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Storey County Planning Commission
Storey County, NV

To All,

The following comments are directed to Tom Taormina's application for a Special Use Permit to install additional towers at 370 Panamint Rd., listed on the agenda for the March 3, 2011 meeting of the Planning Commission as:

> 2011-010 SPECIAL USE PERMIT: By Taormina, Thomas (Highland Ranches) Request for Special Use Permit to maintain existing amateur ham radio antenna towers and to install two additional amateur ham radio antenna towers, all of which will exceed the 45 foot height limitation established by Title 17 of the County Code. Project is located at 370 Panamint Road (APN 003-431-18), Highland Ranches.

These comments are specifically directed to ***Showing of Need for Height of Amateur Radio Antenna Support Structure*** dated August 12, 2008, by R. Dean Straw.

(This appears to be substantially the same as ***Needs Analysis for Height of Amateur Radio Antenna Support Structures*** dated August 13, 2008 except that several references have been omitted from the new filing.

A. In Mr. Straw's ***Showing of Need for Height of Amateur Radio Antenna Support Structure*** he justifies the need for the towers based on providing reliable communications with Asia and Europe. The ARRL publication ***Antenna Height and Communications Effectiveness*** that he mentions (and which he co-wrote) is available at: http://www.arrl.org/files/file/antplnr.pdf [Reference 1] . Not surprisingly, it says that higher is better. (But it doesn't say that more towers are better.)

From page 3:

> This report considers amateur radio antenna systems on proposed supporting structures that have already received permits but which are presently under a stop-work order. The studies presented consider antenna heights to compute standard reliability criteria for communications on the 80 and 40-meter Amateur Radio bands for:
>
> 1. A height of 195 feet for the 80-meter band (3.5 to 4.0 MHz) to Asia and Europe
> 2. A height of 45 feet, for the 80-meter band (3.5 to 4.0 MHz) to Asia and Europe
> 3. A height of 140 feet for the 40-meter band (7.0 to 7.3 MHz) to Asia and Europe
> 4. A height of 45 feet for the 40-meter band (7.0 to 7.3 MHz) to Asia and Europe
>
> Mr. Taormina has specified that the purpose of High Frequency (1.8 to 30 MHz) antenna systems is intended to serve to provide effective communications with Europe, Asia and North America. These three geographic areas are the most highly populated areas for Amateur Radio operators. North America, basically Canada, the USA and Mexico, is located relatively close to Nevada, while Asia and Europe are far more distant, requiring higher antennas for reliable communications.

and from page 10:

> 80 METERS (3.7 MHZ) TO ASIA
>
> What then are the actual effects of using these antennas, in terms of the reliability of signal coverage into Asia?
>
> Fig 3 shows the REL (reliability) contours generated by VOAAREA using the high 195 and 70-foot pair of 3-element Yagis pointed towards Asia at 1000 UTC in November. The 57% reliability contour just manages to cover all of Japan plus Korea. Again, this means that on four days out of seven communications are possible with the eastern part of Asia from Reno, NV, using a large antenna array. Coverage further west into mainland China with Beijing or Hong Kong is just out of range.

What possible kind of emergency could Storey County have that would require direct communications between the County and either Europe or Asia?

The assumptions underlying this need are:

1. Communications with the rest of North America is no longer possible.

2. There has been a catastrophe, everyone else is dead, and there is no one to operate the satellite networks or the undersea fiberoptic cables linking the continents.

3. Europe and Asia have escaped the catastrophe that has befallen all of North America (except for Storey County).

What kind of emergency aid does Tom think Europe and Asia will be able and willing to provide to Storey County?

The only emergency I can think of is that Tom and his friends need to contact more stations in Europe and Asia so they can win the Contests they are so passionate about participating in.

One of the events that could destroy the North American Infrastructure would be a nuclear war. If there were a war it would probably be with China. In such a war China would destroy our GPS satellites and we would destroy their GNSS (Global Navigation Satellite System). China could use Tom's communications signals with them as a beacon to send a nuclear-armed missile our way.

B. In Mr. Straw's ***Showing of Need for Height of Amateur Radio Antenna Support Structure*** he lists his qualifications. They are, indeed, impressive. See Page 4: Resume of the Author.

However, he also says:

> Straw retired in March 2008, and has been devoting his time primarily to the technical analysis of propagation and antenna phenomena, while indulging also in his passion for traveling and operating ham-radio contests around the world. He has been licensed as a Radio Amateur for 49 years, holding an Amateur Extra, the highest class, license since 1969.

{Emphasis added}

Also, from Mr. Straw's resume, from page 4 is:

> Straw also edited a number of books in his 15-year tenure at ARRL, including:
>
> 1. Three editions of The ARRL Handbook
> 2. Four volumes of The ARRL Antenna Compendium series
> 3. ON4UN's Low-Band DXing (two editions)
> 4. Low-Profile Amateur Radio
> **5. The ARRL DXCC Handbook**
> 6. Antenna Zoning
> 7. DXing on the Edge—the Thrill of 160 Meters
> 8. Basic Radio
> 9. Basic Antennas
> 10. He was co-author of Simple and Fun Antennas for Hams.
> 11. He has authored dozens of technical articles for the ARRL monthly magazine, QST.

