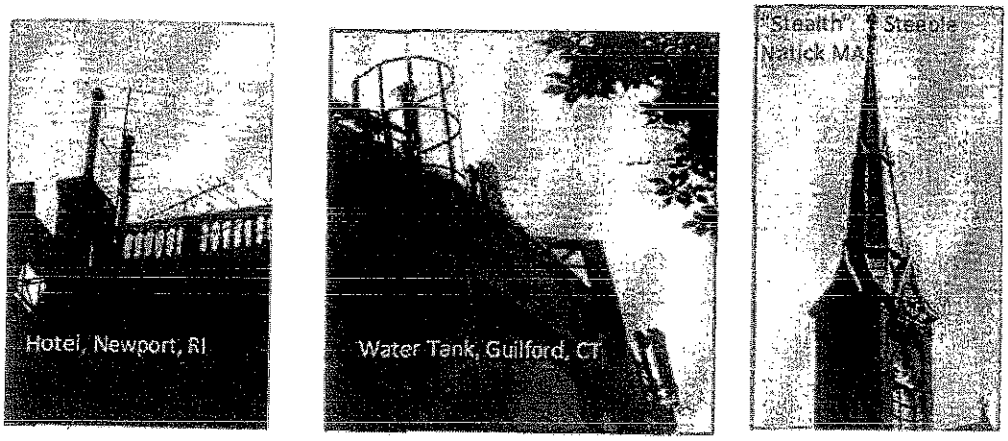

Figure 2 – Examples of PWSF Antenna Collocation

There are two primary factors that affect the provision of services: coverage and capacity.

The capacity of a PWSF is the maximum volume or quantity of services that can be provided simultaneously to all subscribers connected to a given PWSF. Traditionally, capacity issues are most prevalent in locations with a high density of subscribers such as, urban areas, major commuter highways, or stadiums. Primarily, however, it is *coverage*, of one form or another that drives new PWSF development.

"Coverage" is another term that deserves explanation. The TCA focuses on "the provision of personal wireless services" and is silent on "coverage." Coverage is shown on maps. The area(s) on a map where the signal from a PWSF is expected to be above a specified signal level is given a certain color.

Figure 3 is a map of coverage in and around North Mianus. There are existing wireless facilities marked in blue dots on the map. The coverage from those facilities is shown in two shades of green. The dark shade of green represents a stronger signal level than the light shade. Where there is no green (just the background color), the signal levels are expected to be weaker than the thresholds set for the colored areas.

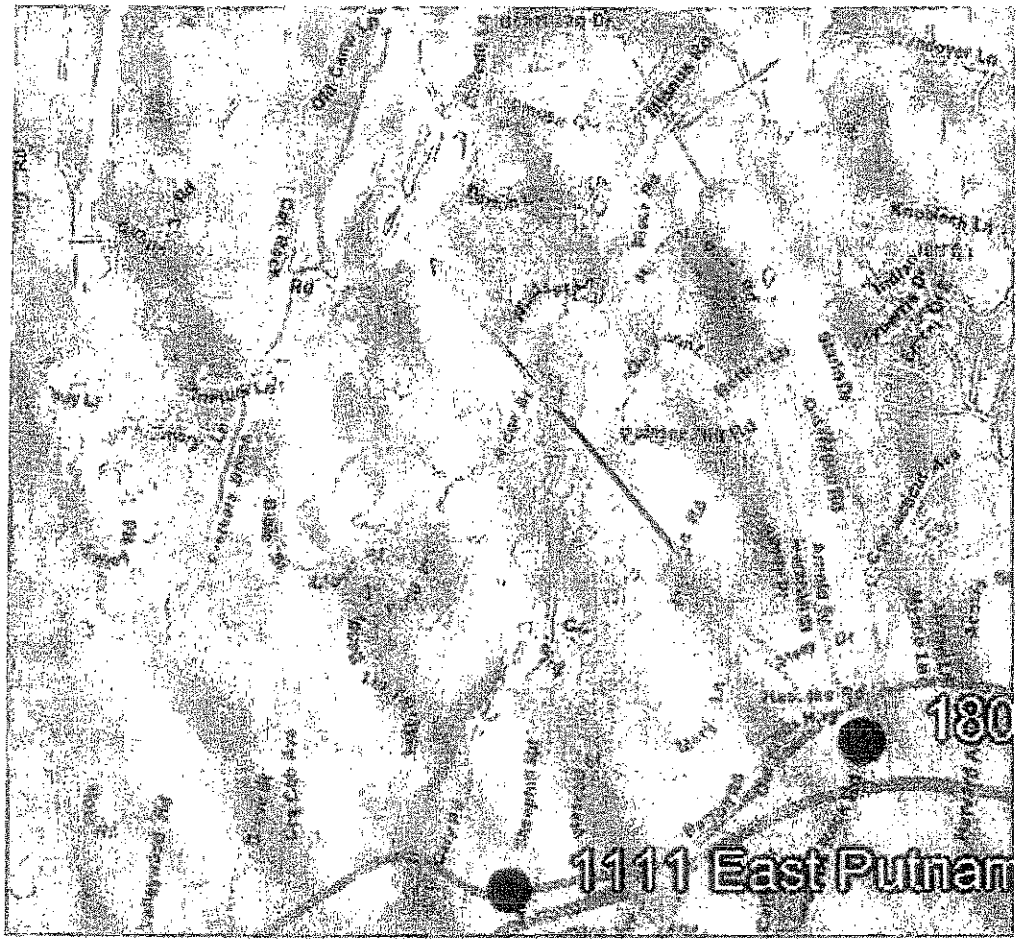

Figure 3 - Example of a Coverage Map

Coverage maps like Figure 3 are generated by a computer. The computer is given a digitized topographical map and another digitized map of the characteristics of the "land cover." The surface features – various kinds of vegetation plus the presence of buildings and water – have an effect on the movement of radio waves ("propagation") in the environment. The computer uses the terrain and land cover data to calculate how well the wireless signals propagate to various points on the map. Computer modeling of coverage is a statistical process; no computer coverage map is an exact representation of the actual coverage at a single spot at a given time. Collectively, all the individually calculated color dots on the map are intended to provide a good sense of the typical or average coverage conditions.

Showing two or more color ranges on a coverage map helps the reader understand how the signal levels degrade as the radio waves propagate away from the cell site. The short arrow on the right in

Figure 3 illustrates how the signal from the cell site can be obstructed by the terrain. The signal follows the path of the short arrow and very quickly degrades from dark green to light green to no color. The transition occurs at a relative high point in the terrain. The area beyond the short arrow is said to be "in shadow" because the hill is blocking the signal to the northeast. (Other factors are also involved, but in this case the terrain is the dominant factor). If the antennas at site "180" were higher, the coverage past the hill might improve.

The leftmost and longest arrow on Figure 3 depicts a more complicated path. The signal reaches to Florence Road well, until the terrain drops on the opposite side of Florence Road, and the signal is in shadow approaching the Mianus River. Then as the terrain rises on the opposite side of the river, the signal is picked up again because the terrain is no longer blocking it. This additional coverage across the river is a coverage patch that stands alone or nearly so from the coverage of other facilities.

Continuing out across the coverage patch, the signal level drops to a relatively wide light green area at the far edge, before it drops to no color. Remote patches of coverage can be helpful in the absence of a nearby facility. However, they create a situation where connections can drop when the subscriber exits the area of the of the coverage patch.

The colors on the coverage map are often chosen to indicate threshold signal levels. For instance, T-Mobile typically uses a signal level of -76 dBm to depict "reliable in-building coverage." That means if the signal level outdoors is at or above -76 dBm, then –as we understand it– T-Mobile is satisfied it will have excellent coverage inside residences. Signals lose strength passing through building surfaces. This is the dark green in Figure 3.

The light green spans out to include signal levels to -84 dBm. Because these are negative numbers, -84 dBm is a weaker signal than -76. T-Mobile typically uses -84 dBm as their threshold for "reliable in-vehicle coverage." A signal level outdoors of -84 dBm or greater is regarded by T-mobile as excellent in-vehicle coverage. On the average, signals lose less strength passing into cars than they do passing into houses. This means that both the dark green and the light green areas are desirable to T-Mobile for providing service to subscribers in vehicles.

Finally, the meaning of the areas with no color must be understood. It is not the case that there is "no coverage" in the uncolored areas. It is just that the computer model has been set to show "coverage" only if the predicted signal strength is better than -84 dBm. There is signal strength in the uncolored areas past the light green. The signal strength would be less than -84 dBm, but by how much one cannot be certain. Signal levels less than -84 dBm can provide coverage into vehicles and residences, just with less reliability than at the thresholds selected by T-Mobile. It is only when the signal levels drop to substantially lower levels that the service becomes very unreliable.

EXISTING COVERAGE

The current carrier of interest is T-Mobile. Isotrope gathered public records to identify the existing T-Mobile PWSFs in and around North Mianus. The CSC website makes available two key characteristics: tower location and antenna height. Isotrope contacted T-Mobile to obtain additional information about T-Mobile's antenna types, orientations and power levels. T-Mobile indicated a willingness to provide the data. However, the short time frame within which this assessment was conducted did not synchronize with the amount of time T-Mobile required to provide the information.

Lacking specific antenna characteristics, Isotrope used transmitted power levels that are typical of the T-Mobile and other PCS services in the northeast. Consequently, the Isotrope maps are generally indicative of the coverage that *could* be obtained from T-Mobile's cell sites, and they are not representations of T-Mobile's actual coverage. For the purposes of the present analysis, these approximations will be sufficient to examine the effects of terrain, distance and vegetation on T-Mobile coverage from various existing and potential sites.

Figure 3 is a detail view of Isotrope's map of the coverage available from existing T-Mobile cell sites. Note how the area surrounding the lower elevations of Palmer Hill Road and the nearby section of the Mianus River appears to be in a "pocket" of coverage that is less than T-Mobile's threshold. In other words, this area is substantially without T-Mobile's desired green levels of coverage.

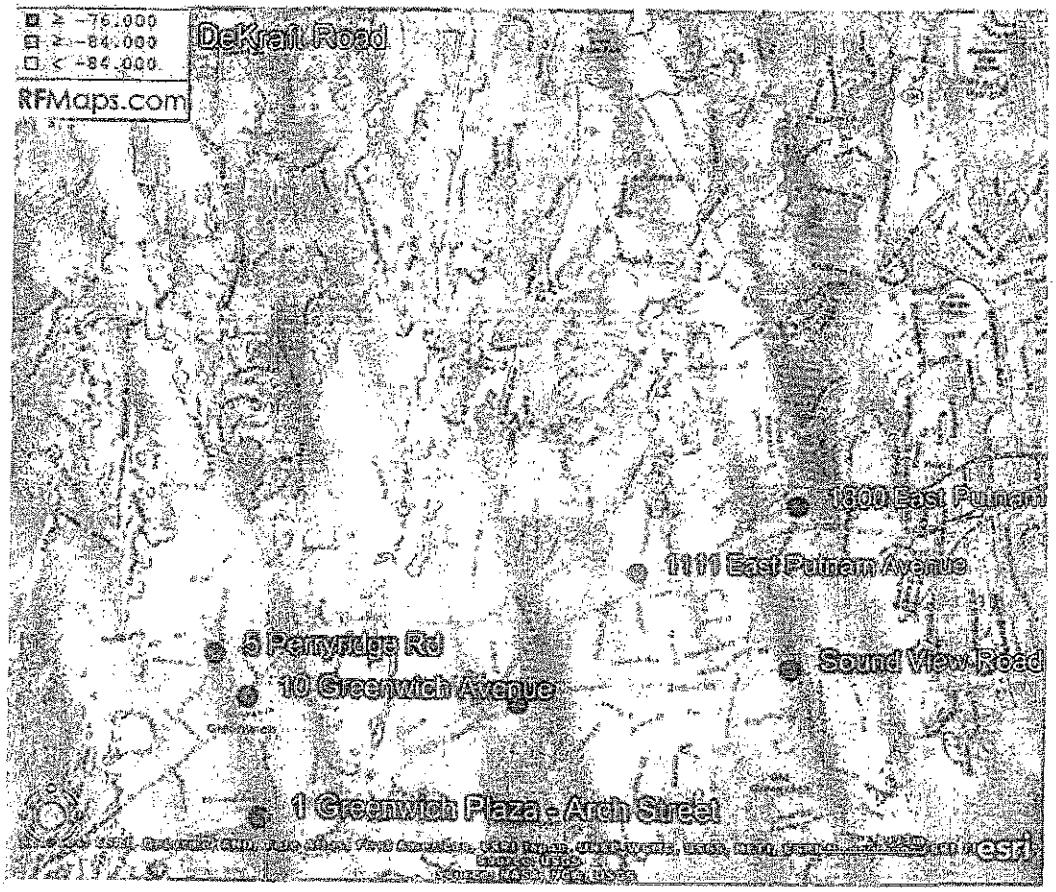

Figure 4 - Coverage Available from Existing T-Mobile Cell sites

Figure 4 shows the coverage available from the existing T-Mobile facilities over a wider area than Figure 3. In addition to the North Mianus pocket north of 1111 East Putnam Avenue (right arrow), notice how the lack of additional facilities to the north of Route 1 leaves more developed area with signal levels below T-Mobile's thresholds (left arrow). These two areas are more detailed in Figure 3..

Figure 5 is a third representation of the same general area of the proposed 80 foot unipole at the 328 Palmer Site. This format will be used to compare alternatives in the rest of this report. Note that in addition to the relief map layer and the coverage layer, there is an additional parcel layer. This layer helps illustrate the location and density of development on the map. The arrows in Figure 4 are reproduced in Figure 5 to maintain a reference to the two general areas of below-threshold coverage.

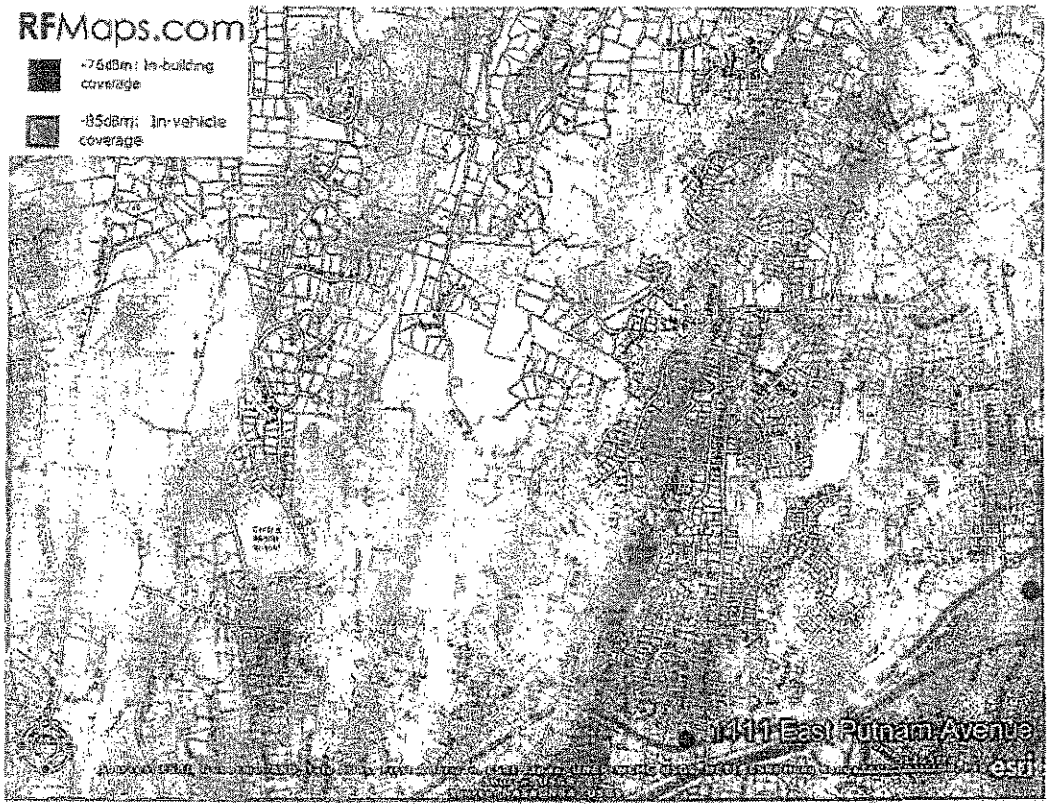

Figure 5 - Coverage Available from Existing T-Mobile Facilities, with Parcel Overlay

The remaining coverage maps in this report maintain the scale of Figure 5 for easy comparison.

