# Municipal Ordinances and Reviews for Wireless Communication Towers

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## 1. The Issues

There has been a tremendous growth in the number of telecommunications towers built in recent years. Municipalities and the wireless telecommunications companies struggle to find a happy medium between the need for towers and the desire most cities have to limit the number of towers.

### Municipal Concerns

Why should the cities care? Don't we have enough towers and tall structures to accommodate the future antenna requirements? The answer is no. We are just at the beginning of a wireless technological revolution. We have moved from cellular telephones, which are 100% analog, to the personal communications services (PCS) which work at higher frequencies and use digital technologies. PCS is superior in many ways, including audio quality and security. However, as far as moving anything other than voice, PCS (often called second generation or 2G) is very limited.

What is seen advertised on television, and hyped in the media, is the result of the current and future wireless capabilities. Most of us are familiar with the wireless Short Message Service, or SMS, that allows users to send quick text messages from one phone to another. However, these services are minimal compared to the promise of surfing the web, watching real-time video, listening to software radio, and many other promised wireless services. These new services demand more bandwidth and new technologies. The wireless companies are currently rolling out advanced services to go beyond their 2G offering. These advanced services are often called 2.5G as a midpoint between 2G and 3G. Some companies are already deploying the full 3G technologies. (For more information on 2.5 and 3G see [1,2]). Of course, 3G will be followed in a few years by the rollout of 4G services at even higher bandwidths. The speed and bandwidth available for future wireless services promises to be better than that of our home dial-up modems. As will be discussed in a later section, this improvement in services will result in two things, 1) greater demand and 2) a need for more towers.

### The Problem

Wireless telecommunication companies have teams of engineers that are responsible for the development of their networks. They are equipped with software modeling tools that help them optimize the placement of towers and antennas for maximum diversity and channel capacity. On the other side, when these wireless companies apply to cities for a permit to

build a tower and place an antenna, what tools and skills do the cities have to review the applications?

The fact is that many cities are at the mercy of the telecommunication companies on these issues. The municipal council and municipal engineers simply do not know the questions to ask to determine if the tower is needed. In addition, cities are often using their standard building ordinances as the guidelines to review these applications. There have been several papers and reports that provide information that should be a guide to cities on this issue and are worth checking out [3,4,5,6]. Recently, consultants have appeared offering to help cities develop ordinances and review the tower applications. However, many of these consulting firms are themselves standing on shaky legal ground.

A following section will help identify what an ordinance should and should not include, guidelines about hiring consultants to develop ordinances, and guidelines about reviewing the applications themselves.

## 2. Wireless Telecommunications Models

The decisions about placement of antennas, the number of antennas, and the number of channels are based on models. In turn, these models are based on statistical analysis of customer usage. Here are some common rules of wireless carriers use today.

A. Towers and antennas are put in place to service a percentage of the total users in the area. The theory is that only a certain percentage of the customers will be making a call at any one time.

B. Users tend to have a short duration (a few minutes) per call. This average length of call is watched very carefully by the wireless companies. An increase in minutes per call often will result in the need for new antennas or towers.

C. Keeping A and B in mind, wireless companies design their network to serve a portion of the users. This design requires a limited number of antennas and, therefore, a limited number of towers.

### 3G & 4G Wireless Telecommunication Models

As the wireless companies roll out 3G services and consumer demand picks up, three things can be expected to happen.

A. The number of users will increase. This increase is not a 3G issue so much as a simple growth in the demand for the new services 3G will offer.

B. The average length of call will increase since customers are expected to be doing more web surfing and interactive messaging.

C. The bandwidth requirements are going to increase as a result of more video and data traffic.

D. Interference problems that are difficult to locate and manage will emerge. These interference problems will not be the fault of the wireless providers but will be caused by other businesses whose equipment does not meet Federal Communication Commission (FCC) emissions guidelines. The problems will have been hidden until the new services are offered.

