

DEERFIELD PLANNING BOARD  
DEERFIELD, NEW HAMPSHIRE  
JANUARY 22, 2014

MINUTES OF MEETING

PRESENT: Board members Fred McGarry, Lisa Wolford, Peter Schibbelhute. Also present Planning Consultant Gerald Coogan and secretary Jane Boucher.

7:10PM Chair McGarry called the meeting to order at 7:10PM.

REQUEST FOR EXTENSION

Cathleen Perron and Peter Menard were present.

Ms. Perron is requesting a one year extension for conditional approval of her proposed Phase III subdivision on Middle Road. The conditional approval will lapse on January 23, 2013.

Chair McGarry read a letter from Peter Menard, Parade Properties, advising that he has walked the land with several interested buyers.

Peter Schibbelhute moved and Lisa Wolford seconded to grant an extension for one year for Phase III of the McCarron Subdivision. Voted in favor. (Conditional approval to lapse on January 23, 2015).

Peter Schibbelhute moved and Lisa Wolford seconded to approve the manifest in the amount of \$3,830.04. ( KNA-\$540.46 JCR, KNA-\$540.46 Verizon, KNA \$454.62 Browns Mill, Gerald Coogan \$752.50 Verizon, IDK Communication \$1200.00 Verizon, Upton & Hatfield \$342.00 Verizon, Time Sheet Jane Boucher 22 1/2 hours)

APPROVAL OF MINUTES

Lisa Wolford moved and Fred McGarry seconded to approve the minutes of January 8, 2014.

The following corrections were made to the minutes:

Page 2 Paragraph 5: Correct to read "...and someone would be on the property at all times."

Page 3 Paragraph 2: Correct to read "...would be a concern to abutters."

Page 3 Paragraph 7: Correct to read "...to Section 206 and 205.2 H..."

Chair McGarry called for a vote on the motion. Voted in favor with Peter Schibbelhute abstaining.

CORRESPONDENCE

A letter was received for NH Electric Coop requesting a Public Hearing for removal of trees on Candia Road. Gerald Coogan

will contact them requesting that trees to be cut be marked .  
The Planning Board will visit the site.

7:30PM CONTINUATION; PUBLIC HEARING; SITE PLAN REVIEW; VERIZON  
WIRELESS

Attorney Tom Hildreth, Tom Hayes, Dan Goulet along with others  
were present representing Verizon Wireless. Also present  
abutters Janet Samuels and Robert Hayes.

Chair McGarry advised that the Board had requested an  
independent review of the project by IDK Communications and  
Allen Drake. Chair McGarry noted that a review of the plans had  
also been done and report received from Keach Nordstrom, Town  
Engineer, and a letter from Avitar, Town Assessing Company.  
Copies of these reports are attached to these minutes.

Attorney Hildreth introduced himself and explained that he has  
been doing cell tower sitings for Towns since 1994. He noted  
that the ordinance allows up to a 175 foot tower Verizon had  
agreed to a 125 foot tower.

Attorney Hildreth also noted that there was discussion  
regarding a mono pole versus mono pine. He said they have some  
modified photo simulations done by Ben Caron.

Attorney Hildreth referred to C Squared Systems RF Report  
(Pages 4 and 5) towers and heights. He noted that the average  
tower height is 155 feet. A copy is attached to these minutes.

Robert Hayes, an abutter, asked if there was any consideration  
given to moving the tower to another location on the property.  
Attorney Hildreth replied that other locations were looked at.

Attorney Hildreth referred to the January 17, 2014 report from  
Allen Drake.

He noted that the generator, in ordinary conditions, is  
programmed to run 20 -30 minutes once a week. He said that the  
closest abutter from this tower is 500 feet away. He advised  
that he has done a tower in Portsmouth , NH which is 6 feet  
from a senior housing complex and in Hanover, NH a tower is  
located 10 feet from a dormitory at Dartmouth College.

Attorney Hildreth said that they find ways to comply with local  
noise ordinances. These noise producing elements; the  
generator, with very limited operation and air conditioning  
units, which only operate one at a time, are no different than  
things you would have in your own home.

Attorney Hildreth referred to "Claim 4" in Mr. Drake's report.  
"The loudness of the dBA levels mentioned above are somewhat  
subjective. Table 4, taken from Ref 1, p 32, gives and

indication of what various dBA levels correspond to in our daily experience. The right-most column in dBA 1 will leave the question of whether Claim 4 is met to the reader; however, if it is not met, it is close."

Janet Samuels, an abutter, said she would like to speak to the issue of the noise levels and were they adequately addressed by each engineer. She noted that the Concord Monitor ran an article in March, 2013 in which Hopkinton neighbors of a cellular tower complained about the noise levels from compressors. She added the compressor noise was not included in Doug Sheadels' report. Ms. Samuels felt that Allen Drake should be asked to provide information on the compressor noise.

Chair McGarry referred to Mr. Drake's report under "Recommendations #3 It could prove useful to determine from the HVAC unit manufacturer how much greater start-up noise is than steady-state running noise and how long it lasts."