{Emphasis added}

From the ARRL page for the DXCC Handbook [http://www.arrl.org/shop/The-ARRL-DXCC-Handbook] [Reference 2]

> **The ARRL DXCC Handbook**
> -- --by Jim Kearman, KR1S
> **The Thrill of Working DX!**
>
> **DX** in ham radio shorthand means ***distance***, literally talking to people in distant lands. Many radio amateurs enjoy the lure of DXing--seeing how far away we can communicate with other Amateur Radio operators. It's a way of determining how well our stations -- and we, the operators -- perform. DXing is a full-time goal for some hams and a just-for-fun challenge for others. The pinnacle of DXing success is the **ARRL DX Century Club**, or DXCC award.
>
> Author Jim Kearman, KR1S, discovered the thrill of DXing shortly after receiving his General Class ham radio license in 1963. After more than 40 years, the fluttery sounds of radio signals from faraway places still thrill him. In short, he still chases DX because it's great fun!
>
> We hope this book will inspire you to try DXing, and that you'll use it as a guide to beginning your own DX journey.

C. Mr. Straw is hardly an objective expert. He is a past Director (2007-2008) of the Northern California Contest Club. Tom was a director of that club in 2008-2009. See http://www.nccc.cc/officers.html [Reference 3]

Perhaps Mr. Straw's passion for contests and DXing (and his association with Tom) has influenced his interpretation of the data regarding the need for Tom's antenna heights.

In a Judicial Court Mr. Straw would not be allowed to testify as an expert witness due, at least, to his association with Tom.

D. There are a number of charts in ***Showing of Need for Height of Amateur Radio Antenna Support Structure*** that are used to show the need for high towers. These charts were produced using the computer program VOAAREA which is used by the Voice of American to plan their shortwave facilities. http://www.voacap.com/

The Voice of America is a ***Broadcaster***. From: http://www.voanews.com/english/About/

> The Voice of America, which first went on the air in 1942, is a multimedia international broadcasting service funded by the U.S. Government through the Broadcasting Board of Governors. VOA broadcasts more than 1,250 hours of news, information, educational, and cultural programming every week to an estimated worldwide audience of 134 million people.

Although they now also use satellite radio and the Internet, they still also use short wave.

1. When you are listening to a broadcast and you miss something, you cannot ask them to repeat it. When you are using person-to-person communications (as with ham radio) you can.

2. Asserting that emergency communications requires the same high quality signal as a Broadcaster (even a short wave Broadcaster) is ludicrous. It's like saying that your cell phone quality must be as good as what you hear on broadcast FM.

On page 6 on the Needs Analysis Mr. Straw states:

> 2. The MAL (Minimum Acceptable Level) is expressed as a percentage of time that communications are available at a specified Signal-to-Noise Ratio (SNR). The SNR value of 40 dB is commonly used in Amateur Radio. It is the minimum required SNR for a Single Sideband (voice) transmission. Single sideband transmissions sometimes require an SNR of up to 50 dB or more, which would further lower the results presented here (ie, this would require a larger/taller antenna system). In other words, in presenting the results here, the assumptions about required Reliability are very modest indeed.

I would like Mr. Straw to cite a reference to back up his statement that the SNR value of 40 dB is commonly used in Amateur Radio.

I have seen references (somewhere) that 40 dB is the SNR for Plain Old Telephone Service (POTS) and, according to the following reference, 20 dB is considered acceptable for communications.

From:
http://publib.boulder.ibm.com/infocenter/tivihelp/v8r1/index.jsp?topic=/com.ibm.netcool_wireless.doc/xF1122641919096.html
In Table 22 of the document: ***Netcool for Wireless User Quality, Version 2.0*** (it appears to be a product sold by IBM for evaluating communications networks) in the section ***Voice Monitor Measurements***, there as an entry:

Minimum signal to noise ratio	The minimum Signal to Noise Ratio (SNR). SNR measures the speech stream's signal strength relative to background noise. The higher the signal to noise ratio, the better the possible listening quality. SNR is measured in decibels (dB). An SNR value of 20 dB can begin to impair conversational quality.

They are saying that conversational quality can begin to be impaired when the SNR drops below 20 dB.

It can also be found in Table 22 of the PDF version of the document [PDF page 94] at: http://publib.boulder.ibm.com/infocenter/tivihelp/v8r1/topic/com.ibm.netcool_wireless.doc/WUQ_2.0_Monitoring_Guide.pdf [Reference 5]

The Signal-to-Noise Ratio (SNR) is given in dB, which stands for deci-Bell (1/10 of a Bell). The Bell is a logarithmic unit named in honor of Alexander Graham Bell. For comparing power levels the actual math is dB = 10 * log(p2/p1) . Because this is a logarithmic unit dBs are added (or subtracted) instead of being multiplied (or divided).

