BACKGROUND REPORT
SALINA CITY PLANNING COMMISSION
JANUARY 18, 2011

Wireless Communication Facility Regulations

Historical Background in Salina

On May 21, 1998 the Salina Board of Zoning Appeals approved a structure height variance to allow the construction of a 150 ft. cellular phone tower on the Kansas Cellular (now Alltel) campus adjacent to Graves Boulevard. This request had to be dealt with through the variance process because the City of Salina did not have any regulations in place dealing with the location and height of wireless communication towers and antennas. Rather than deal with future tower requests through the variance process on a case by case basis, staff recommended that the Planning Commission and City Commission consider adopting a set of local standards and guidelines that would regulate the location, height, setbacks building and safety standards of communication towers and antennas. Staff felt that having a uniform set of rules would help make the approval process more predictable for the wireless communication industry and assist local officials in their decision making process.

The Planning Commission authorized staff to prepare and file an amendment to the Salina Zoning Ordinance that would create a new section - Section 42-69 Communication Tower Regulations. The Planning Commission conducted public hearings on these proposed regulations on June 16 and July 21, 1998 and these regulations were adopted in their final form by the City Commission on August 17, 1998.

From the effective date of these regulations in August of 1998 until December of 2000 several wireless communication towers were constructed in Saline County, particularly along I-70 and I-135, but staff never received a request or proposal to place a tower within the city limits. The expectation was that the network of towers in the rural areas was providing adequate coverage in the Salina area. In December of 2000 representatives of Centerpointe Tower Site Solutions and Sprint PCS contacted City staff about their perceived need for a new tower in east Salina to provide increased capacity and coverage in that area, particularly PCS service. PCS was an emerging digital technology that was new to the Salina area. It operates at higher frequencies and with lower powered transmitters than conventional cellular technology and therefore it may require more tower and antenna sites because the effective coverage area of a cell is smaller than with conventional cell phone service. In other words it requires a network of shorter but closer together antennas and/or towers.

In their preliminary engineering study, the engineers for Sprint PCS identified the Marymount and Crawford intersection as the ideal location for a new tower and specifically the Roselawn Cemetery property because of the elevation and the amount of available open space. The southern portion of the Roselawn Cemetery grounds is zoned RS

(Residential Suburban) and the City's 1998 Communication Tower Regulations did not allow the placement of commercial towers in any residential zoned areas. They did however allow the placement of towers up to 200 ft. in height on A-1 (Agricultural) zoned property.

On December 15, 2000, the owner of the Roselawn Cemetery filed an application to rezone the cemetery grounds from RS to A-1 to make the zoning conform with the current use of the property. Cemeteries are a permitted use in the city's A-1 district.

The contact regarding a possible new communication tower in the cemetery coupled with the request to rezone the cemetery ground to A-1 caused staff to begin a review of the City's current zoning regulations as well as conduct some preliminary research on the status of wireless communication tower requirements in other communities. This preliminary staff work brought the following conclusions:

- Since adoption of the city's first communication tower zoning regulations in 1998, there had been significant change in the Midwest and throughout the country in how communities and the communication industry address issues related to siting communication towers in urban areas.

- Some cities had adopted regulations which appeared to more comprehensively and effectively address our priority issues related to protecting the public health, safety and welfare, while at the same time meeting the important and increasing wireless communication needs for the community.

- A particular staff concern was that the 1998 zoning regulations allowed a large communication tower to be constructed in an A-1 Agricultural zone without a Conditional Use Permit review process, and with a separation distance from residential uses which appeared to be less protective of abutting residential areas than the standards in place in other cities. In addition, there appeared to be some inconsistency in setback requirements for various uses in the A-1 zone. In hindsight, staff determined that the 1998 ordinance did not fully take into account that A-1 zones in Salina are not just "farm land". A-1 zoning is used here frequently as a "holding" zone for properties designated as residential in our future land use plan, and is also the primary zoning designation for parks, recreation areas, golf courses, cemeteries and other uses which frequently abut residential developments.