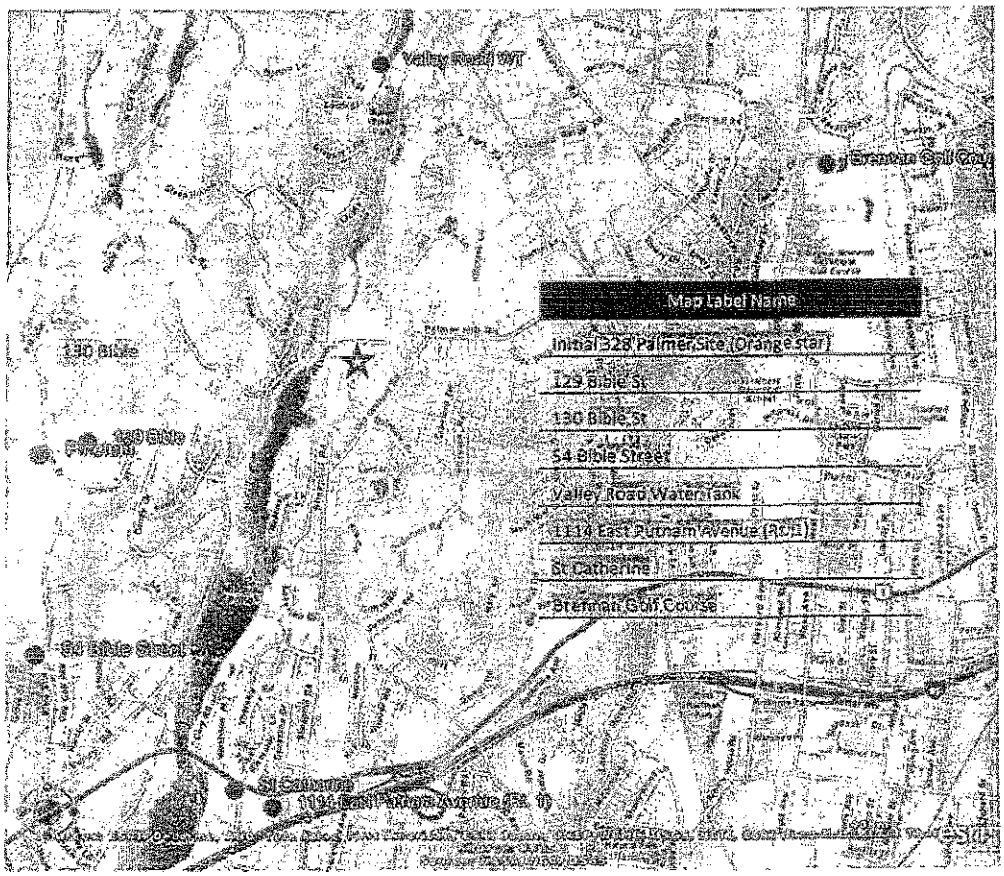

Figure 6 - Locations of Sites Considered

328 PALMER HILL COVERAGE (AT 80 FEET)

The 80 foot unipole that T-Mobile is considering placing at the 328 Palmer Site (Figure 7) provides coverage to T-Mobile's thresholds in the Mianus River valley. Presently, T-Mobile's coverage in this area is predominantly below T-Mobile's preferred thresholds (Figure 5). The east face of the ridge that Palmer Hill Road climbs is more densely developed than its surroundings (particularly to the west). The 328 Palmer Site is central to this developed area. Easterly, its coverage is limited by the ridge and extends

about 6/10 mile to the east. As seen above, coverage from 1800 East Putnam Avenue rides the spine of the ridge, allowing the coverage from the 328 Palmer Site below to connect well with the 1800 East Putnam Avenue coverage above.

The coverage from the 328 Palmer Site also reaches west across the Mianus River. The extent of its westerly coverage is limited by the terrain to a distance of 7/10 mile, reaching Clover Place and not reaching most of the Pinetum lands. Since there is no PWSF to the west or northwest of the 328 Palmer Site, a considerable area of Greenwich would remain unserved with T-Mobile's desired signal levels. This includes areas around Bible Street, Cat Rock Road, Stanwich Road, Dublin Hill Road, and Montgomery Lane. These locations, which are in the Westerly, northerly and southwesterly areas marked on the maps, will be reconsidered in some of the following site analyses.

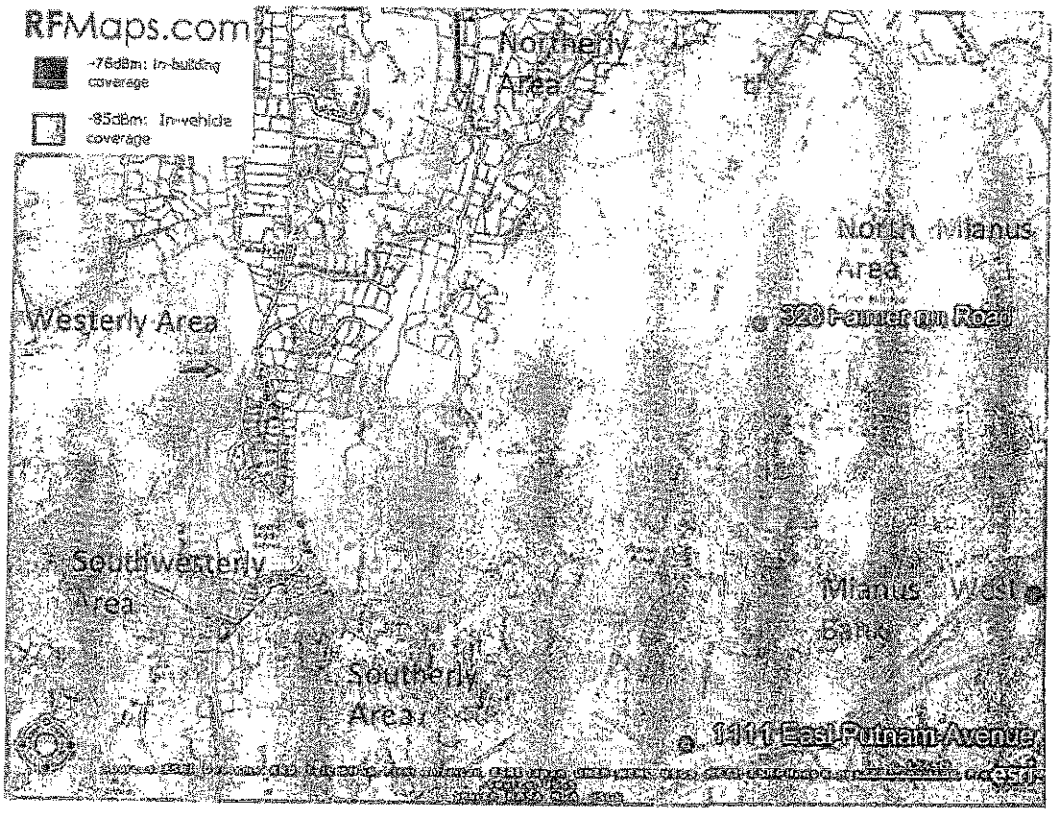

Figure 7 - Coverage Available from Existing T-Mobile Facilities plus the 328 Palmer Site at 80 Feet above Ground.

To the south, toward Route 1, the coverage is sufficient to overlap with coverage from the 1111 East Putnam Avenue PWSF. To the north, the coverage reaches about 6/10 mile to the Gregory Road area. Because there are no nearby facilities to the north, the 328 Palmer Site facility does not provide a smooth

connection to another PWSF in that direction. A future facility can be anticipated to the north to provide more of the desired signal level to that portion of Greenwich.

The remaining maps in this report have the six arrow markers with labels shown in Figure 7. These arrows provide points of reference for the written discussion, and to give the eye these reference marks for visual comparison of the maps.

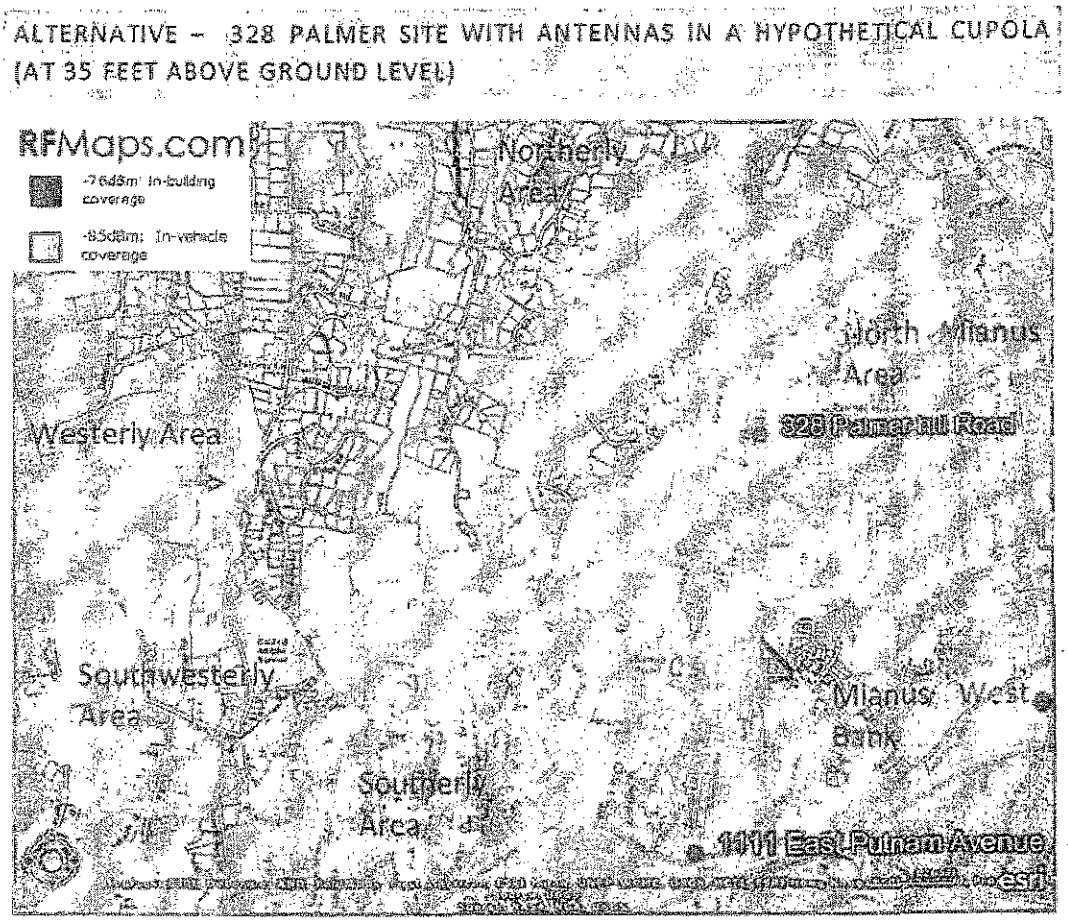

Figure 8 - Coverage Available from Existing T-Mobile Facilities plus the 328 Palmer Site at 35 Feet above Ground.

Because the 328 Palmer Site is, first, on high ground beside the river, and second, in a valley, a lesser antenna height might still be effective there. We use our "salad bowl" analogy to explain this phenomenon. To illuminate a large salad bowl's inside surface, one could place a lamp at the rim of the

bowl and shine it out and down. This is like using a tower on a ridge to illuminate a valley with wireless coverage. Another way to illuminate that bowl is to put the light at the bottom of the bowl and shine it out and up. In the right circumstances, this method is an effective way to reduce the visual impact of a tower by avoiding a hill top and installing in the lowland by relying on the salad bowl effect. The 328 Palmer Site has this characteristic. Isotrope hypothesized the salad bowl effect would be successful at this site. Since the antenna is "shining" uphill for the most part, the height of the facility may not be so important.

If antennas were concealed within a new cupola placed on the roof of the residence at the 328 Palmer Site, it is assumed they would be about 35 feet above ground. The coverage from this alternative height is shown in Figure 8.

The reduced height of the 35 foot high antennas causes the horizon to be a little closer to the source, as compared to the 80 foot height. This causes some pockets in the terrain to fall below the threshold signal level. One such pocket is at a point along Cat Rock Road west of the 328 Palmer Site. Depending on the degree to which the signal levels are depressed in the pocket, and on the actual size of the pocket (determined by a field test of coverage), the pocket may not be consequential to the overall service to the area.

If the visual impact of the proposed 80-foot tower at the 328 Palmer Site were objectionable to the community, the cupola (or chimney) approach would fully conceal the PWSF from public view. It would also not require the participation of the CSC.

129 BIBLE ST SITE (160 FEET ABOVE GROUND)

The most actively considered alternative location for a T-Mobile PWSF is the 129 Bible Street 129 Bible St Site. Town officials are in dialog with T-Mobile on the possibility of utilizing the 129 Bible St Site instead of the 328 Palmer Site. A height of 160 feet above ground has been suggested as the height required to achieve T-Mobile's coverage objectives in North Mianus. The 129 Bible St Site is approximately ¾ mile from the 328 Palmer Site.

A first impression of the coverage available from the 160 foot height (Figure 9) is that it appears to satisfy T-Mobile's stated objectives in the North Mianus area. There are some very minor depressions in signal level below the T-Mobile thresholds. These are so small that it is highly likely that they are inconsequential. Further, they are so small that the variance in this computer model (or any other) may render these small depressions on the map meaningless in the field.

A second impression of this coverage is that it serves a significantly larger area of Greenwich than the 328 Palmer Site facility would. The 129 Bible St Site PWSF at 160 feet would serve additional areas that are below the T-Mobile coverage threshold – in the vicinity of Bible Street, northwestern Cat Rock Road, Stanwich Street, Montgomery Lane and Dublin Hill Road.

These areas served from the 129 Bible St Site at 160 feet extend some 1¼ miles west, southwest, and northwest of the 328 Palmer Site. A substantially greater land mass and residential development is reached from the 129 Bible St Site at 160 feet than from the 328 Palmer Site at 80 feet. Rough estimates indicate the 129 Bible St Site could provide a 50 to 75% increase in residences served with improved coverage, compared to the proposed 328 Palmer Site.

Continuity of coverage from the 129 Bible St Site at 160 feet is obtained to the south and the west of the 328 Palmer Site, the same as from the 328 Palmer Site. This allows communications to be handed off as subscribers move between 1111 East Putnam Avenue and North Mianus. Unlike the 328 Palmer Site, the 129 Bible St Site also provides new coverage continuity along Bible Street and Orchard Street as these streets approach existing coverage near Route 1.