E. New interference patterns that result from non-linearity's of the tower structure. Nonlinearities come up as a result of scattering and reflection from other metallic surfaces near the antenna, typical the tower structure itself. While few instances of this have happened with wireless carriers to date, an increase of incidence can be expected to as the proliferation of wireless antennas continues.

The result as more services are offered and more companies depend on and sale services using these wireless devices, the number of antennas, and hence towers will need to be increased. This growth could in turn result in new interference issues.

## 3. Concerns

**Concerns of the public**
There are three main concerns raised by the public. These concerns are often brought to the municipality.

1. Health effects from the towers
   Based on Section 704 of the Telecommunications Act of 1996, health effects related to cellular and PCS services are not an issue cities can address. While citizens come with many concerns over these issues, the wireless companies are required to meet all FCC guidelines for emissions and safety. Therefore, the only regulatory part the municipality can play in this is to verify that the companies are in fact meeting FCC guidelines. The municipality should also work with the wireless companies to communicate to the citizens the FCC guidelines and why the FCC is not overly concerned with Radio Frequency (RF) emissions from cellular and PCS towers. For more information, see the FCC report at ftp.fcc.gov/cgb/consumerfacts/rfexposure.html [7].

2. Aesthetic concerns of the towers and the landscaping
   The issue of aesthetics usually becomes the critical issue in exclusive neighborhoods or historical areas, but, it can be a problem anywhere. The towers themselves are considered unsightly and, therefore, are claimed to lower property values. This argument is often called the Not-In-My-Backyard issue [5]. Unlike the previous issue, the municipality, within certain guidelines, can address this issue. For example, the use of stealth towers has helped many wireless companies and cities deal with this issue. However, these towers are considerably more expensive. Some of these creative solutions can be found at www.stealthsite.com [8].

3. Fear of falling towers
   While this issue is not a major concern in most circumstances, this issue is often raised as another flag by complaining citizens. Language in an ordinance that limits how close a tower can be to a residence or to a major highway should help alleviate this issue. Towers are rarely over 200 feet tall. So a good ordinance might limit the maximum height of a tower to 200 feet and require a setback of 200 feet from a residence or major roadway. This requirement will limit the chances of injury do to a falling tower. However, modern PCS towers rarely fall, even in high winds, direct tornado hits, and earthquakes. Also, wireless companies are required to submit design information to the Federal Aviation Administration (FAA) to verify the tower design will not interfere with any airports or air traffic areas.

## 4. Municipal Ordinances

How will cities handle this onslaught of new applications expected in the next few years? Developing a quality ordinance can provide a municipality with a great resource for working with the community and with the telecommunications companies. Many municipalities already have ordinances in place, and others are working the tower issues through related ordinances such as land use or general telecommunications ordinances.

The wireless companies support the development and use of ordinances – if they are designed properly and with fairness. A good ordinance provides the companies with all of the information they need to apply for the placement of new antenna or towers. The ordinance makes their job easier since the wireless companies know the questions that are being asked.

**Guiding Principles for Ordinance Development**
First, a review of the law is in order. These laws are based on the FCC guidelines that are found in the Telecommunications Act of 1996. Much of this information can be found at the FCC Wireless Telecommunications Bureau Web site [9]. Specifically the issues addressed in the Act are found in Section 704, which “governs federal, state, and local government oversight of ‘personal wireless service’ facilities” [10].

A summary of the main points by the Telecommunications Act (Act) as they relate to local authorities and ordinances are listed here.

1. The Act allows state and local governments to regulate the placement, construction, and modification of wireless facilities as long as the regulations

   - do not discriminate among providers and
   - do not have the effect of prohibiting wireless services.

2. Any denial of request to place, construct, or modify wireless services must be in writing AND supported by substantial evidence in a written record.

3. Requests to place, construct, or modify wireless services must be acted upon by state and local governments in a reasonable time.