Let's give some examples.

Example 1: A 3 dB difference in power is a factor of 2, a 6 dB difference in power is a factor of 4, a 9 dB difference in power is a factor of 8, a 10 dB difference in power is a factor of 10, a 20 dB difference in power is a factor of 100, a 40 dB difference in power is a factor of 10,000.

Example 2: The difference in power between a 100 Watt transmitter and 200 Watt transmitter (twice the power) is 3 dB. The difference in power between a 200 Watt transmitter and a 400 Watt transmitter (also twice the power) is also 3 dB so that the difference in power between a 100 Watt Transmitter and a 400 Watt transmitter (4 times the power) is 6 dB. The difference in power between a 100 Watt transmitter and a 1000 Watt transmitter (10 times the power) is 10 dB. The difference in power between a 100 Watt transmitter and a 10,000 Watt transmitter (100 times the power) is 20 dB. The difference in power between a 100 Watt transmitter and a 1,000,000 Watt transmitter (10,000 times the power) is 40 dB.

Example 3: The same relationships hold for receiving signals from an antenna even though the power levels of a received signal are very very small. A signal-to-noise ratio of 20 dB requires that the received signal be 100 times stronger than the noise. A signal-to-noise ratio of 40 dB requires that the signal be 10,000 times stronger than the noise. Thus, the difference between a signal-to-noise ratio of 40 dB and a signal-to-noise ratio of 20 dB is 20 dB, which means that a signal-to-noise ratio of 40 dB requires a signal that is 100 times the strength as a signal-to-noise ratio of 20 dB.

Thus, Mr. Straw has exaggerated the amount of signal needed to be received by the antennas (in order to provide reliable communications with Europe and Asia) by a factor of 100.

Even if we say we need a signal-to-noise ratio of 30 dB the amount of signal needed is 1/10 (10 dB lower than) the amount of signal needed for a signal-to-noise of 40 dB.

Example 4: To make dBs more meaningful we will use a stereo system with an amplifier and speakers as an example. The minimum difference in acoustic power that the human ear can discern is 1 dB. (An amplifier producing 10 Watts would have to be cranked up to 12.6 Watts to increase the power by 1 dB.) A 3 dB difference will be noticeable but will not sound twice as loud even though the amplifier has been cranked up to 20 Watts. In order for the human ear to perceive that one sound is twice as loud as another sound it must be approximately 10 dB louder so the amplifier must be cranked up to 100 Watts.

There is also the matter that signal-to-noise ratio is not the only method used to determine the intelligibility of speech. There is the Articulation Index and the newer Speech Intelligibility Index which breaks the audio spectrum into frequency bands and assign a weighting number to the SNR in each band. See: http://scitation.aip.org/getabs/servlet/GetabsServlet?prog=normal&id=JASMAN000119000005003326000004&idtype=cvips&gifs=yes

And, finally, in stating the signal-to-noise requirements for Tom's communications on "Showing of Need for Height" on page 12:

> Noise
> The term “Signal-to-Noise Ratio” suggests that there are two quantities compared to each other - a (desired) voice signal and some sort of (undesired) noise. VOAAREA calculates the average noise mainly due to seasonal thunderstorms (whether the lightning crashes are coming from nearby or distant storms, propagating through the ionosphere). VOAAREA adds to that the average level of noise coming from the local environment — perhaps noise pulses coming from arcing high-voltage insulators, electric fences or an electric trolley running in the street near your receiving antenna.

Instead of a 195 foot tower perhaps Tom could fix his arcing high-voltage insulators and electric fences, and turn off his electric trolly during emergencies.

E. For the record:

1. I have been a licensed ham for 49 years. For the last 33 years I have had an Amateur Extra Class License, the same license held by Tom and Mr. Straw.

2. I have a BSE(EE) from The University of Michigan (1972).

3. I have an FCC General Radiotelephone Operator License with Ship Radar Endorsement. It was originally a First Class Radiotelephone license until the FCC combined the First Class Radiotelephone and Second Class Radiotelephone licenses under the theory that the owners of Broadcast could be trusted to employ only qualified engineers. My first career was as a Broadcast Engineer for WUOM, The University of Michigan’s big public radio station, which was one of the founding stations of National Public Radio (NPR).

4. One of the reasons I moved here was because the house I almost bought (in Sparks) came with CC&Rs that prohibited outdoor antennas of any kind. (see http://www.skyranchnhoa.org)

5. Although I have no plans at all to put up a tower, if I did I would want the option of putting up a 75’ tower in order to make sure the antenna clears the trees, but I could live with 45’.

This is WA2VEW (Jed on Empire) signing off for now.

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