Attorney Hildreth reviewed the "Noise Ordinance" in the Commercial Industrial Overlay Section 212 and noted that they will do whatever to comply and he is confident that it will not be an issue.

Attorney Hildreth noted that the structures will be built to house Verizon equipment. There will be no room for anyone else.

Lisa Wolford asked Ms. Samuels that if the applicant is in agreement to comply with the noise ordinance in the CI Overlay, why is this not okay.

Ms. Samuels felt that Allen Drake should go back and report on noise from compressors.

Lisa Wolford questioned if they were able to give different decibel numbers based on noise reduction techniques.

Attorney Hildreth replied that there is material available in chain link fencing to absorb sound. He added that they have never had a problem having to address noise levels.

Chair McGarry said he would like to see information from the manufacturer regarding noise levels at start-up.

Attorney Hildreth referred to the letter dated December 20, 2013 from Avitar Associates. Copy attached to minutes. Referred to " I have worked in several communities where taxpayers have opposed a cell tower and in one case remember a taxpayer strongly opposed to its presence as he believed it would negatively impact a relatively new housing project. He later bought in that same development after the tower was put up and

said although initially against it, he found the improved cell reception to be a bonus." Chair McGarry read the letter.

Attorney Hildreth reviewed revised plans noting that comments and recommendations made by Steve Keach have been incorporated into the revised plan. He noted that the applicant will receive a NHDOT Driveway permit.

Chair McGarry said that it was his perception that the existing trees will be maintained and left uncut. Attorney Weaver will work with the owner, Daniel Briggs, to create an agreement that trees on the property will remain. The Board would also like to see a plan depicting screening on the 100 x 100 area. Chair McGarry noted that KNA needs to review the revised plans and comment.

Attorney Hildreth referred to IDK's RF report noting that it concurred with C Squared RF Report.

Attorney Hildreth provided photos of mono pole and mono pine towers. Abutters present agreed that mono pole would be preferable.

Lisa Wolford questioned the possibility of reducing the height of the tower from 125 feet to 100 feet.

Dan Goulet said reducing the height will effect the coverage. Chair McGarry noted that there is a drop off between 150 and 125 feet and certainly a further drop off down to 100 feet. Mr. Goulet said that going to 100 feet would be a 22% reduction. He added that at 100 feet is not practical as trees will be in line with signals.

The Board was in agreement with the 125 foot tower.

Lisa Wolford referred to IDK's Report "The backup power option can consist of various options such as propane or diesel generator batteries or fuel cells. Out of all these options the generator would be the loudest when activated. Typically for maintenance purposes the generators are run a few times a month." She questioned batteries or fuel cells. Attorney Hildreth said that generators are standard.

Chair McGarry noted that the following need to be addressed by the applicant:

1. 65 days will elapse on 1/24/14. Applicant will request extension.
2. Performance Bond in place
3. CUP will be required. three year time frame; Applicant will come to Planning Board to renew CUP.
4. Inspections of base of tower by structural engineer.

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5. Co Location Agreement; Holding Town Harmless Agreement
6. Proof of liability insurance
7. Waiver request eliminating requirement of camouflaging
8. Escrow account in place; \$4500.00
9. Revised plans to be reviewed by KNA
10. Manufacturer to provide information on noise level
11. Agreement with landowner regarding trees to be left uncut

Verizon will also do an acoustical study to be measured at start up.

Lisa Wolford moved and Peter Schibbelhute seconded to continue the public hearing to February 26, 2014 at 7:30PM. Voted in favor.

The meeting was adjourned at 10PM.

Recorded and transcribed by Jane Boucher  
Pending Approval by the Planning Board



# IDK Communications

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January 16, 2014

Mr. Gerry Coogan  
Planning Department  
Town of Deerfield  
8 Raymond Road  
Deerfield, NH 03037

**RE: Wireless Engineering Services – Verizon Wireless Application 48 South Road**

Dear Mr. Coogan,

IDK Communications (“IDK”) has been tasked with the following scope pertaining to the above referenced subject.

- 1.) Review the RF Report for the proposed telecommunications facility at 48 South Road dated October 29, 2013
- 2.) Review coverage analysis supplied by the applicant
- 3.) Perform a coverage analysis with different heights for the proposed telecommunications facility
- 4.) Provide a written summary report with outputs

Radio Frequency (RF) Coverage Analysis:

When analyzing a site for radio frequency propagation several factors contribute to the overall performance. Of great importance are factors such as height above average terrain, tree density, building density and construction, frequency and equipment performance specifications.

The following paragraphs identify characteristics of each item used in determining overall performance.

#### Equipment specifications:

It is important to first determine whether a candidate site is limited by the radio path from the handset in a vehicle or building to the radio base station at the tower or by the radio path from the base station at the tower to the handset in a vehicle. In most cases because of the limited output power of the handset the path from the vehicle or inside a building to the radio base station at the tower is your limiting factor. Once this is known input parameters for both the base station and the handset are used to calculate the overall receive parameter used in the propagation modeling.