4. State and local governments are NOT allowed to regulate any wireless communications facility based on the environmental effects of RF emissions as long as the companies comply with the FCC regulations in emissions.

**What should the Ordinance contain**

With the above in mind, here are some recommended actions.

1. Develop an ordinance to control the types, heights, and location of new towers and antennas.

    a. Require the wireless communications companies to provide the municipality with adequate information to review the application to make sure the design has been performed by a licensed professional engineer who is licensed in the municipality's state.

    b. Require the company to provide the municipality with a propagation study showing the location of all their towers.

    c. Give the company an incentive to locate their new antenna on an existing tower or an existing structure, such as a water tower, a tall building, or a roadside billboard.

    d. Encourage the use of camouflage towers (called stealth) that blend in with trees and buildings.

    e. Require an application fee that will cover the costs of the municipal inspectors and/or any consultants needed to review the application.

    f. Develop a reasonable amount of control over the landscaping and grounds of the tower site. For instance, require a minimum landscaping and fencing (partly for safety) in all areas. But in certain residential areas, the ordinance might require extra measures such as wood or brick wall fencing and special gating.

2. Obtain the assistance of an engineer with experience in wireless industry to act as a consultant to review the applications. The role of this engineer should be strictly to assist in the ordinance development and the reviewing of applications. Finding the right consultant can be difficult, since most of the expertise will lie in the wireless companies themselves. Some consulting firms are available to provide this type of work, but you need to approach these firms with care. Many are making a handsome living adding language to the ordinances that are in a gray area of the FCC telecom act. In addition, they often delay approving applications until the last minute.

    Another issue is that most states require a Professional Engineer (P.E.) licensed in the state to be used for ANY engineering work. Many of these consulting firms are not trained engineers, and often are not licensed in your state. These things need to

be checked out. Universities are often good places to go for consultants. University faculty can often be found in or around your municipality, probably have the expertise, and are not usually affiliated with any company.

3. Develop a cooperative relationship with the wireless companies up front. Make sure they are aware of the actions you are planning on taking and notify all in your area when you develop an ordinance. Your citizens are their customers, so they want to make all parties happy.

**Examples of Ordinance Issues that are asking for Trouble**
Recently we have seen several cities adopt ordinances that have had the effect of causing the wireless companies to

- gather together to fight the cities and ordinances,
- threaten the cities with legal action, and
- refuse to serve the area with wireless services.

The first issue the companies have is the extreme cost of the review, which is performed by outside consulting companies. These ordinances often have open-end cost arrangements that allow the consultants to bill over $10,000 for a single tower review. A single review should rarely cost more than $2000.

The second issue is that of delayed applications. While taking three months to review may be justified on occasion, it should be rare.

The third issue is that of the engineering work being accomplished. The ordinances often require the municipality, using consulting engineers, to re-do most or all of the engineering work preformed by the wireless companies. This additional work may include propagation studies, interference studies, and radiation studies. This practice is questionable on several points.

a. The consulting companies or the municipality's engineers performing the review are often not registered professional engineers in the state and, therefore, are not licensed to perform engineering duties.

b. Since the companies making the application often are required by state governments to have drawings and designs by Professional Engineers, the engineering has already been accomplished and certified. Therefore, since this certification has been paid for and performed by the applicant, they are not happy to pay for it again, especially when all of their design criteria might not be taken into account.

c. No matter what the studies determine the FCC does not allow the cities to deny applications based on radiation exposure. Therefore, there is no point in doing a study.

Overall, the wireless companies are held responsible by the FCC for radiation and emissions levels and by the FAA for tower heights and lighting in areas near air traffic. The municipality should play no part in this regulation, except as a possible watchdog. Wireless companies are very aware of these issues and their rights.

## Conclusion

This course was intended to give the student a view of the issues involved with the development of ordinances for wireless communications towers and the issues surrounding the reviews. The authors have found that these issues are relatively easy to handle, since both the local governments and the wireless carriers ultimately serve the same customer.

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