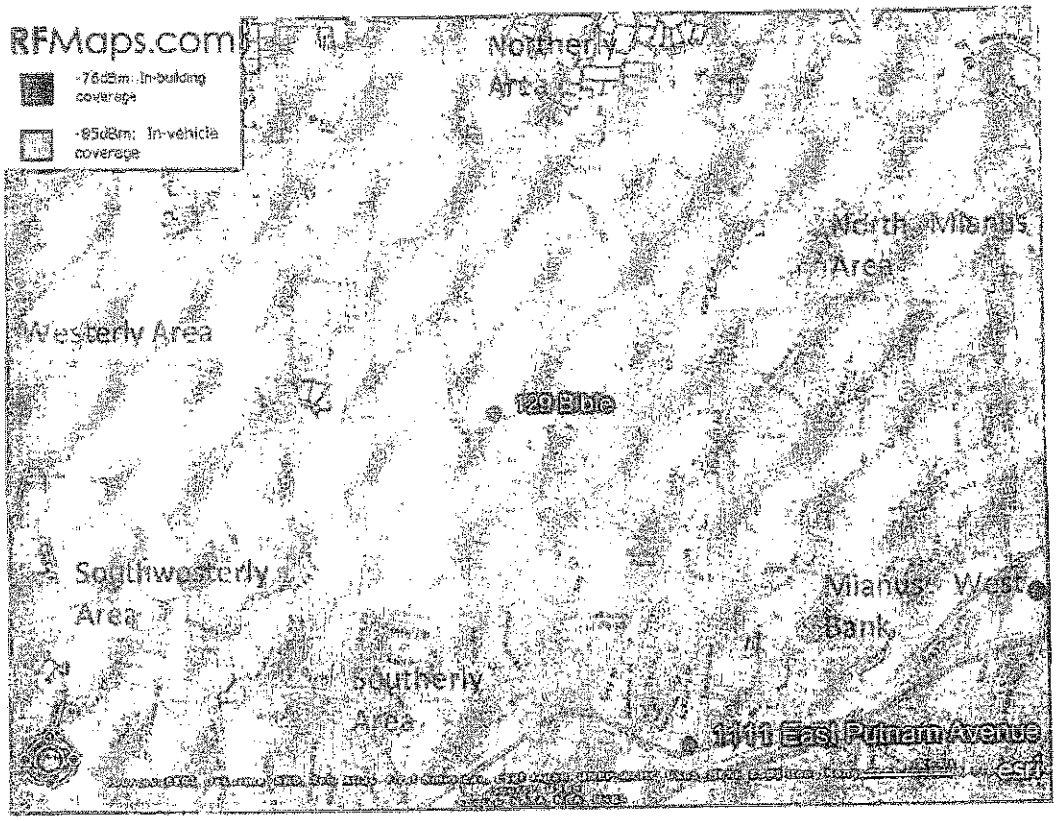

Figure 9 - Coverage Available from Existing T-Mobile Facilities plus the 129 Bible St Site at 160 Feet above Ground.

ALTERNATIVE – 129 BIBLE ST SITE AT 100 FEET

In our preliminary visibility analysis, we determined that a height in the vicinity of 105 feet above ground would be below treeline from certain street views. To assess the coverage viability of a lesser height, Isotrope prepared a coverage map from 100 feet above ground at the 129 Bible St Site (Figure 10).

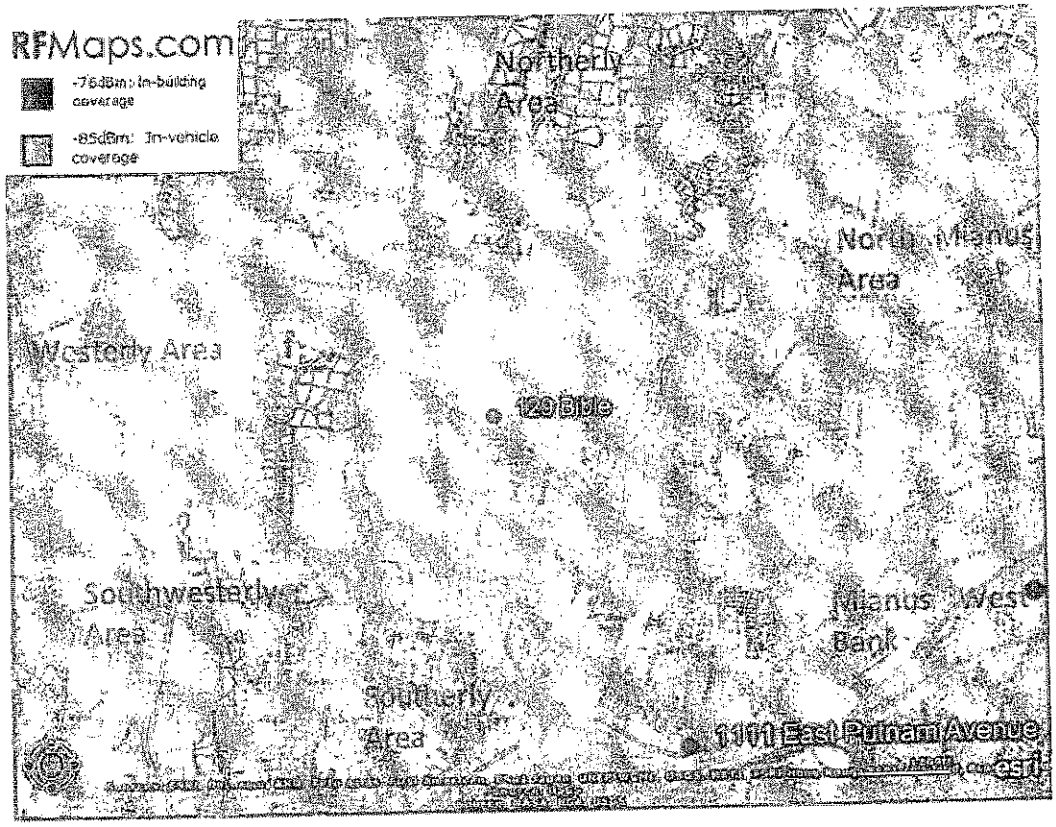

Figure 10 - Coverage Available from Existing T-Mobile Facilities plus the 129 Bible St Site at 100 Feet above Ground

The predicted coverage from 100 feet above ground is visibly reduced compared to the 160 foot coverage. However, closer inspection suggests that both coverage plots have only minor depressions below the T-Mobile preferred threshold. The most apparent difference with coverage from the 160 foot height is an increase in below-threshold coverage in the neighborhood around Coachlamp Lane and lower Ridge Road. It appears the 100 foot height would be viable if the height were necessary to satisfy visual impact concerns.

This is also an opportunity to note the natural tension among tower heights, numbers of towers to be developed, and the local impacts of the towers. On the one hand, it is often a policy to maximize the

heights of towers for tower sharing among carriers, which may result in minimizing the number of towers in Greenwich. On the other hand, matching the height of a tower to the context of the site often results in more palatable facilities, even though less height means fewer Site-Sharing carriers. The proposed 328 Palmer Hill Unipole, at 80 feet height, is an example of an attempt to match the scale of a tower to its surroundings, at the cost of limiting the Site-Sharing capacity of the tower.

If the 129 Bible St Site remains an active alternative, it would be appropriate to perform a more comprehensive visual impact analysis. This analysis would further inform decision making about the optimal height between 100 and 160 feet that best mitigates adverse visual impacts, if any, while it enables improved coverage and allows some Site-Sharing.

ALTERNATIVE – 129 BIBLE ST SITE AT 80 FEET

Pushing toward the lower limit on tower height, isotrope modeled coverage from 80 feet above ground at the 129 Bible St Site. The deciduous trees in the area are estimated to be in the 55 to 65 foot height range at their peaks. It is likely that coverage from antennas mounted below 70 to 75 feet height would be compromised by the tree cover, especially in foliage months.

Considering its height, an 80 foot tower and PWSF at the 129 Bible St Site still provides impressive coverage to North Mianus (Figure 11). It is sufficient to not only substitute for the tower proposed at the 328 Palmer Site, but also extends coverage farther west of the Mianus River to locations west of the Pinetum land. The depression in T-Mobile's desired coverage from the 129 Bible St Site to Coachlamp Lane increases substantially compared to the 100 foot height tower. Since the 328 Palmer Site's desired coverage barely reaches the Pinetum, and does not affect the Coachlamp Lane area, the coverage from the 129 Bible St Site at 80 feet remains more substantial than the coverage proposed from the 328 Palmer Site.

There is a moderate increase in a depression of below-threshold coverage on a terrain-shadowed portion of Valley Road. It still appears to be small enough that there is no significant impairment in coverage along Valley Road.

When considering final height selections at a candidate site and when also trying to be careful to mitigate potential adverse visual impacts, it is helpful to perform a "drive test" of the coverage obtained from several heights at a selected site. This kind of test of a potential site's coverage is called a "CW" test (named for the informationless Continuous Wave signal used to conduct the test). A crane is placed at a candidate site. With an antenna attached to the crane, the crane is hoisted to selected heights. The CW signal from the antenna is received by measurement equipment in a vehicle driven around the subject area. Drive test information is very helpful in fine tuning antenna heights because coverage mapping models may not be precise enough to identify small but critical differences in coverage from various heights.

With a tower of 80 feet height at the 129 Bible St Site, there may be no possibility of a second carrier Site-Sharing the tower with the first carrier. Conversely, with a 100 foot tower, it is likely that up to three wireless carriers will find the 129 Bible St site useful.

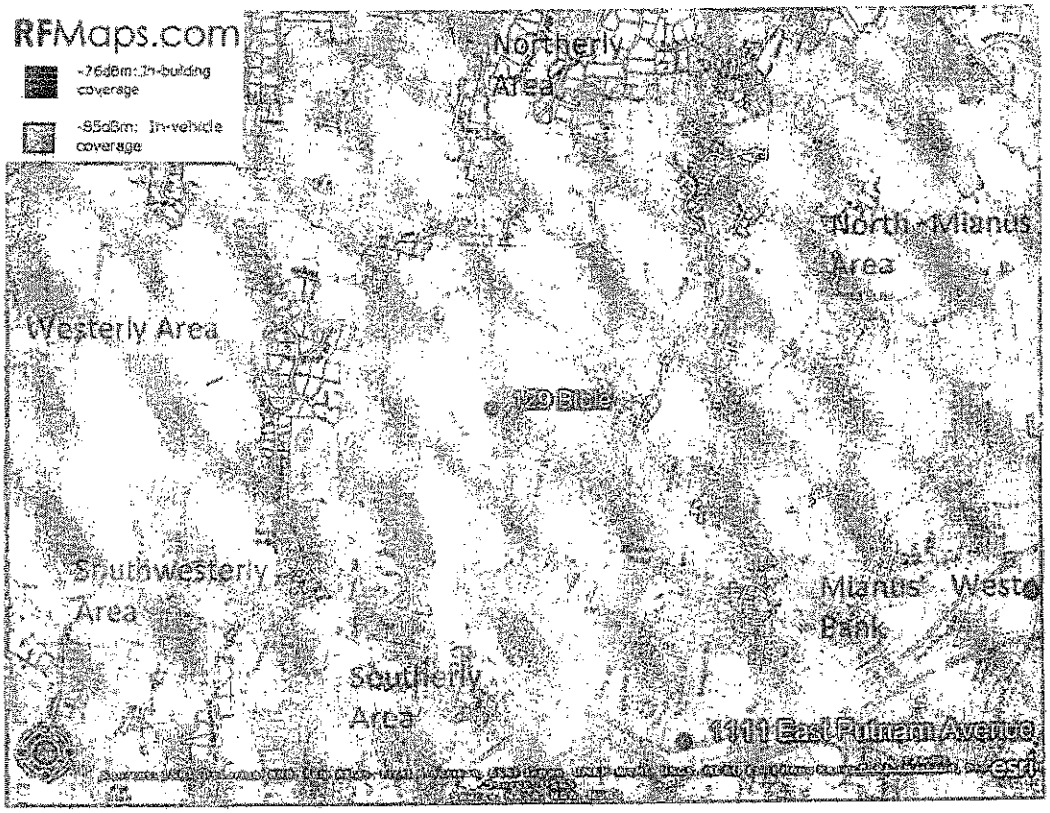

Figure 11 - Coverage Available from Existing T-Mobile Facilities plus the 129 Bible St Site at 80 Feet above Ground

ALTERNATIVE – 130 BIBLE ST SITE

The 130 Bible St Site is about 600 feet westerly of the 129 Bible St Site (Figure 25). Its ground elevation is about 5-10 feet higher than the 129 Bible St Site. Coverage analyses from 160, 100 and 80 feet above ground are shown in the following figures.

At 160 feet, the 130 Bible St Site coverage (Figure 12) is very similar to that of the 129 Bible St Site coverage (Figure 9). The 130 Bible St Site coverage shows a minor depression at the Mianus West Bank.

As the height drops to 100 feet, the extra 600 feet to the river makes a small difference in coverage (Figure 13). The coverage depression at the Mianus West Bank area is increased. In comparison, the 100 foot 129 Bible St coverage (Figure 10) leaves a depression on the Mianus West Bank that remains unremarkable. Overall, these small depressions in signal level are minor differences compared to the amount of coverage obtained from either 129 or 130 Bible St.

Going to 80 feet, the depressions appearing in the 130 Bible St (Figure 14) and 129 Bible St (Figure 11) Site coverage maps are enlarged compared to the 100 foot heights. The Mianus West Bank depression would benefit from a CW drive test to determine the extent and depth of the depression below T-Mobile's preferred threshold, if any.

Coverage to the north and west steadily becomes more perforated as the antenna heights lessen. This is true for both the 129 Bible St and 130 Bible St Sites. In any event, the total coverage from all three heights at the 130 Bible St Site is substantially greater in area and number of residences served than from the proposed 328 Palmer Site.