As a result of these concerns, the City Manager went to the City Commission on **January 22, 2001** and requested that the Commission place a 90 day moratorium on the approval of any communication tower construction project within the city. The City Manager believed

that this 90-day time period was necessary to allow the City to review and possibly amend its land use regulations to adequately address issues related to the siting of communication towers in Salina. During this moratorium period a staff team was put together consisting of the City Manager, City Attorney, Assistant to the City Manager, and the Planning Director. This team performed research, gathered informational material, met with wireless industry representatives and put together an outline of a new regulatory structure for reviewing and processing applications to construct new communication towers within the city.

This outline or concept was put into ordinance form for the Planning Commission's consideration and public input. It was adopted in June 2001.

Background Information on Federal Regulations and Cellular Communication

The regulation of wireless communication facilities is a complex subject that involves federal law, rapid changes in technology and the use of technical terms that are not always easy or simple to define. In this section of the report staff will attempt to briefly summarize the federal laws that apply to wireless communications, provide an overview of the technology involved in the wireless communications industry and attempt to introduce the Commission to some of the terminology used in the wireless cornmunications industry.

Federal Law

The Federal Telecommunications Act of 1996 was intended to encourage competition among providers of cellular phone service and other personal communication services. In Section 704 of this legislation Congress placed a number of limitations on the ability of local governments to control the location and placement of antennas and other wireless communication facilities for cellular phones and similar wireless services. Among the *substantive* limitations the Telecommunications Act placed on the authority of local governments are the following:

- Local zoning ordinances may "not" unreasonably discriminate among providers of functionally equivalent services."

- Local zoriing ordinances may not "prohibit or have the effect of prohibiting the provision of wireless services."

- No state or local government may regulate personal wireless service facilities based on the environmental effects of radio frequency emissions, to the extent that such facilities comply with the Federal Communications Commission (FCC) regulations concerning such emissions.

In addition, the Telecommunications Act placed several *procedural* limitations on local

authority, including the following:

- Local governments must act on applications "to place, construct, or modify personal wireless service facilities within a reasonable period of time."

- Local government decisions denying personal wireless service facility applications "shall be in writing and supported by substantial evidence contained in a written record."

- Any person adversely affected by a state or local decision concerning personal wireless service facilities may commence an action in federal or state court.

Terminology

The ordinance that was prepared by staff in 2001 primarily addresses wireless communication facilities and not other types of towers and antennas. **"Personal wireless service facilities"** is an umbrella term encompassing a broad range of wireless communication technologies that transmit information almost instantaneously, including cellular telephones (which use analog technology) the newer personal communication services (PCS, which use digital technology) and wireless internet services.

Antennas - There are at least three common types of transmitting and receiving antennas used in the wireless communications industry: whip, panel and dish antennas. Whip and panel antennas are used to transmit and receive radio waves carrying conversation signals. Dish antennas provide the link between the central computer switching system and the various whip and panel antennas used through the mobile conversation.

Whip antennas, also known as omnidirectional antennas, emit signals in 360 degree horizontal plane and are shaped like a cylinder. Panel antennas, also called sector antennas, have vertical and horizontal planes that aim, signals in specific directions. Dish antennas send microwave signals that allow the central switch to transfer the call between the various antennas closest to the mobile user.

Personal wireless services, such as cellular telephones and paging devices, function on a "line of sight" transmission. **Antennas need to be placed at specific heights in relation to one another in order to transmit and receive signals. As a result, height is a critical factor in the siting of wireless facilities.**

Antenna support structures - There are several types of antenna support structures used to place antennas at desired heights, relative to other antennas and line-of-site needs, in order to receive and transmit signals: guyed towers, lattice towers, monopoles and building-

attached facilities.

Guyed towers are tower structures that are supported in whole or in part by cables anchored to the ground and can range as high as 400 feet. Guyed towers need more open land area than freestanding towers to accommodate the spread of the support cables.

Lattice towers normally range from 60 to 200 feet but they can be taller than 200 feet. They generally have three or four support legs. These towers can support a variety of types of antennas and are found where great height is needed and where multiple microwave antennas are required. There is an inherent tradeoff with lattice towers in that they can accommodate co-location of different users, but may create more aesthetic impact due to the clustering of multiple antennas, as well as the high visibility of the structure itself.