#### Height above average terrain:

Another important factor in determining a site's viability is how high the antennas will be in relation to the surrounding terrain. In the cellular/PCS world being at a maximum height above the average terrain is not necessarily a good thing since the systems are designed to provide handoffs to adjacent sites. Cellular/PCS carriers will re-use frequencies at different sites so it is important not to create interference with themselves. This philosophy differs from that of older wireless paging systems for example where sites were picked for their greater heights above average terrain. Cellular/PCS sites are picked by how they relate to the area that requires coverage. These areas are where the general population lives and commutes. A site that provides for coverage within a geographical area does not need to be on the highest point for that area but rather an area that provides enough clearance above the average terrain.

#### Tree Density:

Going along with height above average terrain is tree density. This factor is important because where the height of the antennas just clears the overall tree canopy in the surrounding area there may be additional losses associated with foliage. This loss can vary depending on types of trees and the density of the area. These losses are taken into account when determining propagation. It is also important to note that tree losses at the PCS frequencies of 1900 MHz are greater than the cellular frequencies of 700/800 MHz. Verizon Wireless proposed frequency for this application is in the 700 MHz frequency range.

Input parameter values are chosen and then used in statistical calculations to determine if a viable signal is available for a particular area. In some cases coverage deficient areas are caused by shadows from particularly high terrain. Elimination of the deficient area may sometimes only be accomplished by increasing antenna height or by selecting an alternative site if the heights become too great.

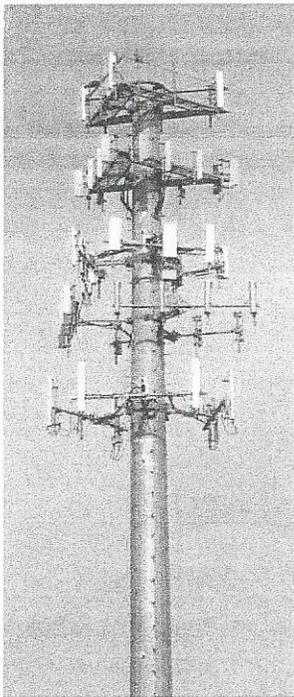
## Site Configuration Options

### Antenna Support Structures

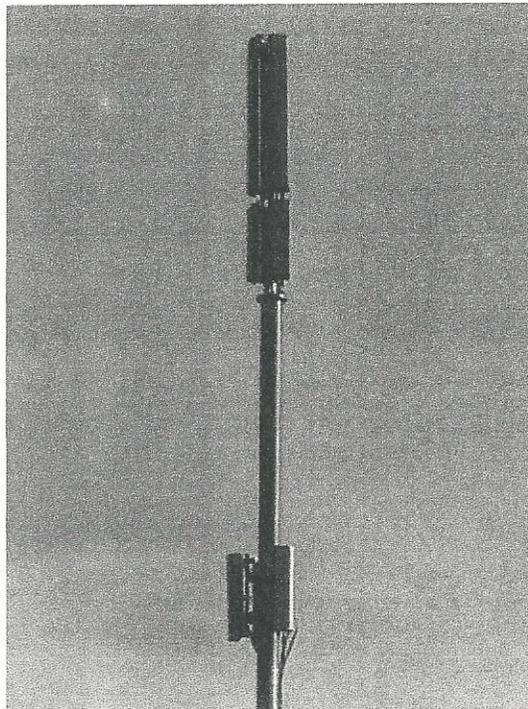
When designing an antenna site there are several options with respect to the structure that supports the antennas. Two of the most basic structures are lattice and monopole towers.

The lattice tower consists of three or four legs with interconnecting braces and is capable of heights in excess of 300 feet. The lattice towers can be either guyed with wires or self-supporting. With structural capacity being equal the self-supporting structures are wider than the guyed counterpart version.

The monopole structures are possible to heights of 190 feet. As their heights increase so does the complexity of the foundations used to support the structure. Antennas can be either mounted on the exterior of the pole with the transmission lines inside the pole or they can be mounted inside the pole with the transmission lines. Mounting the antennas inside the pole creates a more stealth design and they can also be disguised as flagpoles or trees. Doing this however will cause the carriers to take up more vertical space and thus the amount of co-location will decrease. If antennas are mounted outside the pole they can be flush mounted to the exterior of the pole to reduce the visual impact. Doing this would also have the same result as mounting the antennas inside with respect to the co-location opportunities. The pictures below offer two types of antenna installations outside of a monopole.



Non-Flush Mount Install



Flush Mount Install

## Equipment Powering

Typically a cell/PCS carrier constructs a site with an electrical feed and a backup option in the event of an AC failure. The electrical feed to a site is either supported overhead by utility poles or is trenched underground through conduits.

- ✓ The backup power option can consist of various options such as a propane or diesel generator, batteries or fuel cells. Out of all these options the generator would be the loudest when activated. Typically for maintenance purposes the generators are run a few times a month.