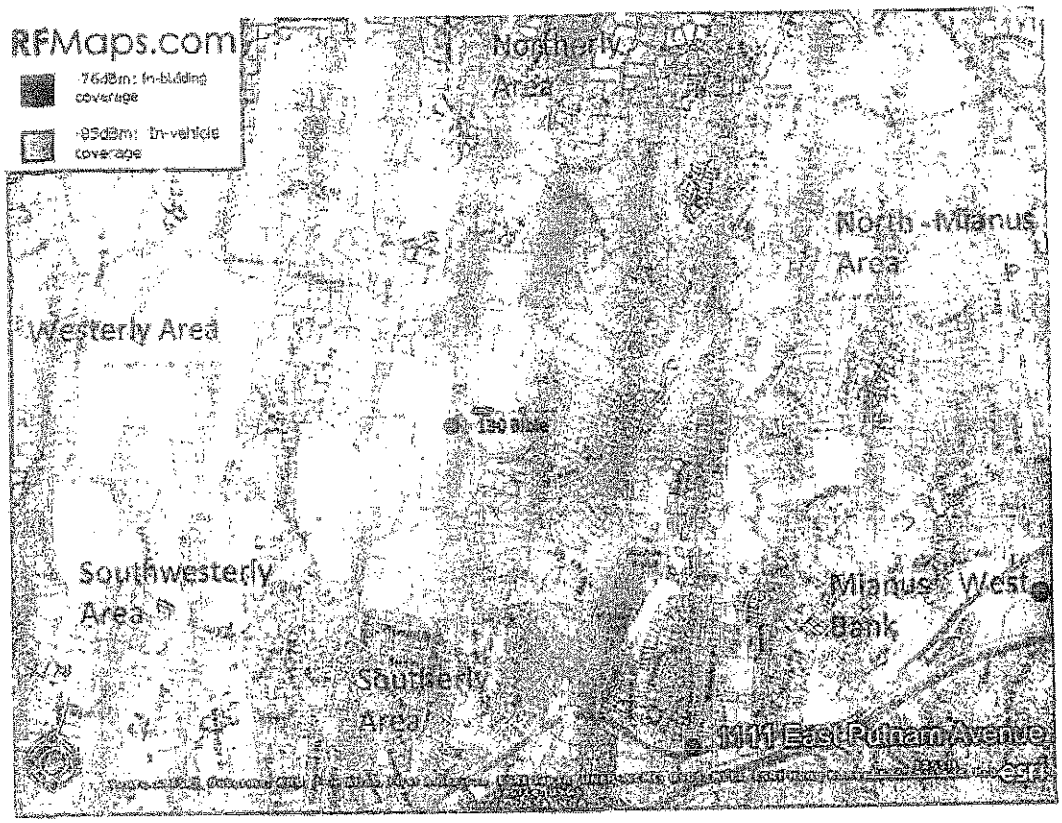

Figure 12- Coverage Available from Existing T-Mobile Facilities plus 130 Bible St Site at 160 Feet above Ground

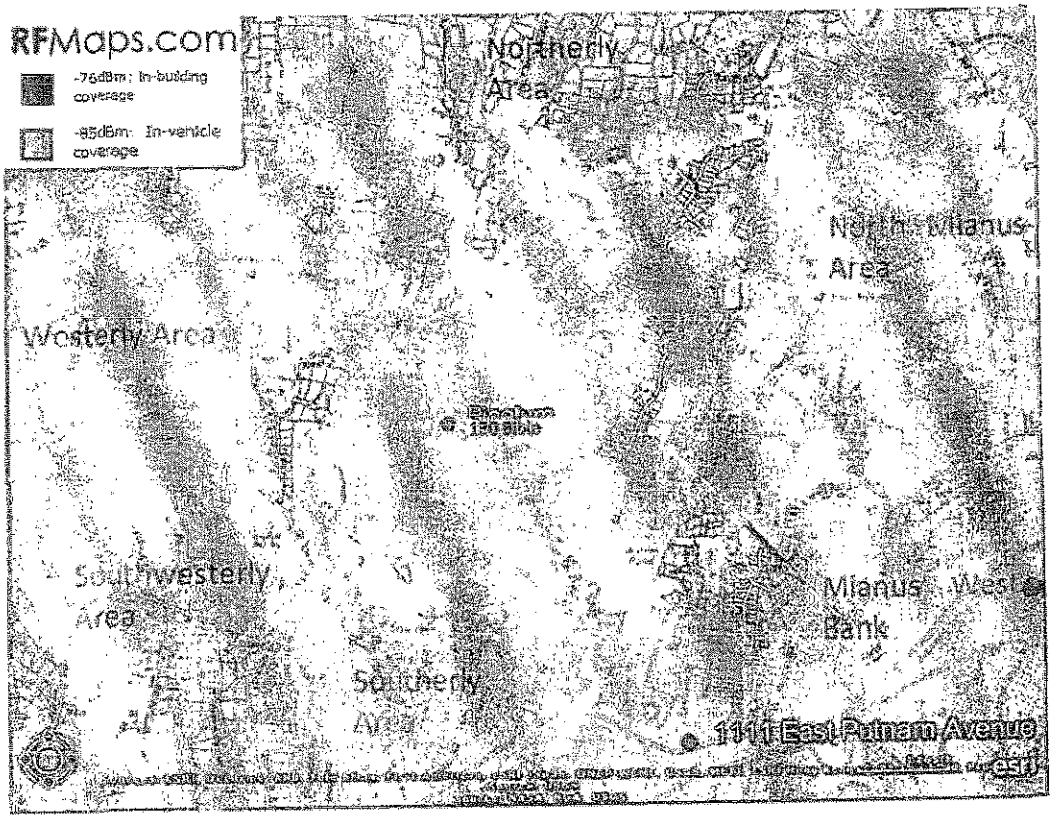

Figure 13- Coverage Available from Existing T-Mobile Facilities plus 130 Bible St Site at 100 Feet above Ground

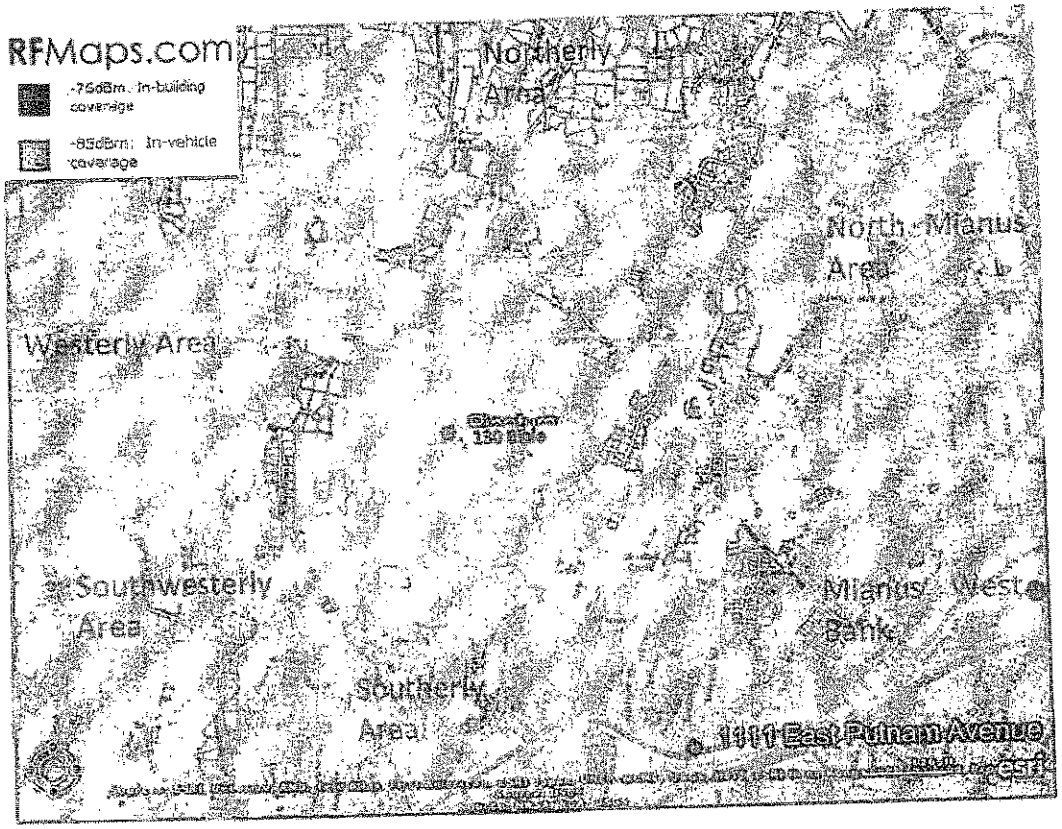

Figure 14- Coverage Available from Existing T-Mobile Facilities plus 130 Bible St Site at 80 Feet above Ground

ALTERNATIVE – 54 BIBLE STREET AT 100 FEET

Another site that came up in discussions with Representative Town Meeting Land Use Committee and Pinetum Coalition representatives was a parcel consisting of two ball fields, tennis courts, playscape, parking and an outbuilding (Figure 15). It is designated 54 Bible Street. The parcel is relatively large, 6.8 acres, and is surrounded by a dense development of residences on 0.1± acre parcels (~5000 sq ft). The location is 1000 to 2000 feet from Route 1. Being this close to Route 1, the general area of 54 Bible Street has patchy coverage from facilities along Route 1, which varies above and below the T-Mobile coverage thresholds.

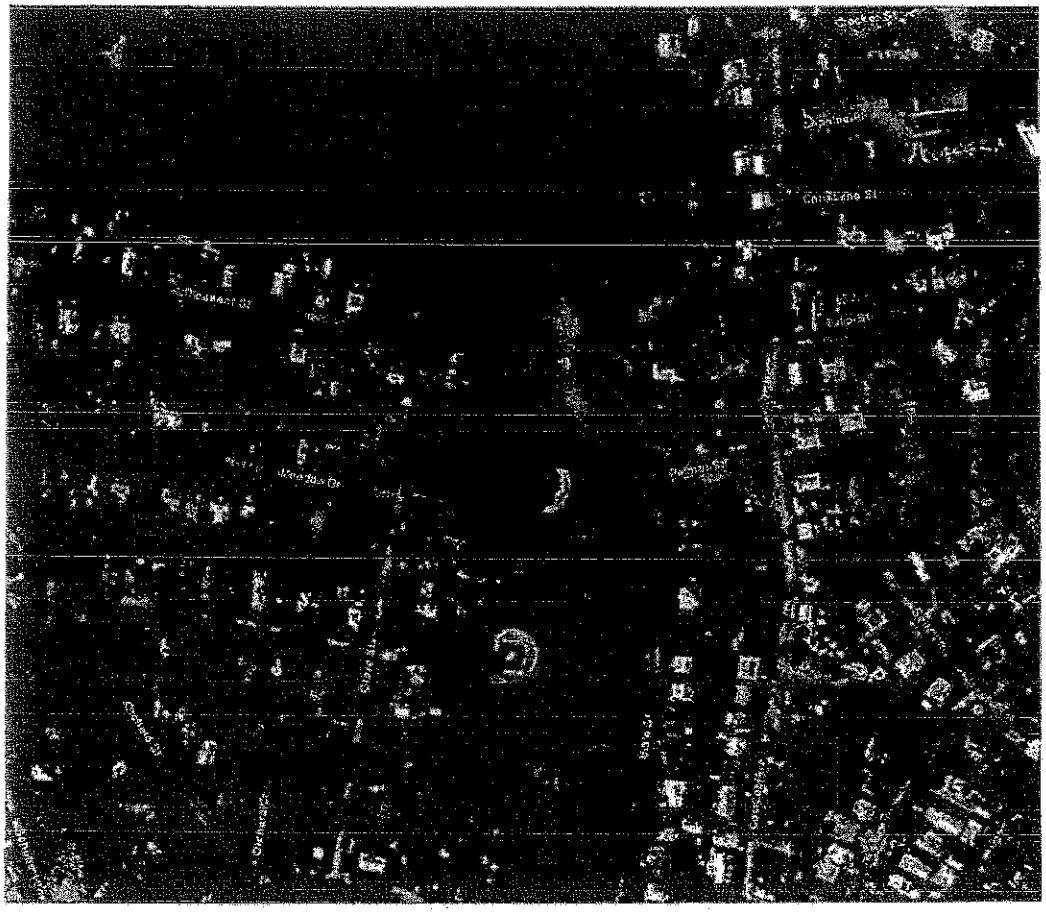

Figure 15 - Aerial View of Southerly Bible Street, with #54 at Center

Figure 16 illustrates the available coverage from 54 Bible Street. Note how the coverage extends northerly as far as Clover Place beside the 129 Bible St Site; easterly to the Mianus River (Pond); and westerly to the Orchard Street, Stanwich Road, Central Middle School area. Only on the wedge of land between the Mianus River and Clover Place is there coverage in common between coverage from the 328 Palmer Site and the 54 Bible Street site. On the North Mianus side of the river, the 54 Bible Street facility would have no impact on coverage at the T-Mobile thresholds. Coverage to the south of 54 Bible Street already exists, which means much of the coverage that would be obtained from 54 Bible Street would be redundant. Perhaps, in the future, a carrier will need to increase capacity to the densely developed residential area around 54 Bible Street. Then it would be more productive to consider putting PWSFs at 54 Bible Street. Presently, 54 Bible Street appears to be insufficient to address, or contribute to addressing, the current coverage objective.

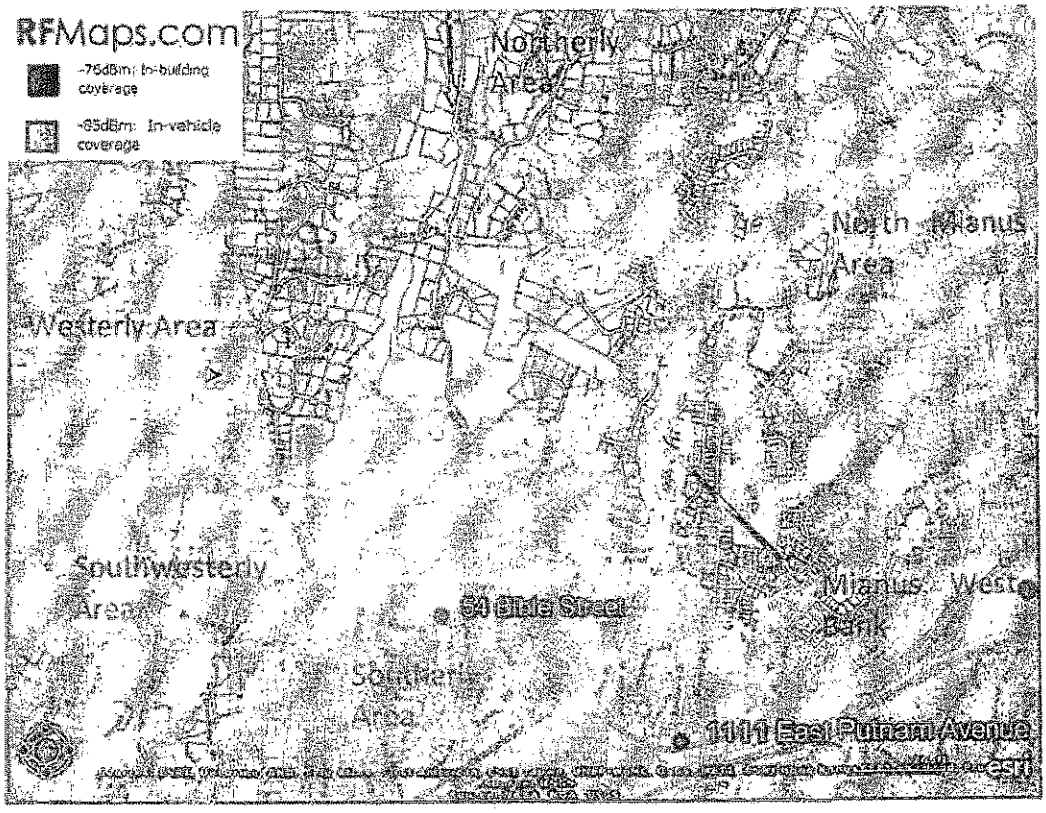

Figure 16 - Coverage Available from Existing T-Mobile Facilities plus 54 Bible Street at 100 Feet above Ground

ALTERNATIVE – VALLEY ROAD WATER TANK

The Valley Road water treatment facility on the Mianus River, 2/3 mile north of the Palmer Hill Road crossing, is a narrow parcel almost fully developed with a treatment plant (Figure 17). The site includes a water tank on the north end of the parcel, which Isotrope estimates to be 40 feet tall. Isotrope modeled coverage at 50 feet above ground, assuming that 50 feet is enough height to clear the tree heights (no certainty).

