City and Borough of Juneau, AK

DRAFT Wireless Telecommunications Master Plan

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Prepared for:
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Chapter 1 Wireless Telecommunications Master Plan

Purpose

The Wireless Telecommunications Master Plan (WMP) serves as a planning tool for the City & Borough of Juneau (CBJ) that guides the future development of wireless telecommunication facilities. This plan provides a short history of wireless communication technology, explanation of current technology, service area maps, and an inventory of telecommunication sites in the borough. The WMP meets the goals and objectives of the 2013 CBJ Comprehensive Plan. Specific land use permitting requirements for wireless communication facilities are provided in the CBJ Land Use Code, Title 49. These permitting requirements are consistent with the policies provided in the WMP.

Background

Wireless communication technology has been rapidly evolving during the past 20 years with the increase in cell phone and internet use and the advent of smart phones. Demand for data (internet) service coverage has grown tremendously due to the popularity of smart phones. This high demand for data service has strained existing telecommunication facilities and resulted in a surge of new infrastructure, such as towers and antenna arrays.

Due to the remote location of Juneau and its regional and state importance, the use of wireless technologies is critical and heavily relied upon. In the past 10 years, Juneau has seen an increase in new towers and antenna arrays. Juneau experiences a summer seasonal spike in cellular and data usage from the more than one million cruise ship tourists who visit annually. Also, high marine use places another unique service demand: the need for cell and data service over waterways. Further, the mountainous terrain presents another challenge in service coverage.

Since 2005, the public has shown a growing concern in new towers, health effects from radio frequency emissions, and trends in wireless infrastructure. New towers have become most controversial in residential neighborhoods. The permitting process for new wireless infrastructure may be unclear and unpredictable for developers and general public. To better understand wireless technology and improve the permitting process, the CBJ and Cityscape Consultants, Inc. (CityScape) partnered to create the *Wireless Telecommunications Master Plan* and associated *Personal Wireless Service Facility Development Standards*.

The need for CBJ to manage the development of wireless telecommunication infrastructure is indicated by the following policies of the 2013 Comprehensive Plan:

POLICY 12.11. TO PLAN FOR AND TO ESTABLISH LAND USE CONTROLS ON WIRELESS COMMUNICATIONS FACILITIES IN A MANNER THAT IS APPROPRIATE FOR THE COMMUNITY AND WITHIN THE PARAMETERS ESTABLISHED BY FEDERAL LAW.

- 12.11 – SOP2 Avoid potential injury to persons and properties from tower failure and windstorm hazards through structural standards and setback requirements.

- 12.11 – DG1 Encourage developers and tenants of WCF to locate them, to the extent possible, in areas where the adverse impact on the community is minimal.

- 12.11 – DG2 Encourage the location and co-location of WCF on existing structures to minimize the need for additional structures.

- 12.11 – IA1 Conduct a planning process and adopt a CBJ *Wireless Master Plan*.

- 12.11 – IA2 Adopt new Specified Use Provisions in the Land Use Code that provide a uniform and comprehensive framework for evaluating proposals for WCF.

- 12.11 – IA3 Establish standards for location, structural integrity, and compatibility with surrounding neighborhoods to minimize the impacts of WCFs on surrounding land uses.

- 12.11 – IA4 Establish predictable and balanced codes governing the construction and location of WCF.

- 12.11 – IA5 Ensure that any new local regulation or restriction on WCFs responds to the policies embodied in federal law.

- 12.11 – IA6 Include provisions that encourage the use of locations identified in the CBJ *Wireless Master Plan* as preferred locations for wireless communications infrastructure in any ordinance that regulates WCFs.

- 12.11 – IA7 Use zoning restrictions to encourage concealment technologies for new wireless communication infrastructure to lessen adverse effects to surrounding neighborhoods.

The *Wireless Telecommunications Master Plan* and *Personal Wireless Service Facility Development Standards* help achieve conformance with those policies and consistency with the 2013 Comprehensive Plan.

Wireless Telecommunications Master Plan Policies

The policies and implementing actions shown below shall guide the development of Wireless Communication Facilities (WCF).

Public Health & Safety

Ensuring the safety and health of the public with the development of wireless communication facilities is critical. Many antenna array are placed on tall towers near buildings and roads. Having towers and antenna array meet local building codes will minimize tower failure during high wind and snow/ ice conditions. Further, antenna arrays send radio waves when distributing cell and data signal. This emits levels of electromagnetic frequencies that, if not controlled, can be harmful. The Federal Communication Commission (FCC) establishes a maximum emission level to preserve human health and safety. Also, with the construction of new and improved towers reaching above the treeline, it is important that the Federal Aviation Administration (FAA) and the Juneau International Airport (JIA) are notified to ensure aviation safety and compliance with aviation regulations.

POLICY 1. TO ENSURE THE PROTECTION OF THE HEALTH AND SAFETY OF THE PUBLIC WITH THE DEVELOPMENT OF WIRELESS COMMUNICATION FACILITIES.

POLICY 2. TO PROTECT AVIATION SAFETY BY COORDINATING WITH FEDERAL AVIATION ADMINISTRATION (FAA) WITH THE DEVELOPMENT OF WIRELESS COMMUNICATION FACILITIES.

Implementing Actions:

1. Require permits for all wireless communication facilities to ensure building and land use code compliance.
2. Adopt standards that establish a minimum setback distance that towers must be located away from adjacent property lines or buildings (i.e., fall zones).
3. Require compliance with minimum FCC radio frequency emission standards.
4. Adopt standards that allow for the development of wireless communication facilities in remote areas for emergency communication.

Natural Environment

Wireless communication facilities shall be located and designed in a way that avoids harming sensitive environments. Best Management Practices shall be used to lessen impacts. The placement of wireless communication facilities shall avoid highly sensitive wetlands, riparian vegetation, eagle nests, and other protected areas. Coordination with State and Federal agencies that manage sensitive environments shall be ensured with the development of wireless communication facilities.

POLICY 3. TO PROTECT THE NATURAL ENVIRONMENT WITH THE DEVELOPMENT OF WIRELESS COMMUNICATION FACILITIES.

Implementing Actions:

1. Ensure that new wireless communication facilities are located away from, or built using BMPs to minimize impacts to, sensitive environments such as wetlands, anadromous streams, eagle nests, etc.
2. Coordinate with State and Federal jurisdictions when wireless communication facilities may impact sensitive environments.
3. Ensure that wireless communication facilities are located away from geophysical hazards, such as flood zones, or are built to withstand such forces.

Neighborhood Harmony

Property value and neighborhood harmony shall be preserved with the development of wireless communication facilities. The fabric and overall feel of residential neighborhoods shall be preserved with new and improved wireless communication facilities through the adoption of design standards. The permitting process shall include incentives to support preferred development methods. Having a clear permitting process for the public to follow and participate in will improve decision making. Encourage the development of camouflaging wireless communication facilities to reduce impacts to residential neighborhoods.