## Review of Applicant's RF Report

IDK reviewed the RF report dated October 29, 2013. We see no issues with the statements provided in the document and concur with the radio frequency explanations, analysis and regulatory summaries. Included in the report are coverage analyses for the existing and proposed locations. IDK has performed coverage analyses for the proposed location at different antenna heights as stipulated in the following paragraphs.

### Coverage Analysis:

IDK was tasked to validate the radio frequency performance of the proposed site at different heights. Verizon Wireless provided RF system information for its radio sites. The site data together with GIS information for the area were used in IDK's RF analysis. The output of these analyses is a map or plot that depicts the radio frequency propagation prediction. IDK has presented an analysis using the 700 MHz cellular frequency band currently used by Verizon Wireless to support its LTE buildout.

### Results:

Propagation analysis was performed for the proposed Verizon Wireless location at 48 South Road. Three heights were analyzed; 150 feet, 125 feet and 100 feet. Maps (Figures 1, 2 and 3) are included at the end of this report that depict the results with the coverage areas in green and blue. The green represents in-building coverage while the blue is the additional in-vehicle coverage. Areas with less than reliable coverage are depicted in white. The following paragraphs identify each scenario with the associated results:

### FIGURE 1

IDK ran coverage for the proposed location at a height of 150 feet. The site provides coverage to the southern part of the Town in the areas of South Road and Route 43.

FIGURE 2

IDK ran a coverage analysis to determine the impact to coverage by reducing the height to 125 feet. At this height a reduction of coverage occurs mainly on the outskirts of the target area and primarily with in vehicle coverage. The majority of coverage for South Road and Route 43 is not greatly impacted with this reduction in antenna height.

FIGURE 3

IDK next ran a coverage analysis reducing the height to 100 feet. At this height additional coverage is lost along South Road both east and west of the site as well as the interconnecting roads. Lowering the height of the structure to 100 feet will also limit the amount of co-location possible on this structure. Wireless carriers typically require a minimum of ten feet of vertical separation on a tower. Once antennas start to get below 90 feet the surrounding terrain will begin to pose a greater impact to propagation and thus may not be suitable for another wireless carrier.

In summary, the applicant has provided an analysis using standard engineering practice. Lowering the height of the structure impacts radio coverage, this is more evident at a height of 100 feet, and will impact co-location viability when reducing to this level.

If you have any questions please feel free to contact me at (978) 375-7914.

Yours truly,



Ivan Pagacik









## 5. Site Search, Selection Process and Alternate Candidates Evaluation

To find a site that provides acceptable service and fills the gaps in coverage, computer modeling software is used to define a search area. The search ring identifies the area within which a site could be located (assuming that sufficient height is used) that would have a high probability of meeting the coverage and capacity objectives established by the Verizon Wireless RF (Radio Frequency) engineers.

Once a search ring is determined, Verizon Wireless' real estate specialists search within the defined area for existing buildings, towers and other structures of sufficient height that would meet the defined objectives. If none are found, then the focus shifts to "raw land" sites. Even if a site meets the technical objectives established by the RF engineers it can still be rejected if it does not meet the requirements of the Real Estate and Construction departments. Every effort is made to use existing structures before pursuing a "raw land" build to minimize the number of towers throughout the towns being serviced.

In this particular instance, there were two existing towers investigated; however neither one was pursued due to their distance from the search area and their inability to satisfy the coverage and capacity objectives. The details of these towers are shown in Table 2 below.

Candidate Name	Address	City/State	Structure Type	Available Height (ft)	Evaluation
AT&T Tower	30 Raymond Rd	Deerfield, NH	Tower	140	Rejected: > 2.5 mi from Search Area
TRM	459 High St	Candia, NH	Approved Tower	177	Rejected: > 2.6 mi from Search Area

**Table 1: Alternate Candidates**

After the search of the area had been completed, Verizon Wireless had determined that there are no existing structures available that can meet the coverage and capacity objectives in the area, and that a "raw land" facility is required. Based on the search ring location and network needs, Verizon Wireless determined that the proposed "Deerfield" site is the best solution to fulfill the targeted coverage and capacity objectives.

## 6. Pertinent Site Data

Table 2 below details the site-specific information for the existing and proposed Verizon Wireless sites used to perform the coverage analysis and generate the coverage plots provided herein.