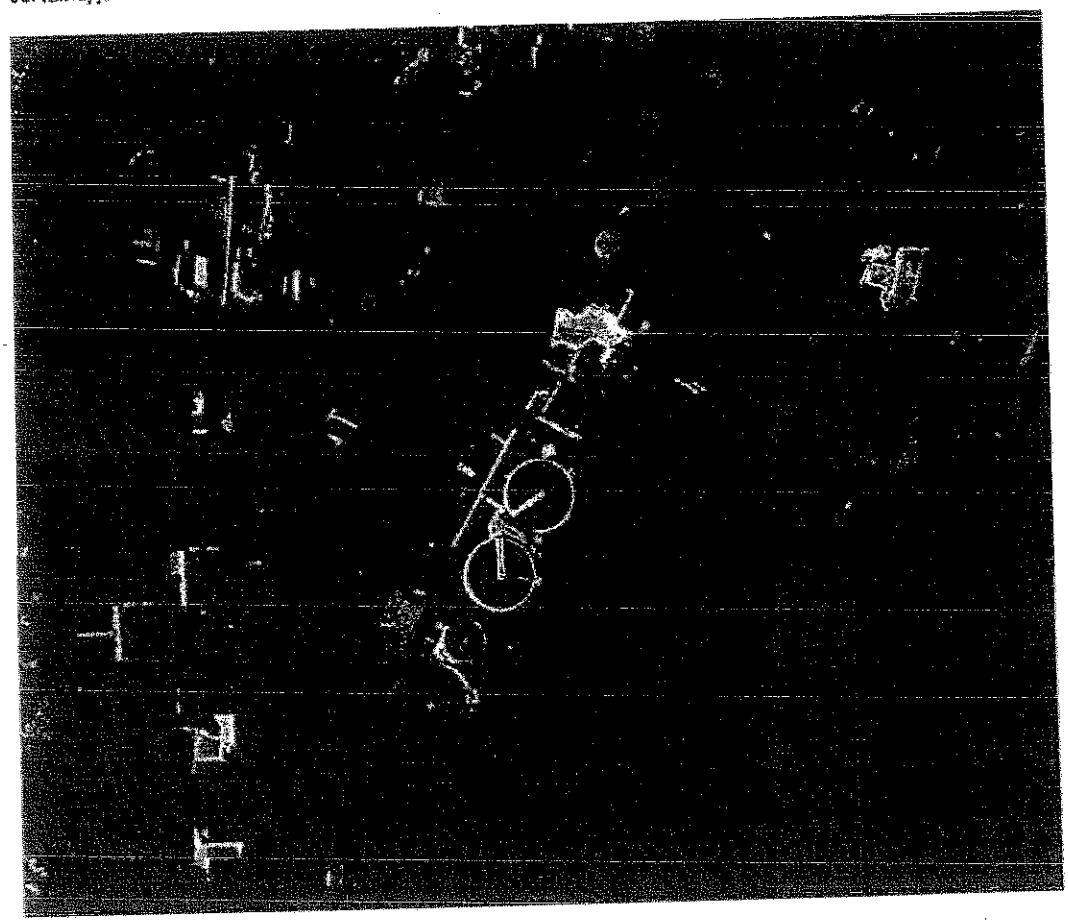

Figure 17 - Aerial View of Valley Road Water Treatment Facility, with Water Tank

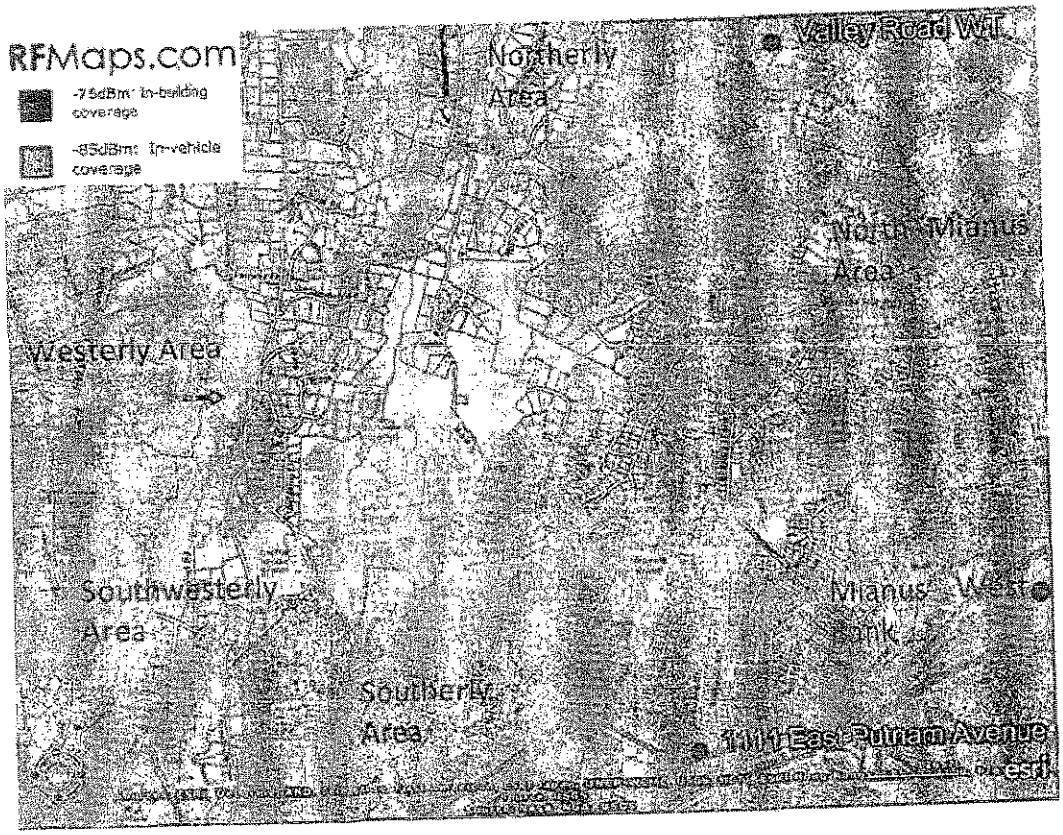

Figure 18 - Coverage Available from Existing T-Mobile Facilities plus Water Tank 50 Feet above Ground

Figure 18 illustrates the potential coverage from the water tank. Despite its height, and its position at river level in the valley, the 50 foot height does provide patchy coverage to the North Mianus area. This is due to the salad bowl effect discussed above. The desired level of coverage does not reach the west side of the Mianus River in the area south of the Palmer Road crossing. The water tank site is not nearly as effective in reaching the North Mianus area with coverage as the Pinetum sites are.

ALTERNATIVES – 1114 EAST PUTNAM AVENUE & ST CATHERINE

The two final locations suggested to Isotrope in discussions with Representative Town Meeting Land Use Committee and Pinetum Coalition representatives are along Route 1 in the locus of 1111 East Putnam Avenue. Because these locations are duplicative of the existing T-Mobile PWSF at 1111 East Putnam Avenue, there is no value in analyzing them further.

ALTERNATIVE – UTILILTY INFRASTRUCTURE

The alternatives discussed above rely on new towers or existing structures for mounting wireless antennas. Another means of providing coverage is the use of utility infrastructure in the public way for mounting antennas. There are various ways PWS providers employ this infrastructure. In locations where a single facility is sufficient to patch a hole in otherwise sufficient coverage, a *microcell* might be sufficient. A microcell is in effect a miniature cell site; it consists of base station equipment and antennas configured to provide a reduced number of wireless channels to an area of restricted size. Figure 19 shows the microcells of three different wireless services mounted on utility poles.

Figure 19 - Microcells (3) at busy residential intersection, Lower Merion, PA

Another architecture for providing wireless services using utility infrastructure is the Distributed Antenna System ("DAS"). DAS installations rely on the same building blocks as microcells and full cell sites, including base station equipment, interconnections of equipment using fiber optic cables or microwave radio links, a centralized connection back to the national communications network ("backhaul"), antennas and antenna cables. The difference with DAS is that rather than place a microcell base station at each antenna installation, a more compact radio transceiver is placed at the antenna sites ("nodes") where

antennas are attached to utility poles (Figure 20). The remainder of the base station's equipment is at a centralized location ("hub" or "hotel") where it serves antenna installations on numerous utility poles. Cabling (usually fiber optic) on the utility poles connects the hub with the antenna nodes.

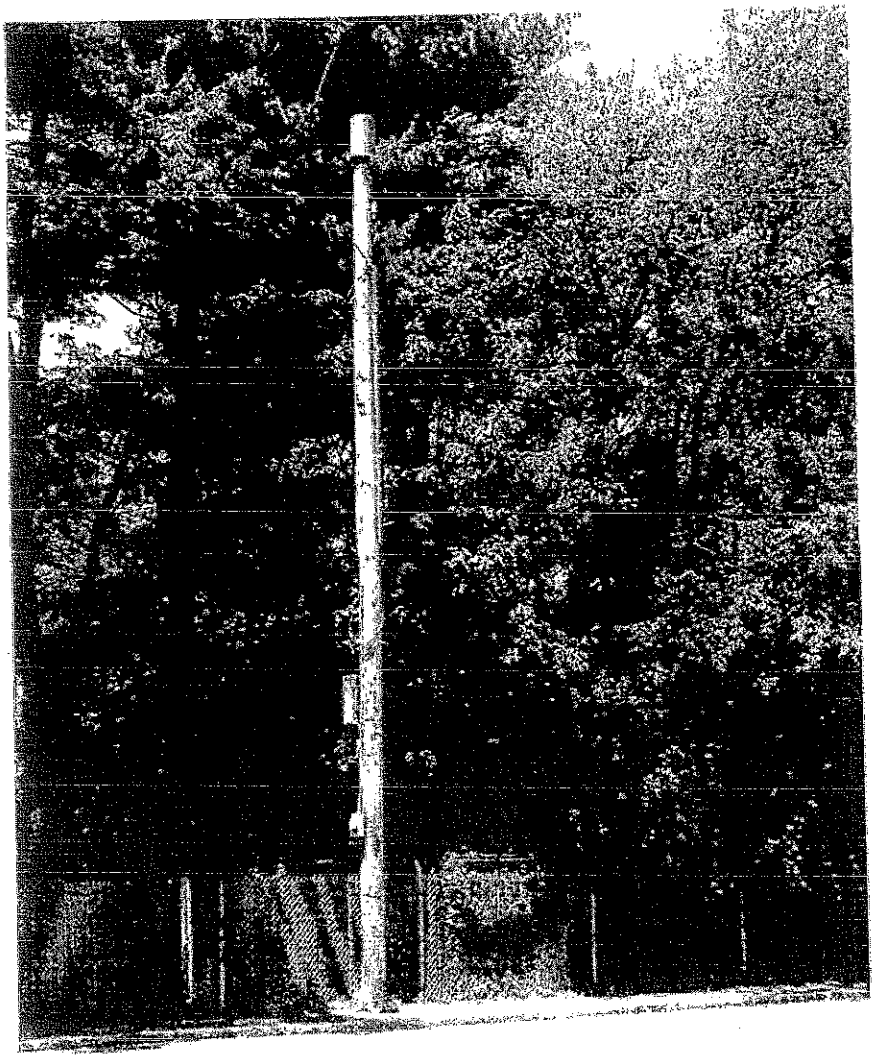

Figure 20 - DAS Node in Brookline, Massachusetts

Just as there is a tower industry supporting the placement of wireless facilities on towers, there is a DAS industry that is presently experiencing explosive growth enabling wireless services on utility infrastructure. As one would expect, the industry growth is first occurring where DAS networks are

needed most. The earliest and easiest opportunities for outdoor DAS facilities occur in areas with high use density (such as urban areas and densely developed suburban areas) and in locations where towers and rooftop antenna facilities are impossible or impracticable to achieve (such as scenic locations Nantucket Island, Massachusetts and Hilton Head Plantation, North Carolina – two early examples).

Tower and rooftop facilities are developed essentially one at a time. When a new need presents itself, a PWS provider typically budgets for a new base station facility and looks for a solution. Existing structures are typically sought first, followed by a search for "raw land" on which to place a tower. There is little in the way of long range planning (5 years or more) on wireless network layout.

DAS installations are inherently extendable in a way that individual PWSFs are not – Additional nodes can be added to the area served by existing "backbone" cables on utility poles; also, the backbone can be expanded to a larger area when needed. Consequently, the benefits of DAS architecture are apparent when considering a long range view of the provision of PWS in a particular area. In the short view, PWS providers tend to rely on the traditional approach, continuing network expansion one tower (or rooftop) at time.

The exception to this generalization is occurring mostly in the densely developed areas. New York City, Yonkers, Mount Vernon, Boston, Providence, and numerous other urban areas in the northeast already have significant DAS network penetration.

Isotrope developed a DAS network layout in the area of the 328 Palmer Site (Figure 21). The goal was to provide coverage from a DAS network that would be equivalent to the coverage that the 80 foot unipole is expected to achieve. The example shown in Figure 21 employs 18 separate DAS nodes on utility poles. Isotrope's modeling is configured conservatively to anticipate the often significant impact of foliage on the wireless signals. The DAS nodes in this model are set at 40 feet above ground. The present state of utility and DAS regulation in Connecticut is bleak with respect to the ability of a DAS developer to mount an antenna above certain utility poles to achieve the desired coverage. New utility poles could be necessary at many of the DAS node locations depicted, in order to obtain a 40 foot height. Alternatively, DAS antennas may have to be demoted to a height of about 25 feet. This can substantially diminish the coverage of a DAS node. A more detailed analysis is necessary to develop a validated working model of a DAS in the subject area.

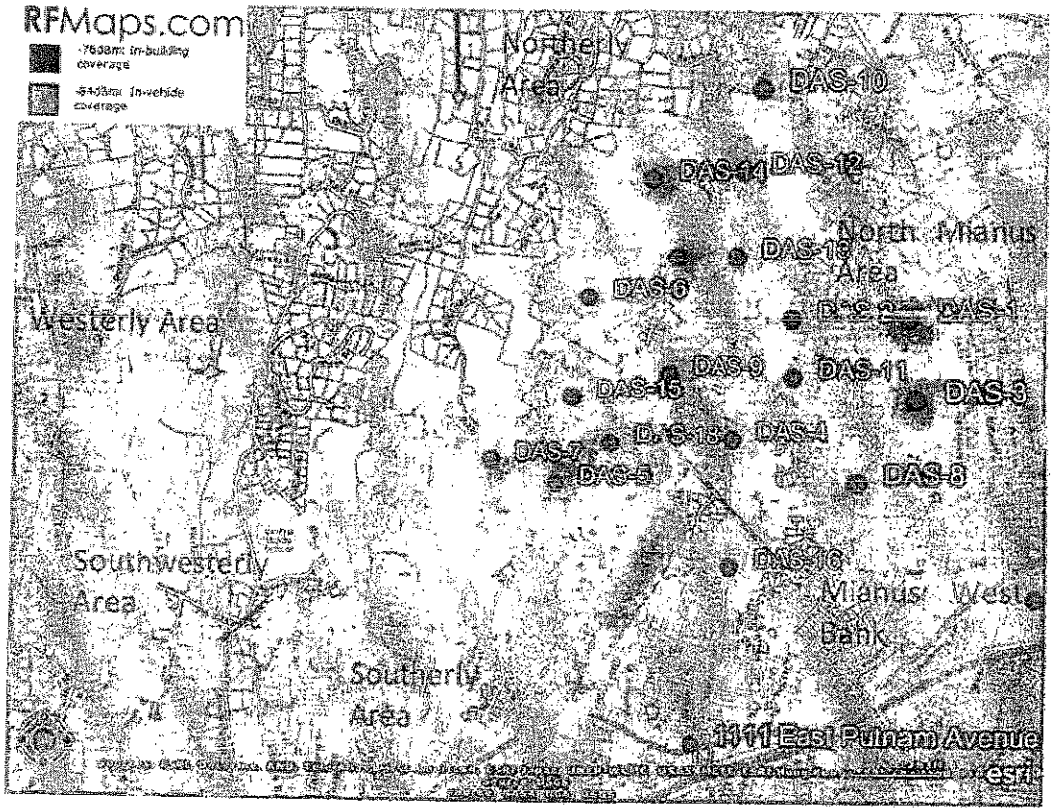

Figure 21 - Hypothetical DAS Configuration

Figure 21 shows that the 18 node DAS is not intended to reach west, north and south of the Pinetum area. Numerous additional nodes would be necessary to do so. Because the primary objective of this study is to provide alternatives to the facility that T-Mobile contemplates at 328 Palmer Hill Road, Isotrope limited the hypothetical DAS layout to the same coverage area as that of the 80 foot unipole.