POLICY 4. TO PROTECT THE PUBLIC INTEREST, PROPERTY VALUE, AND NEIGHBORHOOD HARMONY WITH THE DEVELOPMENT OF WIRELESS COMMUNICATION FACILITIES.

Implementing Action

- The CBJ shall adopt regulations that are predictable for the public to ensure fair and timely participation.
- The CBJ shall adopt regulations that require new wireless communication facilities in residential zones to be designed in a manner that minimizes impacts to residences.
- In residential neighborhoods, the CBJ shall seek experts in the industry for determining effects to property value from new wireless communications facilities, where necessary.
- The CBJ shall provide permitting incentives for new towers that encourage designs and locations that have minimal intrusions toward residential property.
- The CBJ shall encourage the use of public lands, buildings, and structures as locations for future wireless communications infrastructure to minimize impacts to private property.
- The CBJ shall adopt regulations that encourage wireless communication facilities to be designed to blend in with the surrounding environment.
- The CBJ shall encourage concealed technologies for new or rebuilt wireless communication facilities.

Land Use Efficiency

Due to the shortage of buildable land, especially residential, the CBJ shall encourage developers to utilize existing structures for future collocations or attachments of antenna array. This will reduce the need for new towers and increase the efficiency of land use. Existing towers shall be reinforced to allow for future collocations.

POLICY 5. PROMOTE LAND USE EFFICIENCY WITH THE COLLOCATION OF WIRELESS COMMUNICATION FACILITIES TO EXISTING STRUCTURES.

Implementing Action

- The CBJ shall incentivize the collocation of antenna arrays onto existing towers and structures to reduce the need for new towers.
- The CBJ shall establish incentives for reconstructing existing structures to accommodate future antenna arrays.

Scenic Corridors/ Viewsheds

Unique scenic corridors and viewshed in the borough have been mapped in the 2013 Comprehensive Plan. These areas capture the quintessential feeling of Juneau and Alaska and, therefore, shall be preserved.

POLICY 6. TO PRESERVE THE SCENIC VIEWSHEDS AND CORRIDORS LISTED IN THE 2013 COMPREHENSIVE PLAN WITH THE DEVELOPMENT OF WIRELESS COMMUNICATION FACILITIES.

Implementing Action:

- Wireless communication infrastructure shall be located outside of, or blend in with existing vegetation, the mapped scenic viewsheds and corridors of the 2013 Comprehensive Plan.

Intergovernmental Coordination

Due to the various uses of wireless communication facilities, the CBJ shall coordinate with other State and Federal agencies, such as the FAA and FCC, for assuring safe locations and designs.

POLICY 7. TO COORDINATE WITH STATE AND FEDERAL GOVERNMENT ENTITIES WITH THE DEVELOPMENT OF WIRELESS COMMUNICATION FACILITIES.

Amendment and Updating

The Assembly shall update the Wireless Telecommunications Master Plan every ten years or more frequently depending on the growth of wireless communication infrastructure. This update shall include the re-modeling of the service coverage maps (as provided in Chapter 3 of the WMP) and constitute as a substantial change to the Master Plan.

Amending the WMP, or minor change, shall be done on an as-needed basis at the Director's discretion. An amendment shall not have the effect of changing any policies or substantially revise any service coverage maps within the Master Plan.

Chapter 2 The Telecommunications Industry

Introduction

Telecommunications is the transmission, emission and/or reception of radio signals, whether it is in the form of voice communications, digital images, sound bytes or other information, via wires and cables; or via space, through radio frequencies, satellites, microwaves, or other electromagnetic systems. Telecommunications includes the transmission of voice, video, data, broadband, wireless and satellite technologies and others.

Traditional landline telephone service utilizes an extensive network of copper interconnecting lines to transmit and receive a phone call between parties. Fiber optic and T-1 data lines increase the capabilities by delivering not only traditional telephone, but also high-speed internet and, in some situations cable television, and are capable of substantially more. This technology involves an extensive network of fiber optic lines situated either above or below ground locations.

Wireless telephony, also known as wireless communications, includes mobile phones, pagers, and two-way enhanced radio systems and relies on the combination of landlines, cable and an extensive network of elevated antennas most typically found on communication towers to transmit voice and data information. The evolution of this technology is known as first, second, third, fourth and fifth generation (1G through 5G) of wireless deployment.

Wireless handsets

1G 1984 Mobria Cell Phone
Image: J. Bundy

During the early 1980's, the first generation (1G) of 800 megahertz (MHz) band cellular systems was launched nationwide. The 1G portable cell phones were boxy in shape and operated much like an AM and FM radio station. The 800 MHz frequency allows the radio signal from the base station to travel between three and five miles depending on topography and line of site between the base stations. Customers using a cell phone knew when they traveled outside of the service area because a static sound on the phone similar to the sound of a weak AM or FM radio station was heard through the handset. The signal either faded or remained crackling until the subscriber was within range of a transmitting base station.

Originally, the 800 MHz band only supported an analog radio signal. Later technological advancements allowed 800 MHz systems to also support digital customers which allows for an increased number of subscriber transmissions per base station.

The 1990's marked the deployment of the 1900 MHz band Personal Communication Systems (PCS). This second generation (2G) of wireless technology primarily supported a digital signal, which audibly was clearer than the analog signal. The handsets were a fraction of the size of the 1G cell phones and the first handsets provided expanded services such as paging and the ability

to send text messaging through the handheld unit. However 2G had some network functionality trade-offs. The technology of 2G included a static free signal but with a higher rate of disconnects or dropped calls thus the deployment of 2G required significantly more base stations for several reasons. First, the propagation signal in 1900 MHz is limited to a 2-4 mile range so the number of required base stations almost tripled just to provide basic 2G coverage in the same geographic area as a 1G service area. Second, the industry was reluctant to share tower space with a competitor and many service providers resisted collocating on the same tower. Third, subscriber base and usage grew rapidly and the industry needed more sites to improve network coverage demands by their customers.

2G Motorola Phone
Image: amazon.com

2G Nokia Phone
Image: htcevoforum.net

2G Motorola Phone
Image: superstock.com

Third and fourth generation (3G and 4G) wireless handsets offer a wide variety of tools and services including access to e-mail, news, music and videos; built in cameras and videos; global positioning services (GPS); internet commerce; and thousands of applications from games to flashlights for downloading onto the handset. These applications require large amounts of bandwidth and service providers continue to upgrade existing base stations and add additional base stations to improve and increase network capacity. To improve network functionality service providers purchased licenses to operate in the 1700-1800, and 2100-2400 MHz frequencies.

2G Phone (left)
4G Phone (right)
Image: answers.com

The operating footprint is similar to the 1900 MHz footprint and helped to increase bandwidth in smaller geographic areas. With the advances of 4G the service providers are purchasing licenses in the 700 MHz frequencies. The 700 MHz platform has a service area similar to 800 MHz and will allow the service providers to broadcast a larger propagation footprint. The need for additional infrastructure for 3G and 4G is significant nationwide and continuous deployment of new base stations will be necessary as the industry transitions to fifth and sixth generation (5G and 6G) utilizing the 700, 800, 1700-1900, and 2100-2400 MHz frequencies. LTE is used as a marketing name and is not reflective of the actual download speed as defined as 3G and 4G.