Site Name	Address	City/State	Location		Structure Type	Verizon Wireless Height (ft)	Site Status
			Latitude	Longitude			
Northwood	Saddleback Mountain Rd	Northwood, NH	43-10-34.30 N	71-12-24.23 W	Lattice	100	On-Air
Bow	734 Route 3A	Bow, NH	43-07-13.41 N	71-28-51.75 W	Lattice	150	On-Air
Candia	230 Tower Hill Rd	Candia, NH	43-02-21.94 N	71-21-31.43W	Lattice	145/190	On-Air
Candia 2	Patten Hill Rd	Candia, NH	43-01-57.37 N	71-15-58.95 W	Lattice	176	On-Air
Raymond	108 Main St	Raymond, NH	43-01-44.00 N	71-10-25.20 W	Lattice	179	On-Air
Epping	San Antonio Dr	Epping	43-01-27.18 N	71-08-10.37 W	Lattice	178	On-Air
Northwood 2	126 First NH Turnpike	Northwood, NH	43-11-40.84 N	71-08-39.22 W	Monopole	107	On-Air
Nottingham N	185 Old Turnpike Road	Nottingham, NH	43-10-58.90 N	71-06-24.20 W	Lattice	180	On-Air
Deerfield	48 South Road	Deerfield, NH	43-05-20.19 N	71-16-21.25 W	Monopole	147	Proposed

**Table 2: Verizon Wireless Site Information Used in Coverage Analysis<sup>2</sup>**

<sup>2</sup> Some sites listed in this table are outside the plot view of the attachments but are included for completeness of information.

# Allen Drake, Ph.D., P.E.

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January 17, 2014

Town of Deerfield, NH  
Planning Board

Ladies and Gentlemen:

**The Task** This report is in response to a request from you through Mr. Gerald Coogan, Town Planner, to provide a Third Party Review of the noise levels resulting from the proposed Verizon cell tower at 48 South Road in Deerfield. I was tasked to review the documents provided by Atty. John Weaver representing Verizon, including various site plans, photographs, generator specifications, HVAC unit specifications, and a statement by Mr. Douglas Sheadel of Modeling Specialties, an acoustic consultant retained by Verizon, who gave his assessment concerning the noise impact on the nearest residences. I was not asked by Mr. Coogan to visit the site, take measurements there, conduct modeling experiments, investigate town noise ordinances, or independently obtain data from manufacturers or from my own observations beyond what was supplied to me by Verizon. I was not asked to make any presentations outside of this written report or to appear in person at any meeting. While I was not asked to make recommendations for noise abatement, I do include three straightforward suggestions if the noise level is considered too high.

**The Claims** Mr. Sheadel makes four significant claims in his paper: (1) That the nearest residence is more than 500 feet away from the proposed tower; (2) That the sound pressure level (SPL) due to the HVAC unit will be no more than 26 dBA at the nearest residence; (3) That the SPL due to the generator will be no more than 41 dBA at the nearest residence; and (4) That the SPL from one of the HVAC units will be "well below the level that would be noticed even in a quiet rural community" and that the SPL from the generator will be less than that of a "typical car traveling down South Road."

## **Background Items**

**The Propagation of Sound over the Ground** Sound decays at a rate of between 4 and 5 dB for every doubling of horizontal distance from a point source when the point source is not too far above the ground [Ref. 1, p. 88]. This assumes that the topography under consideration is ordinary; for example, that any formations causing reverberation or excessive absorption are insignificant. In the calculations below I assumed a 4.5 dB loss for every doubling of distance.

Table 2 gives expected losses in dB from a point 23 feet from the tower to points further away. The 23 foot standard was chosen because it is what was used by the manufacturer in measuring noise from the generator.

Table 3 gives expected losses in dB from a point 60 feet from the tower to points further away. The 60 foot standard was chosen because it is what was used by the manufacturer in measuring noise from the HVAC unit. Other standards are listed in the manufacturer's specifications, but the longest standard was used because it then more closely follows the point source formula.

**The Sound Reducing Qualities of the Compound** The compound is the building at the base of the tower that will house the generator and the two HVAC units. Its effect (in dB) on reducing the noise outside of it compared to the noise inside of it is one of the most difficult quantities to estimate, especially when I was not given a structure to measure, nor many construction details, such as the material of the walls and roof, the thickness of the walls, the sound absorbing characteristics of its interior wall and roof surfaces. See Drawing A-1, Compound Plan and Elevation, prepared by Hudson Design Group for Verizon. Estimating the sound-insulating qualities of any acoustic enclosure, including this

compound, can be tricky, because resonances can be set up within it, which could make some frequencies louder than they would be without the enclosure. Generally, thicker walls will cause greater sound reduction, but the necessary large vents and exhaust ports will prevent there from being a thick wall totally enclosing the generator and the HVAC units. Unfortunately no sound abatement figures were supplied with Drawing A-1. I estimate that the sound reducing effect of the compound will be approximately 10 dB. I will call this the Compound Factor.

### The Claims Investigated

Claim 1 From my measurements taken from Plot Plan C-1 prepared by Hudson Design Group for Verizon, the nearest residence shown is approximately 583 feet away from the tower. (See highlighted block in Table 1.) This assumes, of course, that the Plot Plan is accurate. This claim, then, would appear valid. The reader should note that the nearest point of the lot is much closer (381 feet) to the tower than the nearest point of the residence on this lot (see Table 1). A further caveat is that Plot Plan C-1 does not show structures in the Town of Candia. It seems to me unlikely that a Candia structure could be closer to the tower than the closest residence in Deerfield, but it is impossible to tell from Plot Plan C-1.