Generally, in Isotrope's experience, the area depicted by the hypothetical DAS is not a high-priority location for a DAS for PWS providers. This is due in part to the only moderate density of the development in the area, as well as due to a perception that there may be locations for a new tower that the PWS provider may feel will be acceptable to the CSC. In a very rough approximation, Isotrope found there would be an average of 170 persons per node in Figure 21.

If there is a strong DAS interest on the part of the community, it would require a concerted effort to encourage DAS developers to compete for the opportunity to set up a DAS. In Brookline, Massachusetts this was done when the town issued a request for proposals for a DAS developer to lease municipal land to build the DAS hub facility. This built momentum for the development of a DAS in a moderately densely developed area of Brookline. It took several years for various reasons. Alternatively, the Town could fund and install its own DAS backbone and make it available to PWS providers.

SITE GEOGRAPHY

This section of the report discusses the geographical characteristics of the most effective potential sites. Consideration is given to the topography, land use, land cover and location of each site.

328 PALMER SITE

The property at 328 Palmer Hill Road ("328 Palmer Site") is in predominantly residential use and is at the summit of a small hill with a relatively steep drop to the Mianus River basin, which is approximately 350 feet west of the 328 Palmer Site. The ground elevation of the 328 Palmer Site is roughly 43-47 feet above mean Sea level ("AMSL"), which is approximately 35 feet higher than the Mianus River. The North Mianus School occupies the abutting parcel to the east, which is about ten feet lower in elevation (typical) than the 328 Palmer Site.

Three quarters of a mile east-north-east of the 328 Palmer Site stands the summit of Palmer Hill, located at Starin Drive, Stamford. The summit of Palmer Hill is approximately 180 feet higher in elevation than the 328 Palmer Site.

The locus of the 328 Palmer Site is well developed with mixed residential and commercial use. See Figure 22. The proposed PWSF at the 328 Palmer Site would be designed as a concealed-antenna monopole, most often referred to as a "unipole." No antennas or appurtenances would be visible because they are concealed beneath the tapered tubular surface of the unipole. See Figure 24 for an example.

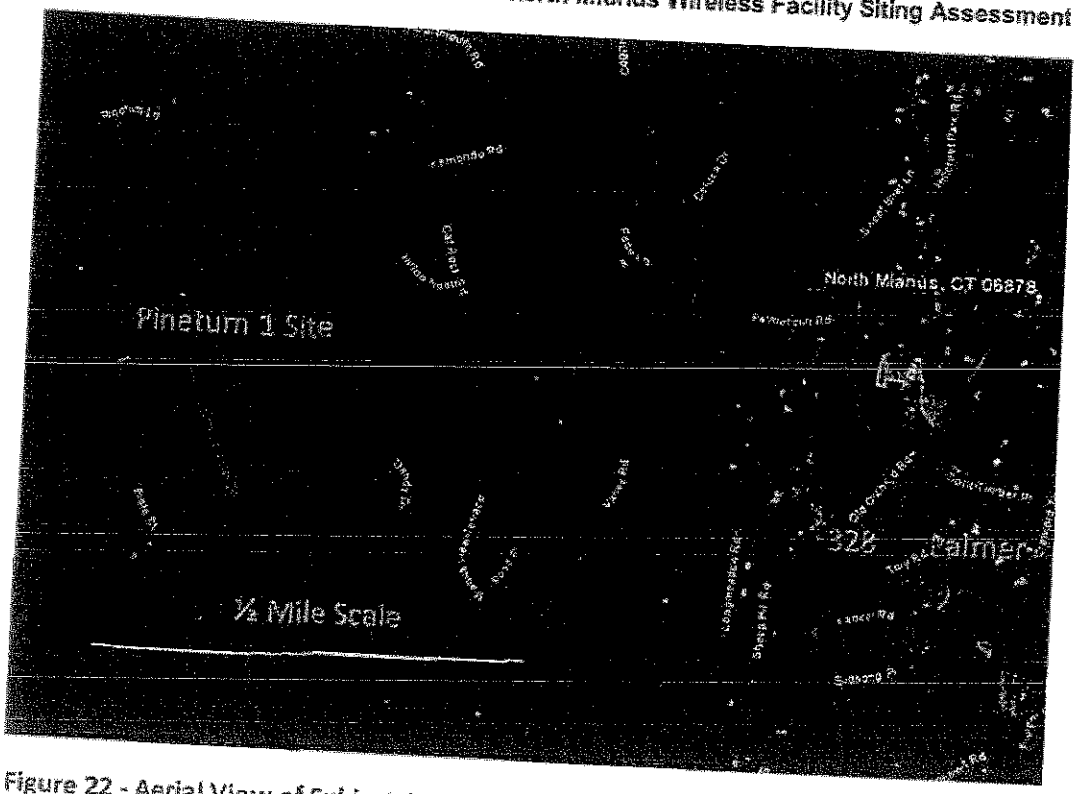

Figure 22 - Aerial View of Subject Area

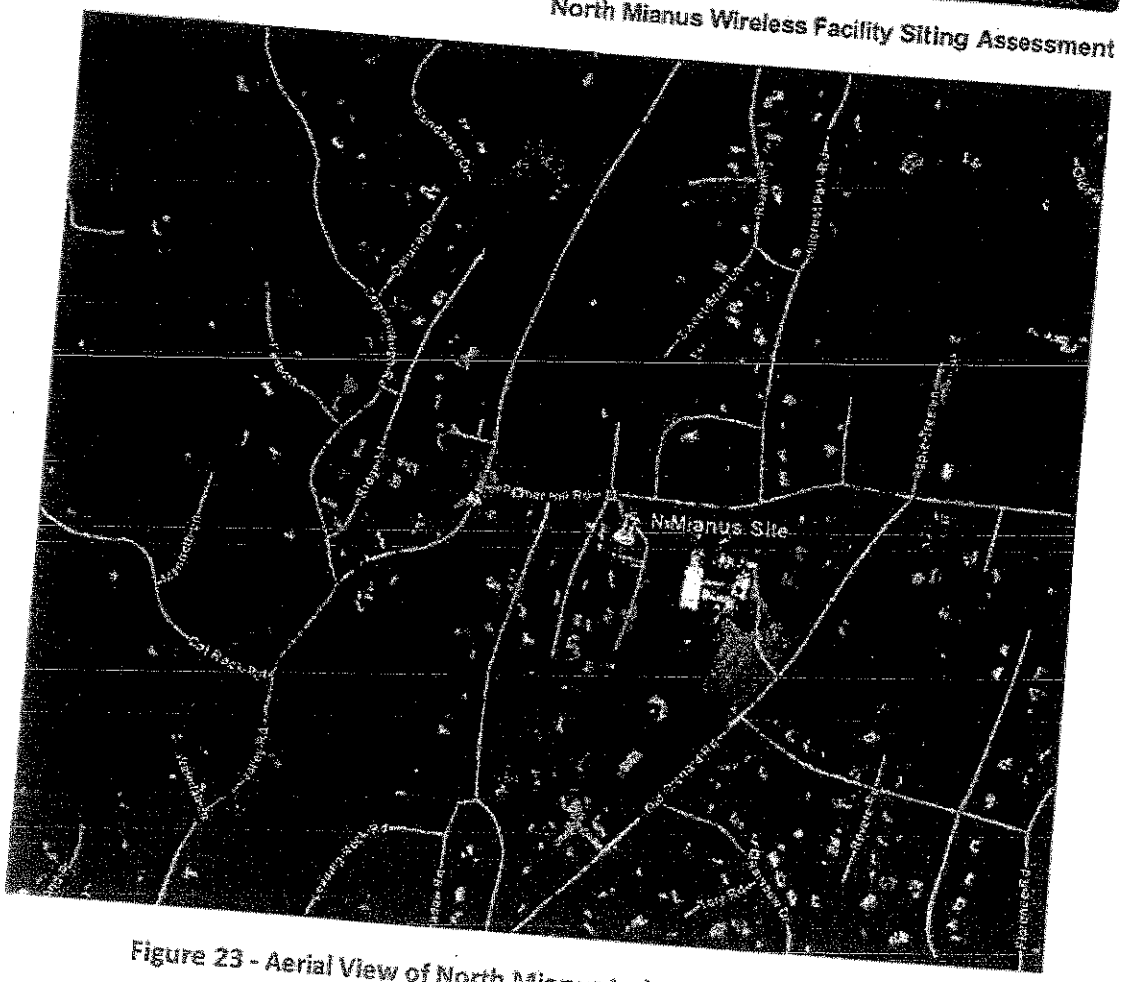

Figure 23 - Aerial View of North Mianus Including 328 Palmer Site

Figure 23 shows the locus of the 328 Palmer Site. The degree of development is apparent with numerous buildings placed fairly close together.

The proposed design of the 328 Palmer Hill PWSF reflects an attempt by T-Mobile to adopt a simple uncluttered look. The intensity of development for the 328 Palmer Hill PWSF is relatively low, for several reasons:

1. The tower height and design limit the intensity, visually. The visual mass of the proposed unipole is the minimum practicable, for a tower – a relatively slender pole, ~2 feet diameter at the top (Figure 24, for example), and nearly as short as they come.
2. The limited height, in turn, limits the number of carriers sharing the site and building ground facilities. There is potentially room for one, or at most two, *additional* PWS carriers on the 80 foot tall unipole. The corresponding area required to develop the subject parcel for PWSFs would be limited to that which two or three carriers would occupy – perhaps 750 square feet at

most. The resulting bulk of structures, cabinets and fencing, as well as noise potentially generated by the PWSFs, has an inherent limit that is substantially less intensive than a tall cell tower development with four to seven carriers.

3. The Site and the area around it are already developed with residence, business and school uses. The existing development may contribute to lessening the relative impact of the proposed development. The eye of the beholder is already accustomed to the structures, utilities and ways around the Site. In some circumstances, such a location may have little detrimental impact on the community. Isotrope takes no position on the issue, and only suggests that this is one factor in considering the proposed 328 Palmer Site.

Figure 24 - Unipole behind Lincoln, Massachusetts Public Safety Building

In the experience of Isotrope, it is quite common for communities to look for alternative ways to lessen the number of people adversely impacted by a proposed PWSF and to seek to lessen the degree of adversity of the impact. Design, intensity and location are the primary opportunities for controlling adverse visual impacts. Sites that are larger and more remote from residential uses are often sought. In addition, existing structures are often sought out to minimize new tower construction and new tower heights.

129 BIBLE ST SITE

The 129 Bible St Site is located at 129 Bible Street. The Montgomery Pinetum is 102 acres and owned by the Town. It consists primarily of open space, although there is an area of disturbance at which the Pinetum's operations are sited. Across Bible Street from these facilities is additional Pinetum land where the 129 Bible St Site is located.

The 129 Bible St Site was considered as an alternative location for placing PWSFs for several reasons. One very common reason for having PWSFs on municipal property is in support of the common good.

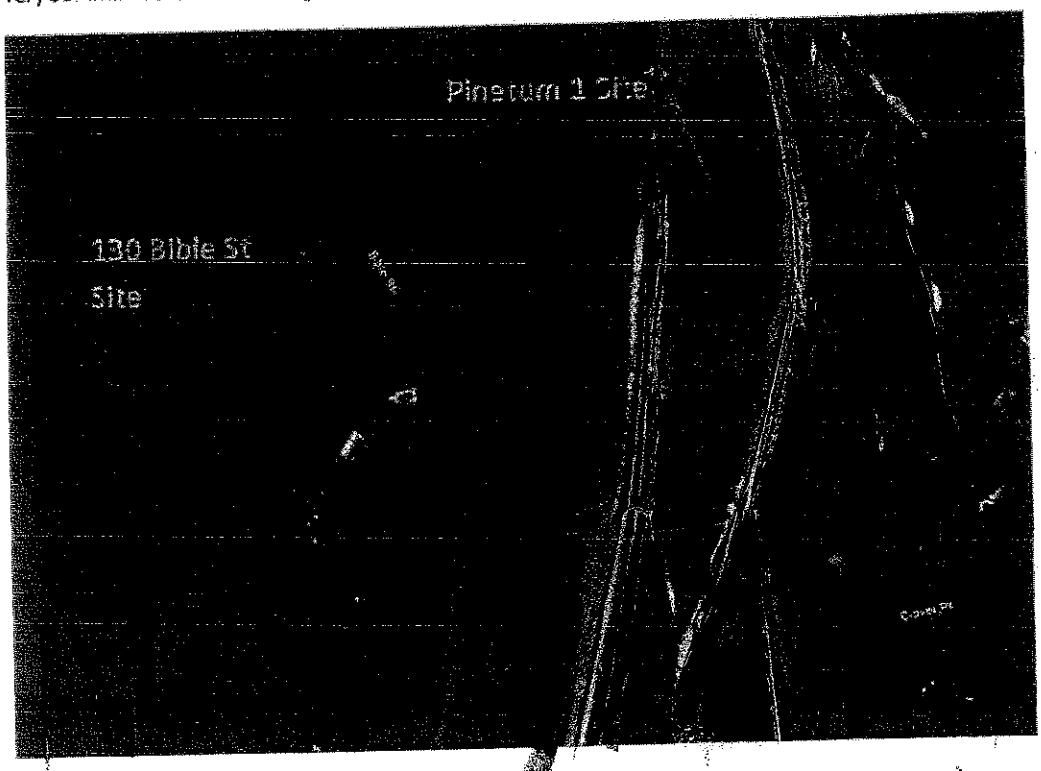

Figure 25 - Disturbed Areas of the Montgomery Pinetum

People also naturally look for locations that are not residentially developed, are on large parcels, or are surrounded by wooded areas. Each of these conditions substantially increases the likelihood that PWSFs will not be particularly visible or seen to loom over neighboring parcels. The Montgomery Pinetum has all three characteristics.

The Montgomery Pinetum is largely open space, but we take no position in favor or against the use of the property for PWSFs.

The initial location of interest provided to Isotrope was 129 Bible St, which is marked on Figure 25. This was an area where vegetative debris had been discarded in the past. Consequently, it is an open area requiring the removal of no trees to construct a PWSF. It has an access driveway from Bible Street.

Isotrope visited the 129 Bible St Site in January. There are two essential concerns about PWSFs and their towers with respect to visibility – horizontal view to ground level of the PWSF and elevated view to a tall tower that pierces or disturbs the skyline. Many residents in many communities are displeased by the prospect of having to look at an industrial looking telecommunications facility from their treasured residential parcels. If the 129 Bible St Site were ideal, it would be invisible at three elevations of view. We will call these "understory," "defoliated trees" and "skyline" visibility. Rarely is such a facility near a residential area completely invisible to residential uses on all three levels.

Figure 26 - South Understory View from 129 Bible St Site

Isotrope took photographs of the residences and outbuildings visible from 129 Bible St. Of course, in January there is no foliage, so there was maximum visibility for the photography. Figure 26 is a southerly view toward the rear of the parcels on Clover Place.