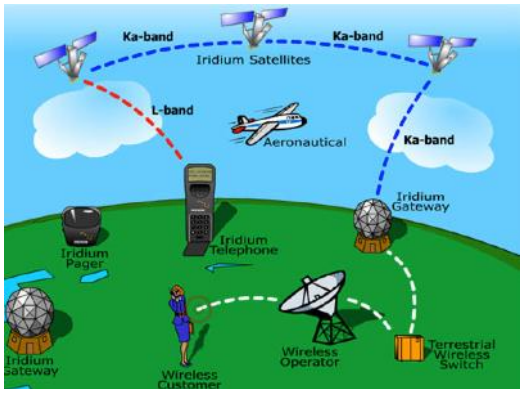
Unlike 1G and 2G (initial launch of cellular and PCS wireless service with the goal and objective of providing initial wireless coverage); 3G through 5G deployments will be focused on compressing more data in existing and future bandwidths. Fourth generation network technology (the platform for smartphones) emphasizes improving network capacity and

maximizing the use of bandwidth for faster and more efficient transfers of data. Fifth generation wireless will bring faster data transfers and additional wireless services such as using your phone for credit card transactions and other similar functions. Like all previous generations of wireless deployment, 5G will require more sites.

Satellite technologies

Satellite growth has surpassed the highest expectations of only a few years ago. The reason is simple - cost. Previously, relaying information, data, and other related materials were cumbersome and required many relay stations in very specific locations and relatively close together. Initially satellite use was expensive because of the rarity and limited amount of available airtime needed. Satellite airtime has become more affordable with the deployment of additional satellites and advanced technologies that allow more usage of the same amount of bandwidth. Competition always holds down cost, and that is what has occurred. In addition, satellite services are in the early stages of designing more localized networks; contributing to the already rapid growth.

Satellite technology has its limitations, which are all based on the Laws of Physics. Some licensees of satellite services such as SiriusXM Radio and satellite telephone services petitioned the Federal Communications Commission (FCC) and have been allowed additional deployment of land-based supplemental transmission relay stations for the ability to compete more aggressively with existing ground base services, and overcome obstacles typical to satellite technology. Subscribers found the delay in talk times unacceptable along with fade and signal dropout. The FCC is looking favorably upon this request, even though the existing land-based services are strongly objecting for various reasons. SiriusXM Radio was successful in obtaining ground base supplemental transmitters, and is rapidly becoming one of the largest users of ground base transmitters. This will place more demands on governmental agencies as another service begins to construct a land-based infrastructure.



Iridium Satellite Routing System
Image: wcclp.com

Wireless facilities

Wireless communication facilities are comprised of four main apparatuses: 1) an electronic base station; 2) feed lines; 3) antenna or antenna array; and 4) an antenna support facility.

Base station and feed lines

Base stations are the wireless service provider's specific electronic equipment used to transmit and receive radio signals, and is usually mounted within a facility including, but not limited to: cabinets, shelters, pedestals or other similar enclosures generally used to contain electronic equipment for said purpose. Feed lines are the coaxial copper cables used as the interconnecting media between the transmission/receiving base station and the antenna. The base station and

feed lines shown in Figure 1 is a typical model for providers operating in the 1900 MHz frequencies and ground space for this equipment cabinet is around eight (8) square feet.

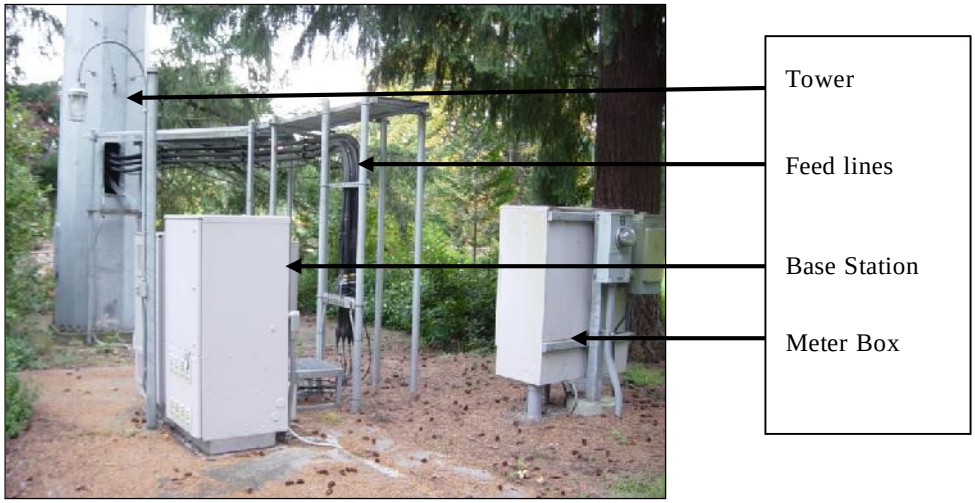


Figure 1: Example of 1900 MHz Wireless Infrastructure Ground Equipment

The electronics operating the 800 MHz wireless systems within the base station can generate substantial heat, therefore the base stations for providers operating in the 800 MHz frequencies are much larger and generally need an equipment cabinet a minimum of four hundred (400) square feet to house the equipment. The only noise that might be produced from the vicinity of any base station would be from an air conditioner or a backup generator that might be necessary in instances of no power or power failure. Figure 2 is a picture of an 800 MHz base statio n.

Figure 2: Example of 800 MHz Base Station

Antennas and antenna arrays for wireless telecommunications

Antennas can be a receiving and/or transmitting facility. Examples and purposes of antennas include: a single omni-directional (whip) antenna or grouped sectorized (also known as panel antennas). These antennas are used to transmit and/or receive two-way radio, Enhanced Specialized Mobile Radio (ESMR), cellular, Personal Communications Service (PCS), or Specialized Mobile Radio (SMR) signals. The single sectionalized or sectionalized panel antenna array is also used for transmitting and receiving cellular, PCS or ESMR wireless telecommunication signals.

Omni-Directional
Whip Type Antenna

Sectorized (panel)
Antenna Array

Figure 3: Examples of Directional and Panel Antennas

The antenna can also be concealed. Concealment techniques include: faux dormers; faux chimneys or elevator shafts encasing the antenna feed lines and/or equipment cabinet; and painted antenna and feed lines to match the color of a building or structure. A concealed attached facility is not readily identifiable as a wireless facility. Various examples of antennas attached to buildings and structures are shown in the following pictures.