Claim 2 . Table 3 (highlighted block) shows that the nearest residence experiences an SPL of 14.8 dB lower than the figure obtained at a point 60 feet from the source. The data from Verizon indicated that two Marvair HVAC Model AVP36 COMPAC II units would be installed, with no more than one of them operating at any given time. Each unit puts out 56 dBA at a point 60 feet from it. Thus the nearest residence experiences  $(56 - 14.8) = 41.2$  dBA.

From what I can ascertain from the manufacturer's specifications, the 56 dBA was measured with the unit outside of any enclosure. Since the HVAC units will be installed in the compound, the noise level will be reduced by an additional 10 dB due to the Compound Factor, resulting in an SPL at the nearest residence of approximately 31.2 dBA. I will assume that no more than one of these two HVAC units will be operating at any one time, so the maximum dBA at the nearest residence remains at 31.2 dBA, approximately 5 dBA greater than the claim. Thus it appears that Claim 2 is not met.

A further caveat should be noted. The readings given by the manufacturer were undoubtedly measured when the HVAC unit was running in steady-state mode. In reality HVAC units have to start and stop according to what is demanded by the environment. Very often the starting process is louder for a short time than the steady-state mode, sometimes 10 dB louder. If the unit cycles on and off frequently, it will then put out a higher average SPL than if it is running constantly for a long time.

Claim 3 I assume that there will be one MTU gas-powered 30kW generator installed in the compound and that its noise output will follow the SD030 Generac specifications that came to me from Verizon, with the following exceptions: MTU units run approximately 3 dB quieter than Generac, and gas engines run approximately 2 dB quieter than diesels. The material I received from Verizon stated this, and it seems reasonable. Thus I will reduce the SPL figures given on the Generac sheet by 5 dB.

On a sheet I received from Verizon entitled "Deerfield Equipment Assumptions," it stated that the generator would be installed "naked," i.e., with no acoustic enclosure. I find from the Generac spec sheet that in this configuration the generator puts out 82 dBA. If the 5 dB mentioned in the paragraph above is subtracted from that, we can consider it a point source measuring 77 dBA at a distance of 23 feet. From Table 2 we notice that the SPL at the nearest residence is 21.1 dBA less than the measurement at 23 feet, or 55.9 dBA. This does not account for the insulating effect of the compound. If we subtract another 10 dB due to the Compound Factor, the result is 45.9 dBA at the nearest residence. This is approximately 5 dB greater than Claim 3 stated, so it appears that Claim 3 is not met.

More noise from an internal combustion engine appears to come from its exhaust port than any other point of the engine. Since the exhaust port has to be external to the compound, the walls of the compound cannot be counted on to reduce the sound so much as in the case of a device that does not require an external exhaust port. Nevertheless, I will still assume a Compound Factor of 10 dB.

The generator, as the HVAC unit, will put out a louder average noise if it is cycled on and off frequently. Since this is an emergency generator, its frequency of on and off cycling is not expected to be very high and will not therefore affect its average noise level significantly.

**Claim 4** The loudness of the dBA levels mentioned above are somewhat subjective. Table 4, taken from Ref. 1, p. 32, gives an indication of what various dBA levels correspond to in our daily experiences. The right-most column is in dBA. I will leave the question of whether Claim 4 is met to the reader; however, if it is not met, it is close. Note that this Third Party Review does not address psycho-acoustic issues.

### Conclusions

1. The nearest residence is indeed greater than 500 feet from the center of the tower.
2. The prediction of 26 dBA for the SPL at the nearest residence due to the operation of one HVAC unit is probably a bit low. However, my estimate could be off by 5 dB.
3. The prediction of 41 dBA for the SPL at the nearest residence due to the operation of the generator is probably a bit low. However, my estimate could be off by 5 dB.
4. If both the generator and one of the HVAC units are running at the same time, the combination of the 31.2 and the 45.9 will give 46.0 dBA at the nearest residence.
5. If either the generator or one of the HVAC units cycles frequently, the average noise produced from it will most likely rise. It would be prudent to quantify this.

### Recommendations

1. If a reduction of noise is needed at the nearest residence due to the HVAC unit and the generator, the sound insulation qualities of the walls and the roof of the compound should be addressed. For example, the vents and exhaust ports could be muffled.
2. If a reduction of noise is needed at the nearest residence due to the generator alone, a generator model that includes an acoustic enclosure could be specified.
3. It could prove useful to determine from the HVAC unit manufacturer how much greater start-up noise is than steady-state running noise and how long it lasts.

### Consultant's Background

Allen Drake's experience includes doing undergraduate research in acoustics with German-born Prof. Helmut Eitzold, an acoustic expert in the Department of Electrical Engineering at the University of Rhode Island, working in the lab of Prof. Amar G. Bose during his master's studies at MIT, performing physiological acoustics experiments at Massachusetts Eye & Ear Infirmary at MGH under Profs. Nelson Kiang and William Peake, and designing otolaryngological instruments in the Ear, Nose, and Throat Department at Boston University School of Medicine under Dr. Geza Jako. Both his master's thesis and his Ph.D. dissertation were in acoustics.