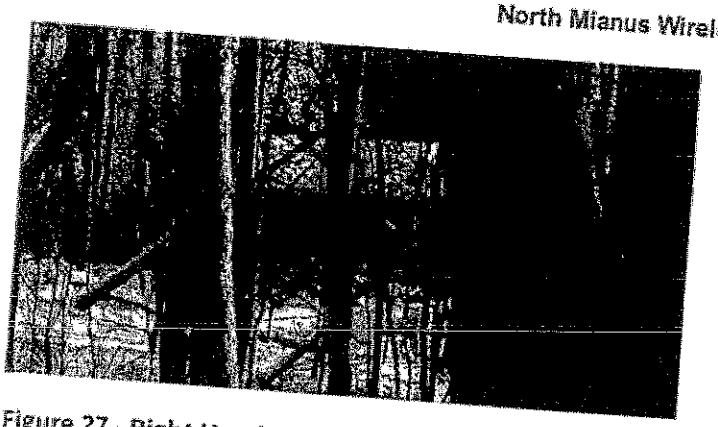

Figure 27 - Right Hand Structure in Figure 4, 3.75:1 zoom 105 mm equivalent

Figure 28 - Center Structure in Figure 4; 3.75:1 zoom 105 mm equivalent

Figure 29 - Left Hand Structure in Figure 4; 3.75:1 zoom 105 mm equivalent

Figures 5-7 are detail views of Figure 26 and are listed in Table 2. Figure 30 is oriented more southeasterly from the 129 Bible St Site. Figure 31 is a detail view of the only remaining residential structure that is visible from 129 Bible St.

Detail View	Estimated Address	Distance to a Laser-Readable Surface on or Near Structure
Figure 27	#23 Clover Place	166 yd/498 ft
Figure 28	#15 Clover Place	162 yd/486 ft
Figure 29	#13 Clover Place	180 yd/540 ft
Figure 31	#5 Clover Place	174 yd/522 ft

Table 2 - Table of Detail Photographs, Addresses & Distances from 129 Bible St Site

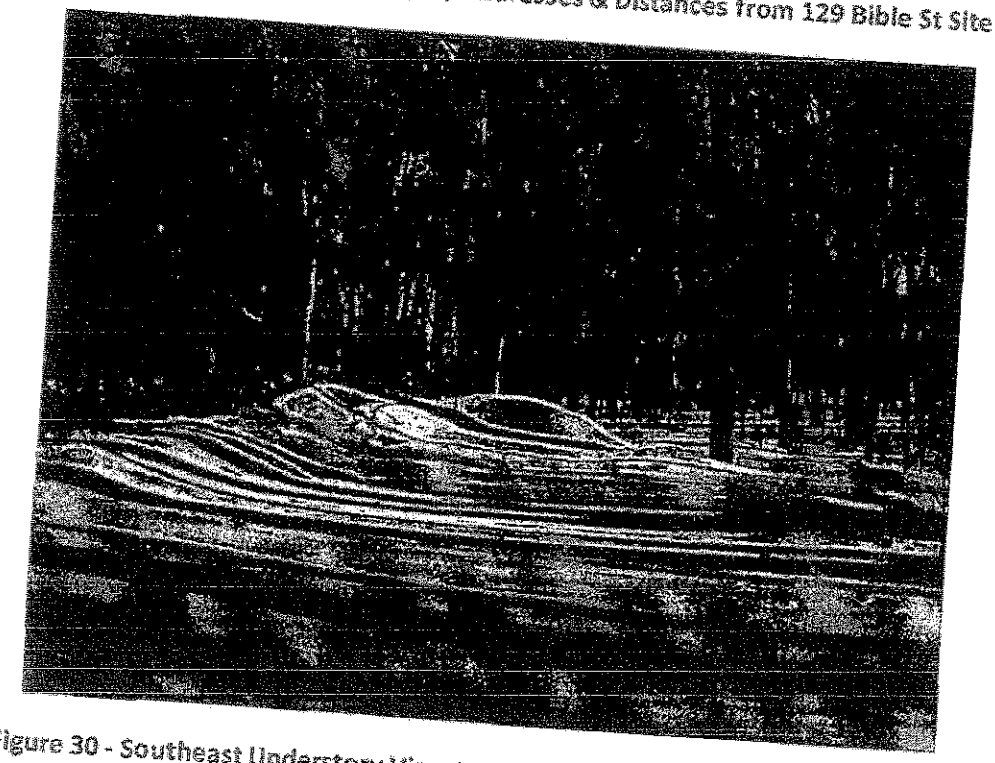

Figure 30 - Southeast Understory View toward Clover Place from 129 Bible St Site

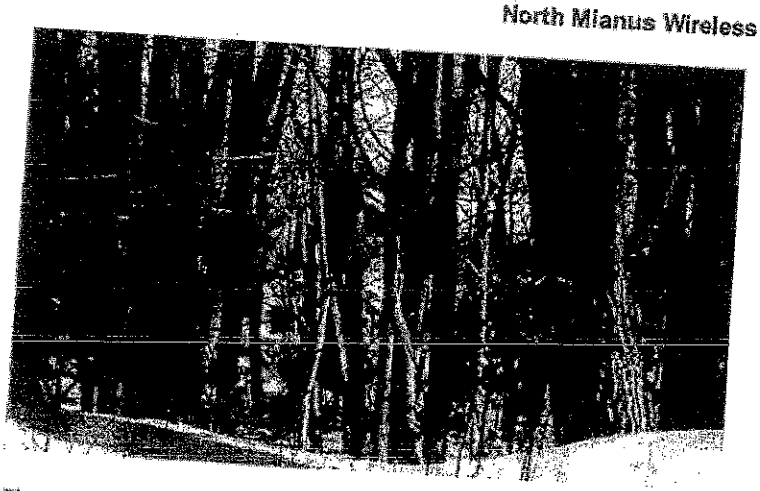

Figure 31 - Detail View of Structure in Figure 8; 3.75:1 zoom 105 mm equivalent

The above series of photographs provides a good sense of the distances and the amount of understory screening that exists between the nearest residences and the 129 Bible St site. This helps visualize the degree of visual impact in the horizontal understory field of view.

To illustrate a skyline view, Isotrope took a photograph from Clover Place at the driveway of #23. Figure 32 is oriented in the general direction of the 129 Bible St Site. Using a laser rangefinder, the distances to various targets captured in Figure 32 were measured. From this data, the approximate height and location of a prospective tower at 129 Bible St Site were triangulated.

On Figure 32 there is a gray "T" shaped marking behind the corner of the house at #23 Clover Place. Isotrope placed this figure on Figure 32 to indicate an estimated height of 160 feet at the 129 Bible St Site. Its thickness approximates the expected thickness of a monopole at that distance. The width of the cross bar at the top approximates the breadth of an antenna platform, if the tower were to use the customary exposed antenna mounts.

Laterally, the proposed tower may not turn out to be exactly in the position shown, depending on the exact position of a new tower in the vegetation disposal area. It may be a little bit left or right of the position shown. However, Isotrope is reasonably certain that from the camera's viewpoint a portion of the 160 foot tower would be clearly visible above the treeline in the background of Figure 32.

Figure 33 shows a simulation of a 105 foot tower at the same position on the 129 Bible St Site. It is partially concealed by the residence. Accounting for potential errors, Isotrope is reasonably certain that a 105 foot tower would not extend above the tree line in the background from the camera's point of view. If the 129 Bible St Site remains a candidate, Isotrope recommends that a more thorough visibility study be performed. While it is often impossible to completely conceal a tower from residential or street views, a study can help determine the severity of the overall visual impact of the facility, help identify the best mitigation methods, and provide a point of comparison with visual impacts of other alternative locations.

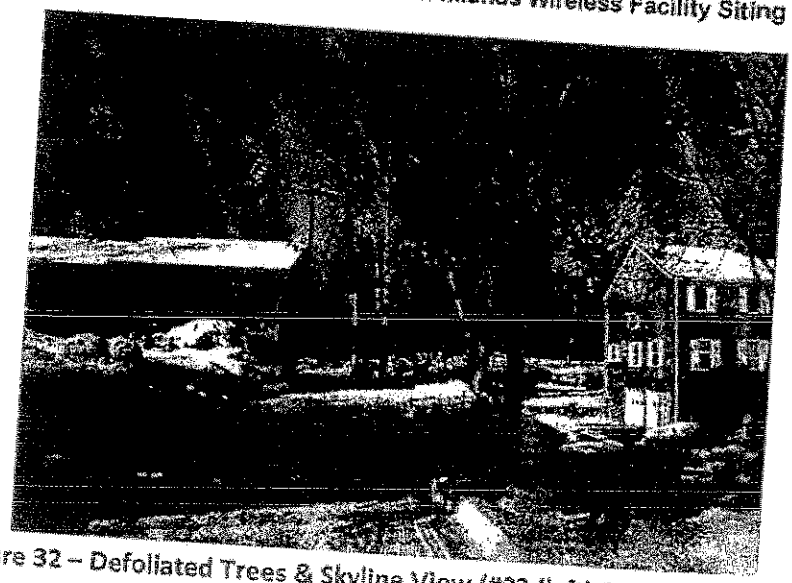

Figure 32 – Defoliated Trees & Skyline View (#23 (left) & #19 Clover Pl) – 160 ft Simulated Tower

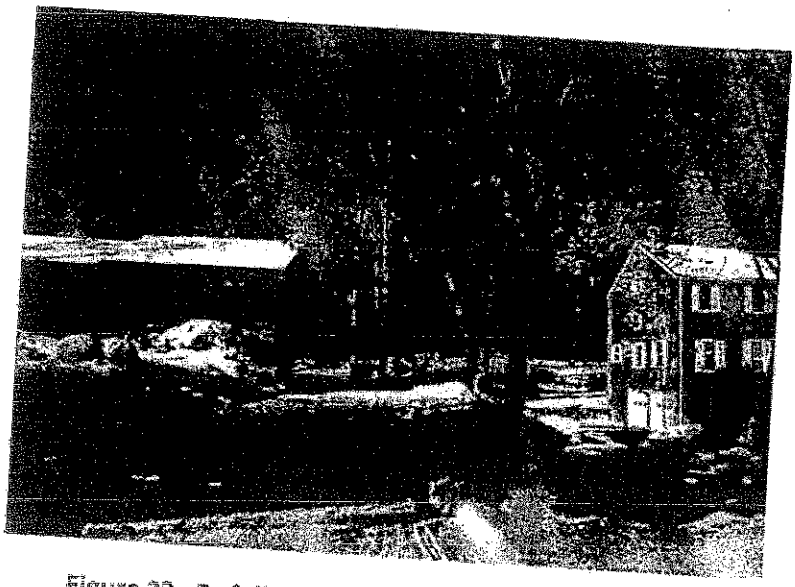

Figure 33 - Defoliated Trees and Skyline View - 105 ft

130 BIBLE ST SITE

Based on Isotrope's experience with searching for alternatives, Isotrope presents the 130 Bible St Site for consideration, for reasons explained herein.

As a point of comparison, let us first review the considerations for the 129 Bible St Site. Among potential locations on the Montgomery Pinetum land that might be suitable technically and aesthetically for a PWS tower, the 129 Bible St Site was attractive for several reasons. Among the reasons for considering the 129 Bible St Site:

- ✓ The 129 Bible St Site was previously used and the land disturbed for vegetation compost;
- ✓ There is existing access to Bible Street;
- ✓ No trees would have to be cleared;
- ✓ There is a 500-foot tree and vegetative understory buffer to the nearest residences that
  - Obstructs ground level views of the tower from the residences.
  - Reduces the scale of the tower, to minimize a shadowing or looming effect
  - Allows the trees behind the residences to obscure, in summer, much of the tower from the clearest view points, and the entire tower from many more vantage points. (In winter, the defoliation increases visibility.)

In comparison, possible reasons for considering the 130 Bible St Site are:

- ✓ The 130 Bible St Site is disturbed and developed as the central facilities for Pinetum operations;
- ✓ There is existing access to Bible Street;
- ✓ It might be possible to construct the facility with no or one tree to be removed or cut back;
- ✓ There is a 550-foot tree and vegetative understory buffer, as well as a 10-foot hill, adjacent to the nearest residence that
  - Obstructs ground level views of the tower from the residences.
  - Reduces the scale of the tower, if visible, to minimize a shadowing or looming effect to residences.

The main "campus" of the Montgomery Pinetum is across Bible Street from the 129 Bible St Site. The campus consists of a horticultural building, greenhouses, driveways and parking areas (an estimated 30,000 square feet of pavement), and a 70x70-foot maintenance equipment building. The campus of the Montgomery Pinetum is the primary area of disturbance on the Pinetum lands.

Many municipalities and planners encourage the use of disturbed land, and particularly developed land, for the placement of new wireless facilities. While the 129 Bible St Site is disturbed land, the 130 Bible St Site is developed with the usual elements of a public gathering place and place of directed activity. Isotrope identified a hypothetical location at the "working end" of the Pinetum campus where the maintenance equipment building is located. The approximate location is marked by the 130 Bible St arrow on Figure 25.

A tower at either location (129 Bible St or 130 Bible St) will be visible to visitors at the Pinetum facilities.

Skyline Views

From the Pinetum upper parking area, a 130 Bible St tower behind the maintenance building will be in full view. In comparison, from that parking area, a 160 foot tower at the 129 Bible St Site would be visible above the treeline.

Based on a preliminary visual assessment, there is a very low likelihood that a tower at the 130 Bible St Site would be visible above the treeline from residential areas within at least 1500 feet of the tower. Contrast this with the expected visibility above the treeline of a 160 foot tower, from some points along Clover Place.

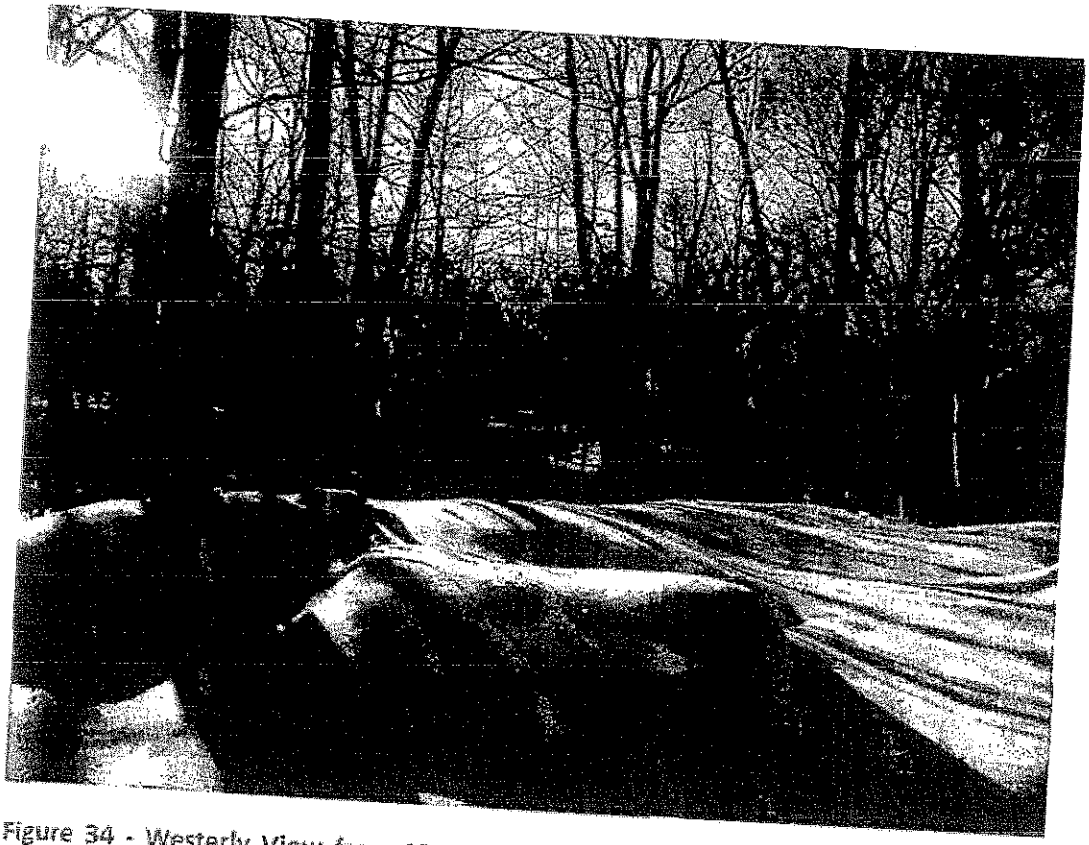

Figure 34 - Westerly View from 129 Bible St Site to Pinetum Maintenance Building, Showing the Degree of Screening through Understory and Defoliated Trees Views

Defoliated Trees Views

From the Pinetum upper parking area, a defoliated view through the tree branches to the 129 Bible St Site would also occur. Note the reverse view (from 129 Bible St Site to the Pinetum Maintenance Building) in

Figure 34. It shows that the defoliated tree view has sky as a backdrop. The same occurs in the opposite view, from the Pinetum parking area to the 129 Bible St Site.