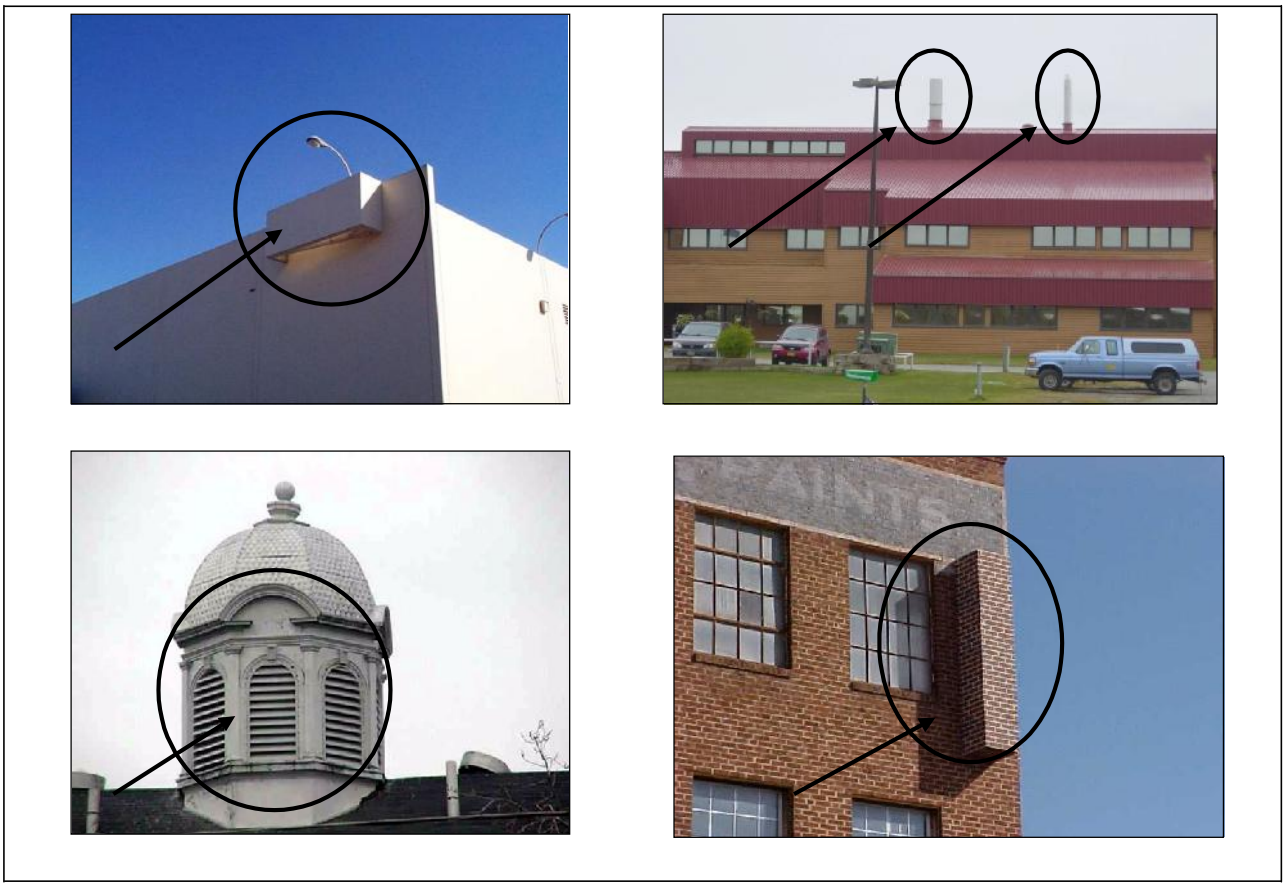


Figure 4: Examples of Concealment Techniques

Support facilities for the antenna

A variety of structures can be used for mounting the antenna(s) such as towers, buildings, water tanks, existing 911 tower facilities, tall signage and light poles; provided that, 1) the structure is structurally capable of supporting the antenna and the feed lines; and, 2) there is sufficient ground space to accommodate the base station and accessory equipment used in operating the network. Antenna support structures can also be concealed in some circumstances to visually blend-in with the surrounding area.

Figure 5 on the following page provides examples of several antenna support structures. The flagpole and light standard are concealed towers. The antennas are flush-mounted onto a monopole and a fiberglass cylinder is fitted over the antenna concealing them from view. The bell tower is a concealed lattice tower. The antennas are hidden above the bells and behind the artwork at the top of the structure.

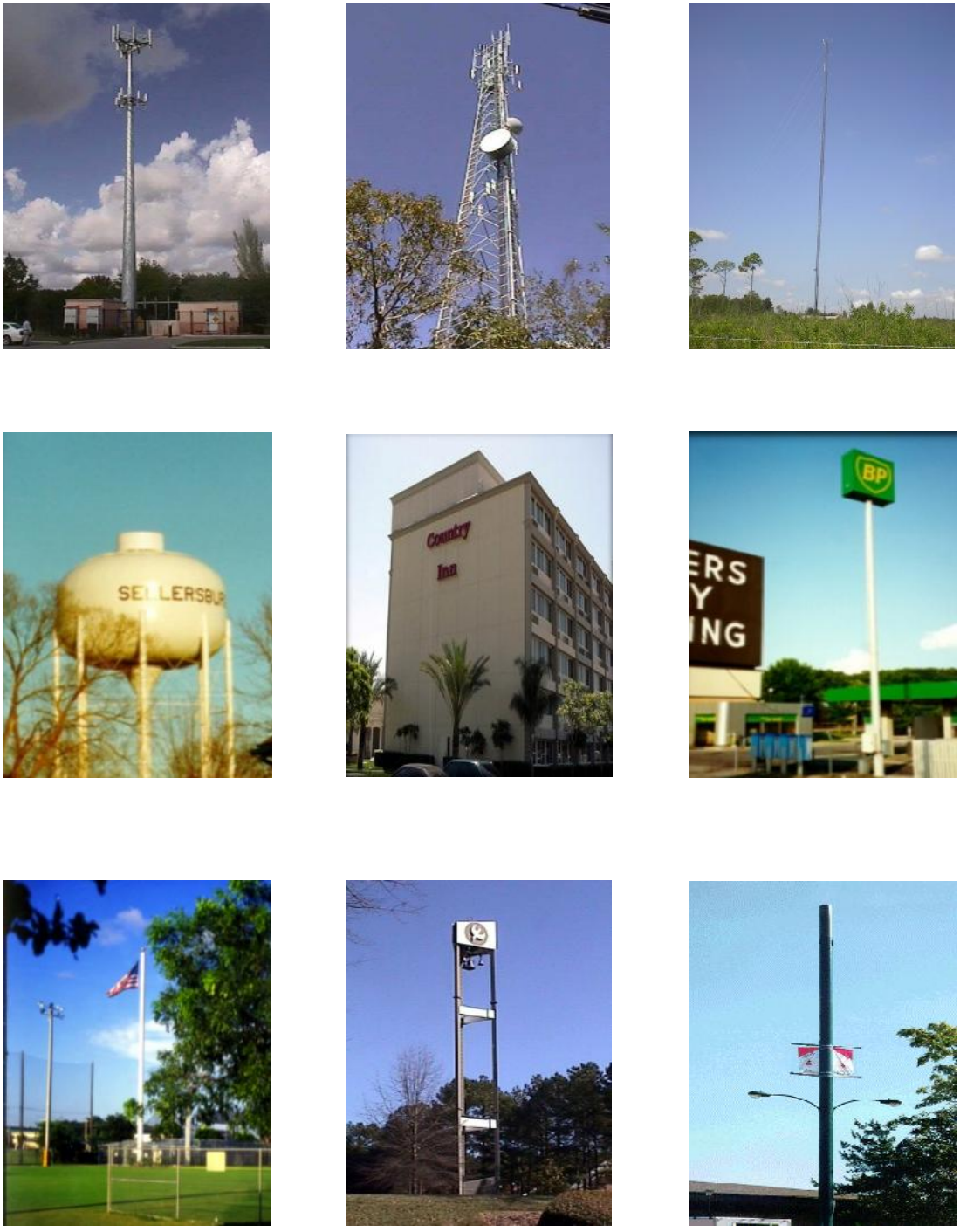
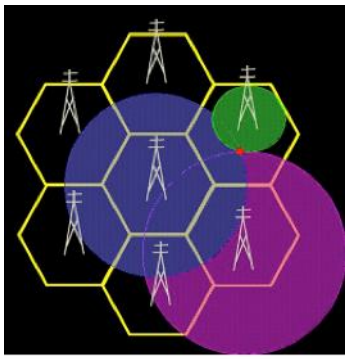