Monopoles may be used by cellular telephone and personal wireless facilities, but the heights and design vary. Height of the single pose may be from 25 to 200 feet, with the diameter ranging from about 3 feet at the base to about 1-1/2 feet at the top. The taller a monopole is, the more geographic area is covered, in which case fewer antennas are needed. A monopole may support any type of antenna (whip, panel or dish). Monopoles used for PCS facilities may be shorter than those for cellular telephones.

Antennas can be placed on the roof or sides of buildings, water towers, billboards, church steeples and similar structures. Depending on the topography and height of the building, rooftop-mounted antennas are often less visible than pole mounted ones. Antennas placed on the sides of structures can often be painted to match the color and texture of the structure. Structures are used for mounting antennas only when they are of sufficient height for the antenna to function effectively.

Equipment buildings - Wireless communication facilities typically include an equipment storage building that houses transmitting and other equipment. Cellular equipment shelters measure around 500 square feet; PCS equipment facilities (called base stations) are self-contained weather-proof cabinets about the size of a vending machine. These structures are unmanned and checked only periodically. Equipment shelters may also be cabinets or boxes and underground vaults. The perimeter around these equipment buildings and tower is usually enclosed by security fencing.

Brief Technology Overview

Wireless communications are transmitted through the air via radio waves at various frequencies. The two main types of wireless communication technologies, cellular and personal communication services (PCS) devices, function similarly in that both depend upon a system of interconnected "cell sites" or geographical areas that cover a region. In this sense, they are both "cellular" technologies, but mobile cellular telephones are

frequently referred to as **"the"** cellular technology because that development pioneered the concept of wireless communication.

Both cellular and PCS technologies require an interconnected network of antennas to function effectively. Such a network involves a large geo-graphical area divided into "cells," each of which has an antenna that broadcasts to subscribers.

Each cell site within the system contains both transmitting and receiving antennas. Calls placed from a wireless telephone or device are sent to a central computer switching system. The central switch completes the call by connecting it either to a conventional telephone through a land-based line or to another mobile telephone through the nearest antenna. As a subscriber travels from cell to cell, the signal is handed off from antenna to antenna, providing uninterrupted service. If the subscriber travels outside the permissible range, however, the call is disconnected. Wireless providers, wanting to provide uninterrupted service, attempt to place antennas strategically to meet customer demand. As customer usage increases, a correspondingly larger number of towers is needed. These new towers may be placed anywhere from elevated, highly visible sites to wooded areas and from densely developed areas to rural highways. The new, popular PCS technology generally requires more towers to function than does cellular technology, although these digital towers may be somewhat shorter than the analog towers. As previously noted, antennas for all personal wireless service facilities may be affixed either to freestanding towers or to existing buildings, with freestanding towers generally having a far greater visual impact on the surrounding neighborhood and the community. Towers are expensive to build and are usually only constructed as a last resort when either extra height is needed or there are no suitable existing structures to mount an antenna on.

PCS and cellular technology function in similar ways in that both operate on a "cell site" system, and both utilize panel and whip antennas on poles and buildings. The differences are that PCS devices: 1) use digital technology (cellular currently uses analog, but it converting to digital); 2) have cell sites with smaller radii, and therefore need more cell sites; and 3) use a higher frequency on the electromagnetic spectrum.

A more recent technological development is wireless (no telephone lines) connection to the internet. (Wi-Fi) Some of these antennas are mobile, and are used with laptop computers. Others are more stationary and may be mounted on the roof of a home or on a commercial structure. Antennas used for this purpose both receive and transmit, but are very low power (about one watt) and are useful in only short range.

<u>How does a cell phone work?</u>

Inside your cell phone, there is a compact speaker, a microphone, a keyboard, a display screen, and a powerful circuit board with microprocessors that make each phone a miniature computer. When connected to a wireless network, this bundle of technologies

allows you to make phone calls or exchange data with other phones and computers around the world. The components operate so efficiently that a lightweight battery can power your phone for days.

Today, cell phones fit in the palm of your hand, weigh only a few ounces, and offer features such as color graphics, musical ring tones and voice-activated dialing. Only a few years ago, the electronics in this sleek device would have filled a large briefcase.