With respect to the residential views to the 130 Bible St Site, based on a preliminary visual assessment, it is uncertain whether there would be visibility from residences through defoliated trees to a 130 Bible St tower. Contrast this with the evident visibility to a 129 Bible St tower through defoliated trees from locations on Clover Place (see Figure 32).

Understory Views

From the parking area of the Pinetum, there is no understory to screen a tower behind the maintenance building. Therefore, a tower at the 130 Bible St Site will be more visible to the grounds around the facilities than will one at the 129 Bible St Site, 600± away.

In contrast, it is expected that there will be no understory view from the nearest residences to the 130 Bible St Site. In contrast there is winter understory visibility, albeit very limited, from several residences to the 129 Bible St Site 500 feet away (for example, see Figure 26).

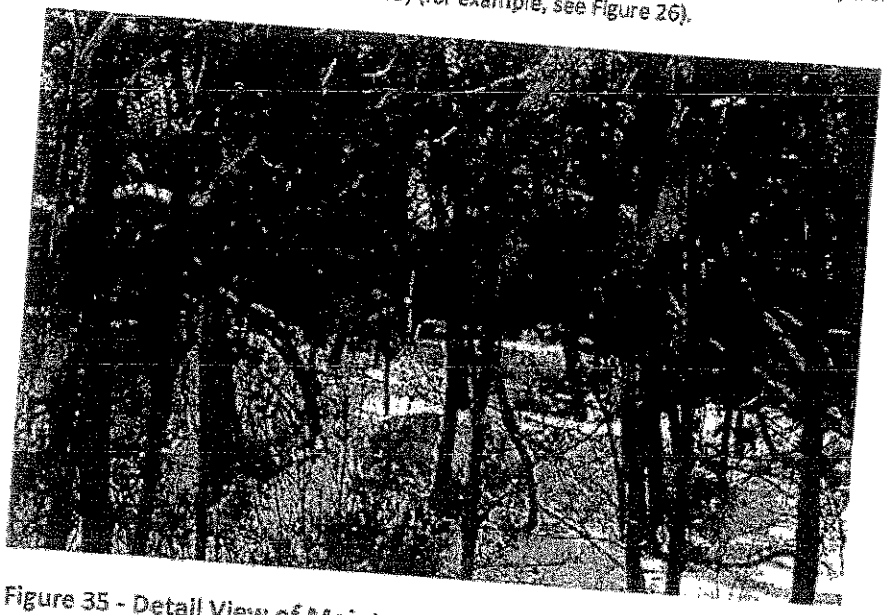

Figure 35 - Detail View of Maintenance Building from 129 Bible St Site; 3.75:1 zoom 105 mm equiv.

Point of View	Elevation of Viewline	129 Bible St Tower in Vegetation Disposal Area	130 Bible St Tower Behind Maintenance Building
From Residences	Skyline	160 ft yes, 105 ft no	Possibly not
	Defoliated Trees	Yes	Possibly not
	Understory	Winter, very limited	Possibly not
From Pinetum Parking Lot	Skyline	160 ft yes	Any height yes
	Defoliated Trees	Yes	Any height yes
	Understory	Winter, very limited	Any height yes

Table 3 Comparison of Visibility of Towers at 129 Bible St & 2 Sites to Residences and Pinetum Parking Area

Table 3 summarizes the visibility characteristics of each potential tower location – 129 Bible St and 130 Bible St. Visibility is considered from residences, and from the parking area of the Pinetum facilities. The 130 Bible St Site appears to have substantially less visibility to residences in the area, but requires further analysis to verify. The 129 Bible St Site has increased visibility to residences, and a similar visibility to the Pinetum parking area.

It may be more palatable to have the tower appear on developed land at 130 Bible St, in full view of the parking area, if it results in a significant improvement in residential visual impacts. These are local judgments that are best informed with a thorough visibility analysis.

At the 129 Bible St Site and the 130 Bible St Site, a unipole similar to that depicted in Figure 24 might be more palatable than a more conventional tower. Wireless coverage is addressed in the next major section of this report.

OTHER LOCATIONS CONSIDERED

During the fact-gathering phase of this project, Isotrope entertained suggestions for alternative locations received from residents. Isotrope also toured the area of interest and studied geographic information sources to identify possible alternatives. Table 1 - Sites Considered, lists the various locations that were evaluated for their potential to provide meaningful improvement to wireless coverage in the subject area. Some of those sites were not addressed in this Geography section: St Catherine, 1114 East Putnam Avenue, 54 Bible Street, Valley Road water tank, and Brennan golf course did not provide sufficient coverage to consider them further.

FINAL COMENTARY

This report describes the analysis of Personal Wireless Service Facility siting options in response to T-Mobile's expression of interest in placing a PWSF on a new tower in North Mianus. The tower would be 80 feet tall. Coverage from the tower would serve the hillside area east of the Mianus River, in the vicinity of the river crossing of Palmer Hill Road. The Town of Greenwich sought to evaluate possible alternatives that might be equally as effective in addressing T-Mobile's desire to improve coverage in North Mianus while also addressing community concerns about PWSF placement.

Several locations were identified for consideration. Isotrope toured the area, examined public records, obtained input from town officials and residents, and performed analysis on its geographic information system and wireless coverage analysis system. Table 4 outlines the alternatives discussed in this report and provides a short synopsis of their coverage performance.

The most effective alternative, from a coverage perspective is with a tower at the 129 Bible Street 129 Bible St Site (the former location of a vegetation compost area). The optimum tradeoff between tower height and visibility to residential uses will require more detailed visual analysis and coverage analysis.

The most effective alternative, from the perspective of visibility to residential uses, is with a tower at the maintenance facility of the Montgomery Pinetum – the 130 Bible St Site – on the opposite side of Bible Street from the 129 Bible St Site. On initial observation at the site and using GIS tools, a tower at the 130 Bible St Site may succeed in not being visible at all to residential uses within 1500 feet or more of the facility. The optimum tradeoff between tower height and visibility to residential uses will require more detailed visual analysis and coverage analysis.

The remaining alternatives considered are at worst, fully redundant with existing wireless facilities, and at best simply fail to come close to addressing the T-Mobile objective.

While the proposed T-Mobile facility at the 328 Palmer Hill Road 328 Palmer Site would serve within a certain radius of the site, the proposed facility by no means addresses all the remaining area of Greenwich that is shown as having T-Mobile service below T-Mobile's preferred thresholds.

The use of the Pinetum for placing a PWSF is an opportunity not only to supply improved coverage to the North Mianus community, but also to serve a larger area of Greenwich that is below the T-Mobile coverage threshold. By allowing wireless carriers to utilize a new tower at the Pinetum, the town forestalls future demand for one or more facilities to improve service in the vicinity of Stanwich Road, western Cat Rock Road, Montgomery Lane and Dublin Hill Road.

A cooperative effort with T-Mobile is recommended to test one or more of the most viable alternatives for the effectiveness of their coverage and the degree of possible visual impact. Both are best done with a crane test. A similar field analysis of the proposed 328 Palmer Site would complete the process and give the Town an opportunity to consider the benefits and detriments of the options available.

Table 4 summarizes key findings about each alternative site and tower height considered.

Map Label Name	Tower Height - Ft	Notes
Proposed 328 Palmer Site 328 Palmer Hill Road	80	Defines basic T-Mobile coverage objective. Does not address all areas with below-threshold coverage. Estimated 1000 residences and 2800 population reached with >-84 dBm coverage
129 Bible St	160	Replaces and expands on 328 Palmer Site coverage. Includes new areas south, west and north of the Pinetum. Estimated 1600 residences and 4500 population reached with new >-84 dBm coverage
129 Bible St	100	Replaces and expands on 328 Palmer Site Coverage. Includes new areas south, west and north of the Pinetum, with a minor depression near Coachlamp Lane
129 Bible St	80	Replaces and expands on 328 Palmer Site Coverage. Includes new areas south, west and north of the Pinetum, with a moderate depression near Coachlamp Lane and Mianus West Bank
130 Bible St	160	Coverage is comparable to that of 129 Bible St at same height
130 Bible St	100	Coverage that is comparable to, and very slightly less effective than the 129 Bible St Site at the same height
130 Bible St	80	Coverage that is comparable to, and slightly less effective than the 129 Bible St Site at the same height
54 Bible Street	100	Reaches some of the area targeted by the 328 Palmer Site facility. Has substantial overlap with coverage from PWSFs along Route 1.
Valley Road Water Tank	81	Not a substitute – coverage too far north of objective. Would require additional facilities to complete objective.
St Catherine	N/A	Fully redundant with existing 1111 East Putnam Avenue T-Mobile PWSF.
1114 East Putnam Avenue (Rt. 1)	N/A	Fully redundant with existing 1111 East Putnam Avenue T-Mobile PWSF.
Brennan Golf Course	N/A	Ridge between golf course and North Mianus blocks all signals.
DAS Network	Util. Poles	Not a high-value location for DAS at this time. Local action necessary to foster DAS over time.

Table 4 - Comparison of Alternatives Considered in this Report

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TOWN OF
GREENWICH

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E-Mail: ptesei@greenwichct.org

Peter J. Tesei
First Selectman

This certificate received on file
FEB 25 2011
On
At 3:31 p.m.
Town Clerk

Board of Selectmen Meeting
Thursday, March 3, 2011
10:00 a.m.
Town Hall Meeting Room

AGENDA

1. **Welcome and Pledge of Allegiance**
2. **Approval of Minutes**
   a. Regular meeting of 2-17-2011
3. **First Selectman's Updates – Peter J. Tesei**
4. **Old Business**
   a. Isotrope Presentation
5. **New Business**
   a. Community Request:
      i. Connecticut Association of Filipino American Families: Request for Board of Selectmen Approval to Hold their Annual Santacruzan Parade down Greenwich Avenue
6. **Appointments and Nominations**
7. **Executive Session**
8. **Adjourn**

Peter J. Tesei
First Selectman

Town of Greenwich
Board of Selectmen Meeting
February 17, 2011
10:00 a.m.
Town Hall Meeting Room

Draft Minutes

1. **The meeting opened at 10:06 a.m. with the Pledge of Allegiance.**
   a. Attendance:
      i. First Selectman Peter J. Tesei – Present
      ii. Selectman David Theis – Present
      iii. Selectman Drew Marzullo – Present

2. **Approval of Minutes**
   a. Minutes of the special meeting held on 2-15-2011 and the regular meeting held on 2-3-2011 were reviewed and approved without objection

3. **First Selectman's Update**
   a. Budget presented to BET
      i. Balances Value and investment – protects and enhances what makes living in Greenwich special
      ii. Town-operating expenses came in at less than 1%
      iii. Capital includes CFS and MISA
   b. BET conducted operations reviews of a number of departments Wednesday 2-16-2011, particularly:
      i. Public Works
      ii. Greenwich Fire Department
         1. Discussed temporary quarters
         2. Need for new station
         3. Reconstruction is less expensive and functionally superior
   c. Historic Budget review shows growth of government – but greater growth in services and mandates
      i. Mr. Tesei stressed that this was merely the continuation of the good work that District 7 members began – indeed the First Selectman was and is a supporter of the initial Sense of the Meeting Resolution
      ii. The research and composition of the report was done in a data-driven and dispassionate manner
      iii. This is a community-wide conversation that must incorporate the views of all residents
   d. Cell Tower study first draft is completed. Not being presented this week because many families are out of Town for school vacation
   e. The First Selectman registered his concerns regarding the recent debate in Hartford regarding potential border tolls and. Mr. Tesei believes that these potential tolls, if installed would adversely affect the Town

4. **Old Business**
   a. Bethel AME directional signs – DPW update

Peter J. Tesei to motioned approve the placement of black and white 18x24 inch way-finding signs for the Bethel AME Church at the intersections of Arch Street

and Sound View Drive; Arch Street and Greenwich Plaza; Field Point Road and Post Road; as well as Lake Avenue directly off the Lake Avenue roundabout. Drew Marzullo seconded. The motion passed unanimously. Dave Theis registered reservations about the proliferation of signs throughout Town.

5. **New Business**
   a. Department of Public Works
      i. Resolution supporting pavement improvement on Millbank Avenue and East Elm Street (State project No. 56-310)

         Dave Theis motioned to support the improvement. Drew Marzullo seconded. The motion passed without objection.

6. **Appointments and Nominations**
   a. Board of Social Services
      i. Dave Theis motioned nominate Angela Arenas (U) as a regular member of the Board of Social Services for a term expiring 3/31/2012. Peter J. Tesei seconded. The motion passed unanimously.
   b. Alarm Appeal Board
      i. Dave Theis motioned nominate Thomas Zack (R) as a regular member of the Alarm Appeals Board for a term expiring 3/31/2015. Drew Marzullo seconded. The motion passed unanimously.
   c. Planning and Zoning Board of Appeals
      i. Dave Theis motioned to nominate Ennala Ramcharandas (U) as an alternate member of the Planning and Zoning Board of Appeals for a term expiring 3/31/2014. Drew Marzullo seconded. The motion passed unanimously.
   d. Planning and Zoning Commission
      i. Dave Theis motioned to re-nominate Paul Marchese (R) as a regular member of the Planning and Zoning Commission for a term expiring 3/31/2014. Drew Marzullo seconded. The motion passed unanimously.
      ii. Drew Marzullo motioned to re-nominate Frank Farricker (D) as a regular member of the Planning and Zoning Commission for a term expiring 3/31/2014. There was no second. The motion failed.
      iii. Dave Theis motioned to nominate Fred Brook Sr. (R) as a regular member of the Planning and Zoning Commission for a term expiring 3/31/2014. Drew Marzullo seconded. The motion passed unanimously.
      iv. Peter J. Tesei motioned to nominate Nancy Ramer (D) as an alternate member of the Planning and Zoning Commission for a term expiring 3/31/2014. Drew Marzullo seconded. The motion passed unanimously.
      v. Drew Marzullo motioned to nominate Michael Borkowsky (I) as an alternate member of the Planning and Zoning Commission for a term expiring 3/31/2014. Dave Theis seconded. The motion passed unanimously.

7. **Executive Session**

Mr. Theis moved to enter into Executive Session. Mr. Marzullo seconded. The motion was approved without objections at 11:28 a.m.

Pending Litigation

Mr. Theis moved to enter into Executive Session. Mr. Marzullo seconded. The motion was approved without objections at 11:55 a.m.

Mr. Marzullo moved to adjourn. Mr. Theis seconded. The motion was approved without objections at 11:56 a.m.

The next meeting of the Board of Selectmen will be Thursday, March 3, 2010 in the Town Hall Meeting Room at 10:00 a.m.