Figure 5: Examples of Antenna Support Facilities

Wireless infrastructure

To design the wireless networks, radio frequency (RF) engineers overlay hexagonal cells representing circles on a map creating a grid system. These hexagons represent an area equal to the proposed base station coverage area. The center of the hexagon pinpoints the theoretical "perfect location" for a base station (antenna support facility). Next, coverage predictions are shown from the base station within the hexagon. The propagation pattern is generally circular and the size of the coverage area is affected by many variables such as antenna mounting elevation, topography, land cover, and size of the immediate subscriber base. The illustration to the left shows a smaller coverage area in green and the largest coverage area in pink. The difference in coverage areas could be relative to the antenna mounting elevations (a lower antenna mounting elevation on the tower in the green circle and a higher antenna mounting elevation on the tower in the pink shaded circle); or differences in network capacity or topography. The grid systems are unique to each service provider and maintained by each individual wireless provider's engineering department.



Hexagonal Grid with Circular Coverage from Base Stations
Image: 5freshminutes.IT

Antenna network capacity

The number of base station sites in a grid network not only determines the limits of geographic coverage, but the number of subscribers (customers) the system can support at any given time. Each provider is different but a single carrier can only process or turn over a certain number of calls per minute, and at any particular time only a certain number of calls can occur simultaneously. This process is referred to as network capacity. As population, tourists and local wireless customers increase, excessive demand is put on the existing system's network capacity. When the network capacity reaches its limit, a customer will frequently hear a rapid busy signal, or get a message indicating all circuits are busy, or commonly a call goes directly to voicemail without the phone ring on the receiving end of the call.

As the wireless network reaches design network capacity, it causes the service area to shrink, further complicating coverage objectives. Network capacity can be increased several ways. The service provider can shift channels from an adjacent site, or the provider can add additional base stations with additional infrastructure.

A capacity base station has provisions for additional calling resources that enhance the network's ability to serve more wireless phone customers within a specific geographic area as its primary objective. An assumption behind the capacity base station concept is that an area already has plenty of radio signals from existing coverage base stations, and the signals are clear. But there are too many calls being sent through the existing base stations resulting in capacity blockages at the base stations and leading to no service indications for subscribers when attempting to place a call.

According to data from SNL Kagan, the federal penetration rates of subscribers with wireless telephone service for the United States indicate a level of around eighty-four percent (84%) and it is predicted to be at one hundred percent (100%) by the end of 2013. This does not mean that every person will have a cell phone; rather, many people will have more than one phone creating the effect of one cell phone per person.

Thus, subscriber density for 3G and 4G is what controls the separation distance between base stations. The existing network design, based on local wireless penetration rates and usage, has each site facilitating the use of between 1750 and 2500 separate devices. As wireless devices increase in number *and* usage (particularly more intensive bandwidth usage like e-mail, Facebook, and mobile TV), each site will need to *decrease* its geographic area and serve a smaller number of subscribers in order to avoid overloading its systems.

Wireless broadband

Wireless broadband is analogous to the communications of voice via wireless phones but for the transmission of high speed wireless data along with standard voice communications. Wireless broadband is the transfer of data (wireless broadband) via radio waves between computers, hand held wireless phones and other wireless devices. First generation wireless deployments launched the analog hand held phones operating in the 800 MHz frequency. Second generation wireless deployments launched the digital wireless voice network in the 800 and 1900 MHz frequencies. Third and fourth generation wireless deployments add the capability of wireless data networks, now including the 2400 and 700 MHz frequencies, although many carriers are using their designated voice channels for broadband.

Traditional service providers such as AT&T, Verizon, and Sprint/Nextel have added wireless broadband to their platforms. Newer wireless handsets (smartphones) can communicate via voice (phone) and access the wireless broadband (internet). Additionally there are service providers such as Clearwire and other smaller regional services whose business plan is to provide wireless data/internet (broadband) (but not traditional voice service) to its subscriber base as an alternative to local cable and dial up internet service providers.

The infrastructure for wireless broadband is similar to that in use for wireless phones; i.e. an elevated antenna with a base station for each service provider. The service area can be reduced in order to maintain an acceptable download speed which will lead to the need for more infrastructure. For example, during maximum usage periods in order to cover a geographic area of approximately five square miles the following would be anticipated:

- 1G – Analog - 1 cell site
- 2G – Cell phone - Digital TDM – 6 cell sites
- 3G – Smartphone - Digital CDMA – 14 sites
- 4G – Universal personal communicator device - Digital CFDM or LTE - 36 sites

Complete fourth generation broadband network deployment is anticipated to begin in 2013 beginning in the urban markets.

Summary

Wireless handsets used for personal wireless services have changed significantly from the initial launch of the cellular phones in the 1980's. The infrastructure that is the backbone of these handsets has not changed as much from a visual perspective. The wireless networks still need elevated antennas above tree lines and rooftops to transmit and receive the communication information between wired and wireless devices. Moisture contained within leaves and pine needles absorb and refract the signal and create an unpredictable propagation variable. There are no antennas currently on the market that can manipulate nature and the laws of physics to eliminate the changes in the propagation characteristics from antennas placed within the tree line. Wireless antennas can function below the tree line but not at the same performance level as compared to antennas placed in the same location above the tree line. For this reason, the industry will continue to prefer placement of their antenna arrays above the tree line to achieve optimal propagation from the infrastructure and maximize their investment in the communities they are servicing. The antenna sizes used have changed minimally over the years. Recent inclusion of remote radio heads in the antenna will generally mean larger and more complex antennas as compared to the earlier 2G installations.