With wireless data services, you can receive faxes, browse the Internet, send and receive email or play video games-all on your cell phone. Some even include built-in digital cameras, spreadsheet software, GPS location services and music features.

A cell phone is really a radio-a very sophisticated and versatile radio. Much like a walkie-talkie, a cell phone receives and sends radio signals. Because these radios connect into a network, cell phones offer much more-the ability to call any telephone anywhere in the world, Internet access and data services.

Wireless networks operate on a grid that divides cities or regions into smaller cells. One cell might cover a few city blocks or up to 250 square miles. Every cell uses a set of radio frequencies or channels to provide service in its specific area. The power of these radios is controlled in order to limit the signal's geographic range. Because of this, the same frequencies can be re-used in nearby cells. So, many people can hold conversations simultaneously in different cells throughout the city or region, even though they are on the same channel.

In each cell, there is a base station consisting of a wireless antenna and other radio equipment. The wireless antenna in each cell links callers into the local telephone network, the Internet or another wireless network.

No longer just big radio towers, wireless antennas can be mounted in church steeples, on trees and flagpoles, and on top of tall buildings. Many are no larger than stereo speakers. In rural areas, taller antennas send signals further distances to better serve users who are more spread out.

Wireless antennas transmit signals just like your local radio station. And just like your car radio, these radio signals can be obstructed by trees, tall buildings and even weather.

When you turn on your cell phone, it searches for a signal to confirm that service is available. Then the phone transmits certain identification numbers, so the network can verify your customer information-such as your wireless provider and phone number.

If you are calling from a cell phone to a wired phone, your call travels through a nearby

wireless antenna and is switched by your wireless carrier to the traditional landline phone system. The call then becomes like any other phone call and is directed over the traditional phone network, and to the person you are calling.

If you are calling another cell phone, your call may go through the landline network to the recipient's wireless carrier, or it might be routed within the wireless network to the cell site nearest the person you called.

All of this takes place in a few seconds-before you say "hello."

Most cell phones use digital technology, which converts your voice into the binary digits 0 and 1-much like a music CD. These small packets of data are relayed through wireless networks to the receiving phone. On the other end, the conversion process is reversed and the person you are calling hears your voice.

But what makes cell phones mobile? If you are walking or driving, the wireless network senses when your signal is getting weaker and hands off your call to an antenna with a stronger signal. Using smaller cells enables your phone to use less power and keep a clear signal as you move. Even when you're not talking, your cell phone communicates with the wireless antenna nearest to you. So, it's ready to connect your call at any time.

Because the shape and size of cells vary, there may also be empty spaces between the coverage areas of two or more cells. These gaps or dead spots can also be caused by trees, tall buildings or other obstructions that block your wireless signal from reaching a nearby antenna. If a local government or landowner won't allow placement of a wireless antenna, that can create a dead spot.

A cell phone is actually a computer connected to a radio. Thus, it works much like your personal computer does to send and receive information. Digital technology is used to convert data, such as short messages, e-mail or digital pictures, into small packets of 0's and 1's. These packets are also transmitted securely over wireless systems.

As the wireless industry converts to packet-based networks, utilizing the same technology as the Internet, wireless data services continue to expand. Today wireless networks operate at data speeds five to ten times greater than dial-up telephone or earlier wireless networks. New networks will offer even greater speeds, equivalent to DSL and beyond.

These faster networks mean that Internet services formerly available only on desktop PCs are becoming available anywhere, in the palm of your hand, as a result of digital wireless technology.

Technology in the communications field is difficult for affected property owners and citizens

to understand, is difficult for local government officials to keep informed about, and is constantly changing. Staff expects that technological improvements and new services will continue to spring up and that federal laws will not allow local governments more regulatory leeway than they have now. Court decisions on issues such as moratoriums, denial of tower permits and interpretations of the federal communications law are likely to result in more uncertainty in the way communities address telecommunication regulation. The 2001 ordinance adopted by the City acknowledges federal preemption through the Telecommunications Act of 1996, added and clarified definitions, attempted to accommodate new technology, established locational preferences for new towers and antennas within the city and attempted to create a regulatory framework and permitting process which is understandable, legal and fair to the industry and the residents of Salina.