Since then he has published papers, guided graduate students, and taught at universities for more than 36 years in the fields of acoustics and electrical engineering. He holds a Professional Engineer's license (#6172) in the State of New Hampshire.

### Reference

1. "The Master Handbook of Acoustics," fourth edition, by F. Alton Everest, McGraw-Hill, 2001

Shown in Table 1 are horizontal distances from the tower's center for selected lots. These are approximate values taken by micrometer readings off Plot Plan C-1 prepared by Hudson Design Group for Verizon Wireless, last revised 12/8/13

Lot #	Nearest Point of Lot (ft)	Nearest point of Structure (ft)
423-26	322	No structure shown
423-27	381	583
423-31	505	788
423-32	462	611
423-33	467	No structure shown
423-34	479	667
423-35	497	594
423-36	549	668
423-37	680	820

TABLE 1: Distances in Feet

Reduction in dBs of SPL due to divergence from a reference point of 23 feet from point source to the points cited in Table 1. (For use with generator)  
This assumes a reduction of 4.5 dBs of SPL for each doubling of distance, implying that the SPL in dBs follows the formula  $15 \times \log [L \text{ meas}/L \text{ ref}]$ .

Lot #	dB	dB
423-26	17.2	NA
423-27	18.3	21.1
423-31	20.1	23.0
423-32	19.5	21.4
423-33	19.6	NA
423-34	19.8	21.9
423-35	20.0	21.2
423-36	20.7	21.9
423-37	22.1	23.3

TABLE 2: dB Reduction with Lref = 23 ft

Reduction in dBs of SPL due to divergence from a reference point of 60 feet from point source to points cited in Table 1. (For use with HVAC units)  
This assumes a reduction of 4.5dBs of SPL for each doubling of distance, implying that the SPL in dBs follows the formula  $15 \times \log [L \text{ meas}/L \text{ ref}]$ .

Lot #	dB	dB
423-26	10.9	NA
423-27	12.0	14.8
423-31	13.9	16.8
423-32	13.3	15.1
423-33	13.4	NA
423-34	13.5	15.7
423-35	13.8	14.9
423-36	14.4	15.7
423-37	15.8	17.0

TABLE 3: dB Reduction with Lref = 60 ft

Sound Source	Sound pressure (Pa)	Sound level* (decibels, A-weighted)
Saturn rocket	100,000. (one atmosphere)	194
Ram jet	2,000.	160
Propeller aircraft	200.	140
Threshold of pain		135
Riveter	20.	120
Heavy truck	2.	100
Noisy office, } Heavy traffic }	0.2	80
Conversational speech	0.02	60
Private office		50
Quiet residence	0.0002	40
Recording studio		30
Leaves rustling	0.0002	20
Hearing threshold, good ears at frequency of maximum sensitivity		10
Hearing threshold, excellent ears at frequency maximum response	0.00002	0

\* Reference pressure (take your pick, these are identical):  
20 micropascal ( $\mu\text{Pa}$ )  
0.00002 pascal  
 $2 \times 10^{-8}$  newton/meter<sup>2</sup>  
0.0002 dyne/cm<sup>2</sup> or microbar

Table 4. Some Common Sound-Pressure Levels and Sound Pressures

Taken from *Master Handbook of Acoustics*, 4/e, by F. Alton Everest, McGraw-Hill, 2001, page 32





December 19, 2013

Mr. Frederick J. McGarry, P.E.; Chairman  
Deerfield Planning Board  
Post Office Box 159  
Deerfield, New Hampshire 03037

Subject: **Non-Residential Site Plan Review Application – Verizon Wireless  
48 South Road (Map 423 – Lot 22); Deerfield, New Hampshire**  
KNA Project No. 13-1216-1

Dear Mr. McGarry:

At your request we have completed a technical review of project plans and supporting information submitted to your Board by or on behalf of the applicant in the subject matter. To date, we acknowledge receipt of the following information, which was the subject of our review:

- A copy of a cover letter, addressed to your Board, as prepared by applicant's counsel on October 31, 2013 together with a copy of all attachments referred to therein; and
- A copy of the proposed project plans (6 drawings) dated August 01, 2013 and last revised on December 06, 2013.

Based upon our careful consideration and review of the foregoing information we offer the following comments and recommendations at this time:

### **General Comments**

1. As depicted on the project plans, we understand the applicant proposes to improve and repurpose an existing gravel drive in order to provide vehicular access to the planned telecommunications facility. Since this drive will intersect with NH Route 43 we recommend the applicant receive a NHDOT Driveway Permit prior to or as a condition of final site plan approval. This appears to be the only State project permit required under this application.