The structures on which the antennas mount have changed very little, other than generally becoming shorter in geographic areas where taller towers are permitted. The monopole and lattice towers remain the most widely used tower infrastructure nationwide for deployment practices. It is likely that diameters of monopoles will need to increase to allow additional space inside for more coaxial lines to accommodate additional antenna and antenna types. Concealment techniques continue to be used to mitigate the visual impact in areas of concern as identified by local governments.

Mergers and acquisitions (Sprint and Nextel for example) will bring about a temporary downsizing and consolidation of infrastructure for the companies involved but overall the industry will continue to need more and more infrastructure with transitions to 3G, 4G, 5G and beyond. The antenna elements will need to be closer together and above tree lines and rooftops.

Chapter 3 Engineering Analysis

Base station network design is founded on the principles of a grid system that is maintained by each wireless provider's engineering department. The hexagonal cells on the grid represent the radius equal to the proposed cells' coverage area. Common points of adjoining hexagons pinpoint the theoretical perfect location for a prospective new base station. For these reasons, deviation from these specified locations can significantly affect the wireless provider's deployment network.

Search area within proposed coverage areas

The search area for new wireless infrastructure is ideally specified in a document provided to site search consultants in pursuit of a lease for property on which to place their facilities, whether a new tower, a rooftop or some other existing structure that could accommodate wireless antennas. From an engineering perspective, any location within the proposed search area is considered to be acceptable for the provider, with certain considerations based on terrain and sometimes population balance.

Search Area Radii

Search areas for the 800 MHz frequencies and 1900 MHz (PCS) frequencies are computed in Tables 1 and 2. The tables utilize the "Okumura-Hata" propagation path loss formula for 800 MHz, and the "COST-231" formula for 1900 MHz. Maximum coverage radii for typical in-vehicle coverage is calculated for various tower heights, and is de-rated by twenty percent to account for a reasonable handoff zone, then divided by four to obtain a search area radius for each tower height. Thus, 800 MHz antenna mounted at the 100-foot elevation would have a search area radius of 0.72 miles, and 0.36 miles for 1900 MHz.

Okumura-Hata Coverage Predictions

Antenna mounting height	50'	80'	100'	115'	150'
Radius, miles	2.53	3.20	3.60	3.88	3.91
Allow for handoff	2.03	2.56	2.88	3.10	3.60
Search area, miles	0.51	0.64	0.72	0.78	0.90

Table 1: Okumura-Hata Coverage Predictions for 800 MHz

COST 231 Coverage Predictions

Antenna mounting height	50'	80'	100'	115'	150'
Radius, miles	1.33	1.64	1.82	1.95	2.32
Allow for handoff	1.07	1.31	1.46	1.56	1.79
Search area, miles	0.27	0.33	0.36	0.39	0.45

Table 2: COST 231 Coverage Predictions for 1900 MHz

Wireless search areas are usually circles of approximately one-quarter the radius of the proposed cell. In practice it is fairly simple to determine whether the search area radius is reasonable. The distance from the closest existing site is determined, halved, and a handoff overlap of about twenty percent is added. One fourth of this distance is the search area radius. CityScape provides the Coverage Prediction tables for antenna mounting elevations between 50 and 150 feet to allow communities the opportunity to evaluate this variable. Generally in areas where initial coverage is the objective taller towers allow the antenna to service a larger geographic coverage area and additional collocations by other service providers. Shorter tower limit the geographic coverage area and reduce the number of collocations resulting in a greater number of towers within each search area.

Tower height and antenna mounting elevation considerations

Taller structures (towers, rooftops, and water tanks) may offer more opportunity for collocation, which could theoretically decrease the number of additional towers and antennas required in an area, but capacity issues could circumvent any advantage of taller towers. The extent to which height may increase collocation opportunities must be verified by an RF engineering review on a case-by-case basis. In geographic areas where there is a larger wireless phone subscriber base or terrain concerns, build-out plans may require lower antenna mounting elevations, especially in densely populated areas. Antennas located at higher elevations on the antenna support facility are indicative of rural areas. In some cases, the wireless providers seek to limit the height in more populous geographic areas because they may need differing heights on a single tower to reduce the potential for interference between the same provider and/or a competing wireless provider.

Master plan design process

This chapter evaluates wireless coverage for the most populated areas of the City and Borough of Juneau (CBJ) and is accomplished by:

- Researching the inventory of existing antenna locations on support structures and buildings and evaluating the possible 800 MHz and 1900 MHz coverage from those sites; and

- Designing an engineered search radii template based on the average existing antenna mounting elevations and applying it over the jurisdictional boundary of the CBJ to evaluate theoretical build-out conditions; and

- Forecasting future infrastructure needs based on the status of the existing deployments and locations of the subscriber base.

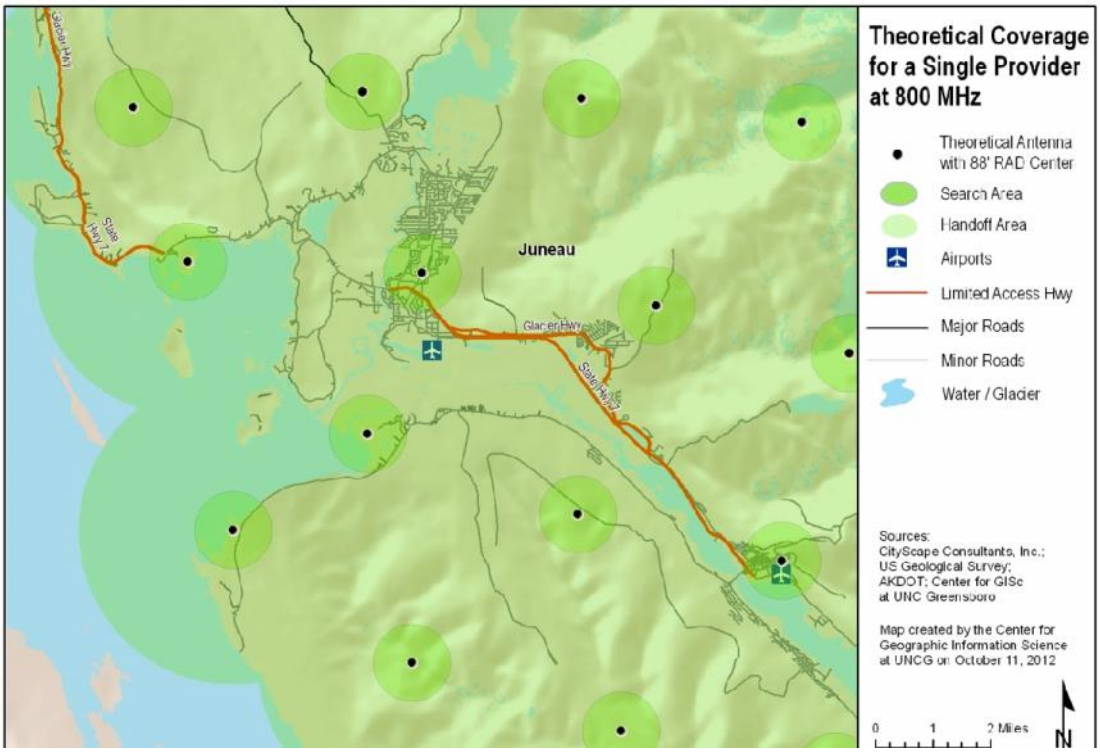
Basic coverage predictions and wireless coverage handoff

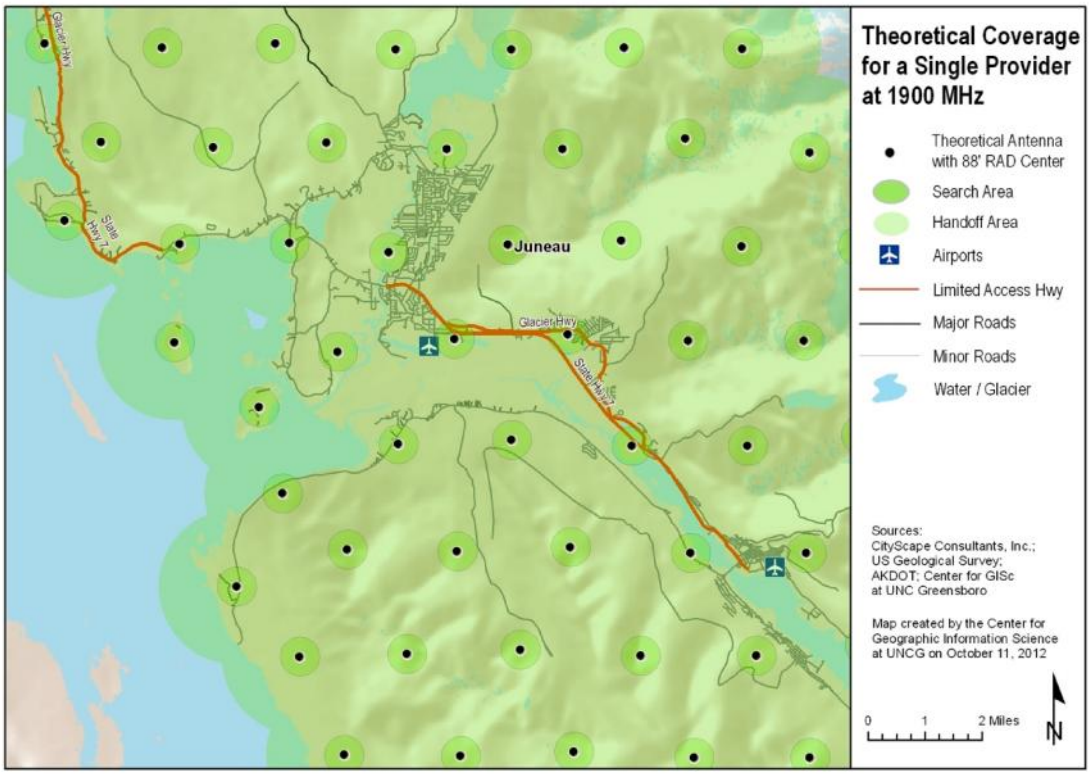
CityScape provides a series of maps to help visualize the number of antenna locations that would be necessary to provide wireless communications coverage throughout the more urbanized areas of the CBJ. To accomplish this task, CityScape has created a series of root mean square (RMS)

theoretical coverage and handoff maps by randomly selecting existing antenna locations throughout the defined geographical boundary. This hypothetical network demonstrates the minimum number of base station locations required for one provider to provide complete coverage throughout the study area. In order to complete this analysis an antenna mounting elevation must be determined. CityScape has reviewed the existing tower inventory for the CBJ and determined the average tower height used for wireless telecommunications purposes to be around 88 feet. Thus, 88 feet was chosen for the mounting elevation for the theoretical RMS maps.

According to the Okumura-Hata propagation path loss formula in Table 1 coverage for 800 MHz, a reasonable coverage area for an antenna mounted at 80 feet for cellular deployment on flat terrain is about 3.20 miles. This means a single antenna mounted at 80 feet with flat terrain and minimal subscribers would provide a wireless signal to a 3.20 mile geographic radius. Using these three variables (flat terrain, 800 MHz and 80-foot antenna mounting elevations) CityScape has created a wireless network grid covering the CBJ. Figure 6 illustrates that it requires fifteen towers centrally located within the study area to provide complete 800 MHz cellular coverage. These sites represent a theoretical build-out for antennas mounted at the 88-foot elevation at equal dispersion, in a perfect radio frequency environment, with no consideration of topographic and population variables. The black dot within the circle indicates the antenna location. The smaller circle shown within the larger circle represents the limits of the search area for locating the tower. The fifteen cells would theoretically provide wireless service throughout the study area for one provider to address coverage objectives and not capacity objectives.

Referring to the "COST-231" formula for 1900 MHz a reasonable coverage area for an antenna mounted at 80 feet for a PCS site on flat terrain is approximately 1.82 miles. The coverage reduction from 3.2 miles to 1.64 miles reflects the variable change from 800 MHz to 1900 megahertz. Figure 7 illustrates it would take up to forty-nine antenna locations to cover the same geographic area as in Figure 6. These 1900 MHz PCS sites represent a theoretical build-out of one antenna mounted at the 88-foot elevation at equal dispersion for one PCS provider; *with no consideration of terrain or demographic variables.*


Theoretical Coverage for a Single Provider at 800 MHz
Theoretical Antenna with 88' RAD Center
Search Area
Handoff Area
Airports
Limited Access Hwy
Major Roads
Minor Roads
Water / Glacier
Juneau
Glacier Hwy
State Hwy 7
State Hwy 2
Sources:
CityScape Consultants, Inc.;
US Geological Survey;
AKDOT; Center for GISc
at UNC Greensboro
Map created by the Center for Geographic Information Science at UNCG on October 11, 2012
0
1
2 Miles
N


Theoretical Coverage for a Single Provider at 1900 MHz
Theoretical Antenna with 88' RAD Center
Search Area
Handoff Area
Airports
Limited Access Hwy
Major Roads
Minor Roads
Water / Glacier
Juneau
Glacier Hwy
State Hwy 7
State Hwy 2
Sources:
CityScape Consultants, Inc.;
US Geological Survey;
AKDOT; Center for GISc
at UNC Greensboro
Map created by the Center for Geographic Information Science at UNCG on October 11, 2012
0
1
2 Miles
N