### **Zoning Matters**

- ✓ 1. Section 329.5 of the Zoning Ordinance contains a series of Construction Performance Requirements germane to telecommunication facility installations. In order to properly acknowledge applicability of these requirements we recommend a series of notes be added to the final site plan citing the text of those sub-sections of the Ordinance entitled

*Civil Engineering*

*Land Surveying*

*Landscape Architecture*

“Federal Requirements” and “Building Codes/Safety Standards”, which, under the terms of the Ordinance are to remain in effect on a permanent basis.

2. As acknowledged under Section 329.6 of the Ordinance, a Conditional Use Permit (CUP) issued by the Planning Board pursuant to authority of this Section, will be required in order to install and maintain the proposed telecommunications facility. In the event the Board elects to grant a CUP, we recommend a note be added to the final site plan acknowledging the same as well as any site specific conditions attached thereto. In order to fully satisfy all applicable requirements prerequisite to issuance of a CUP we recommend the applicant satisfy requirements of this Section pertaining to co-location as well as a hold-harmless agreement pertaining to “extraordinary fire or safety events”.
3. We recommend any approval granted to this application be conditional upon the applicant posting and maintaining surety, in an amount and form acceptable to the Town, sufficient to satisfy the requirements of Sections 329.8 and 329.9 of the Ordinance. In addition, in order to satisfy applicable requirements of Section 329.8 we recommend any approval granted be conditional upon the applicant demonstrating “appropriate liability insurance” is in place prior to issuance of a building permit for installation of the planned telecommunications facility.

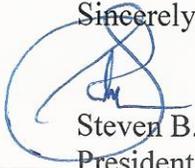
#### **Planning/Design Matters**

1. Given the size of the subject parcel and the generous distance of the planned telecommunications facility from the perimeter of the same, we recommend the applicant request, and be granted a waiver from the requirements of Sections III-3.E.3(a)(4) & (5) of the Site Plan Review Regulations relative to boundary survey information.
2. In order to satisfy applicable minimum requirements of the Site Plan Review Regulations we recommend the project plans be expanded to:
  - Identify the proposed limits of clearing - Section III-3.E.3(b)(1);
  - Provide detailed site grading information for the planned equipment compound and vicinity – Section III-3.E.3(b)(13);
  - Specify erosion and sedimentation control measures to be employed while completing improvements at both the compound area and site access drive – Section III-3.E.3(b)(10);
  - Specify all areas disturbed by construction are to be top-dressed with loam and seed conforming to the requirements of Section IV-3.A.2;
  - Specify construction details for equipment compound perimeter fencing and landscaping sufficient to demonstrate applicable requirements of Section 329.5 of the Zoning Ordinance will be fulfilled under this proposal; and
  - Provide typical details for all elements of site work such as: access drive and turnaround construction; equipment compound area surface; bollards; utility conduit installation; turf establishment and landscaping – Section III-3.E.3(b)(22).

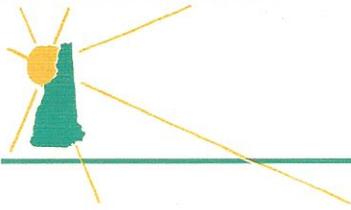
Mr. Frederick J. McGarry, P.E.  
December 19, 2013

We trust you will find the content of this brief letter report useful in your continued consideration and review of the subject application. As always, please contact the writer in the event you should have specific questions or further instructions related to the subject application.

Sincerely:



Steven B. Keach, P.E.  
President  
Keach-Nordstrom Associates, Inc.



# *Avitar Associates of New England, Inc.*

*A Municipal Services Company*

December 20, 2013

**Deerfield Planning Board  
P.O. Box 159  
Deerfield, NH 03037**

**Re: Property Values & Cell Towers**

Dear Board Members;

I am in receipt of the packet you sent regarding the proposed Verizon cell tower. I tend to agree with the appraisers that have analyzed sales over the years to determine if the presence of a cell tower affects market value. I have found no evidence to indicate that property values have been negatively impacted.

The local realtor states based on her experience that there is indeed a loss in value. I would ask to see the evidence to support that opinion. Paired sales (a sale before the tower and a sale immediately after) would be the only real way to measure the impact of the towers presence. I am not aware of any such recent before and after activity, particularly as the number of sales has been down over the past few years. I have worked in several communities where taxpayers have opposed a cell tower and in one case I remember a taxpayer strongly opposed to its presence as he believed it would negatively impact a relatively new housing project. He later bought in that same development after the tower was put up and said although initially against it, he found the improved cell reception to be a bonus. "

We had staff recently attend a cell webinar on this very subject. I am attaching excerpts from their analysis, as well as, their credentials. They have amassed significant amounts of data (paired sales) and have determined by analyzing these sales that the presence of the cell tower does not negatively impact market values. That is not to say that people are not affected by cell towers or negatively impacted by their sight or stigma, however those people will not buy a property within view of a cell tower, therefore it does not affect the market value merely the pool of buyers.

I hope this has been helpful, but please do not hesitate to contact me should you have further questions or concerns.

Sincerely,

**Loren J. Martin, CNHA, Sr. Assessor  
President, Assessing Operations**

LJM/sjc  
Enclosure