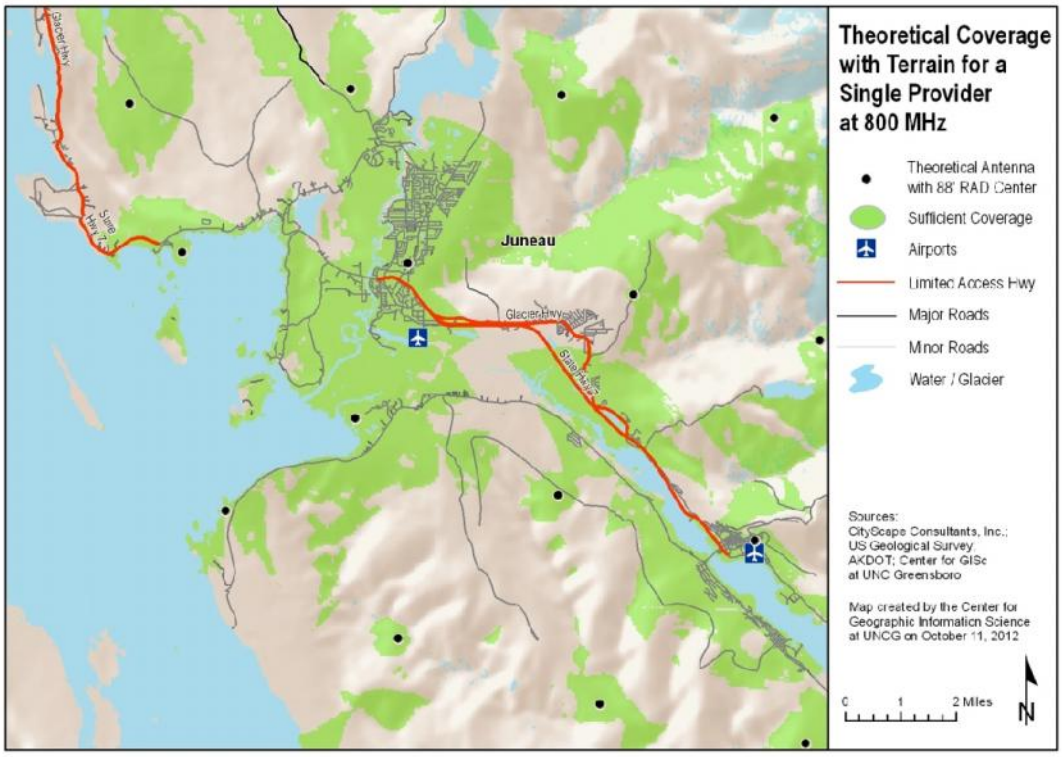
Topographic variable on theoretical coverage

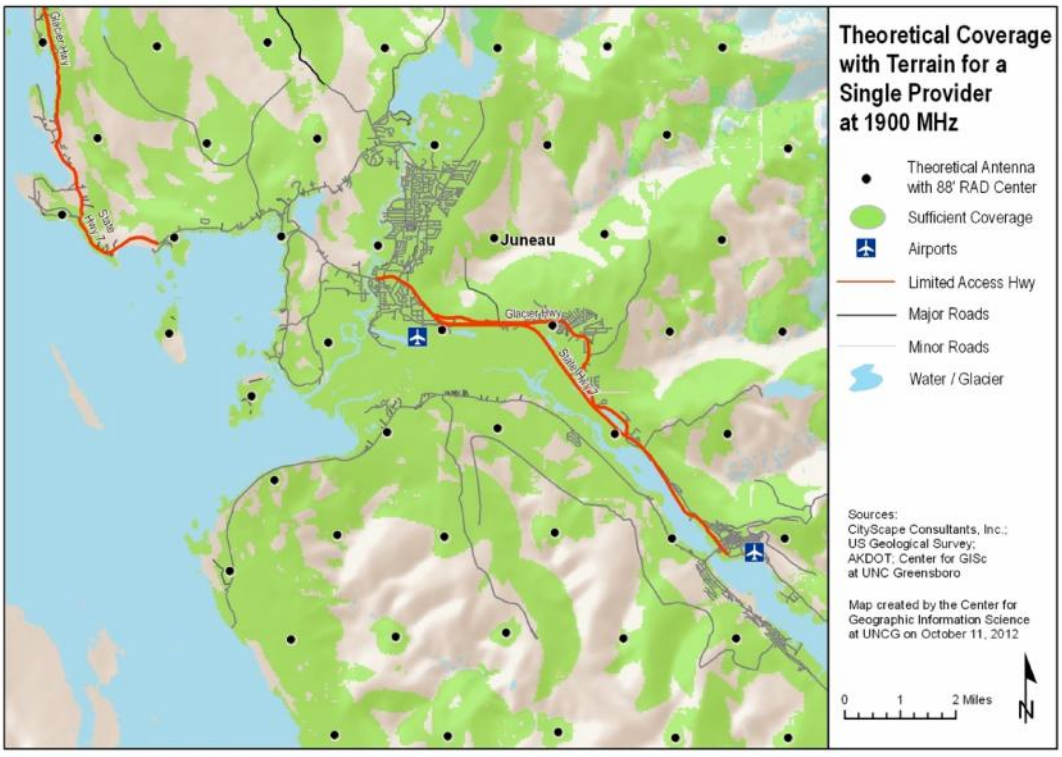
As previously described in flat terrain and sparsely populated areas, base station prediction is an easier art. The impact terrain has on a service area can be the most dramatic. Radio frequency propagation is line-of-sight technology. Line of sight works best with an unobstructed path between the base station and the handset. There are some variations of this principle. The analogy of a light bulb works well to explain how a wireless signal gets from point A to point B.

In this manner communication signals perform very similar to light. The areas closest to the light are illuminated the brightest. Adding a lampshade over the light bulb dims the light. Walls, closed doors, and other opaque object obscure the light. Similarly for best results in wireless communications there should be nothing in the transmission line of sight path between antenna point A and antenna point B, but that is usually impossible. Reflected or refracted signal will fill in some geographic areas but at a reduced power level.

Therefore, on flat terrain service areas with minimal vegetation, the coverage network from each antenna propagates in an even circular pattern. In areas with varying terrain conditions, the line of-sight coverage will be altered by higher and lower ground elevations. The CBJ has significant topographical variations so terrain greatly alters the theoretical maps.

Using the same random grid antenna locations identified in Figure 6 and Figure 7; Figures 8 and 9 illustrate how wireless service coverage is affected when the topographic variables are added to the propagation formulas. The areas in tan identify geographic area that would have no coverage due to the topography.


Theoretical Coverage with Terrain for a Single Provider at 800 MHz
Theoretical Antenna with 88' RAD Center
Sufficient Coverage
Airports
Limited Access Hwy
Major Roads
Minor Roads
Water / Glacier
Juneau
Glacier Hwy
Sources:
CityScape Consultants, Inc.;
US Geological Survey;
AKDOT; Center for GISc
at UNC Greensboro
Map created by the Center for Geographic Information Science at UNCG on October 11, 2012
0 1 2 Miles
N


Theoretical Coverage with Terrain for a Single Provider at 1900 MHz
Theoretical Antenna with 88' RAD Center
Sufficient Coverage
Airports
Limited Access Hwy
Major Roads
Minor Roads
Water / Glacier
Juneau
Glacier Hwy
Sources:
CityScape Consultants, Inc.;
US Geological Survey;
AKDOT; Center for GISc
at UNC Greensboro
Map created by the Center for Geographic Information Science at UNCG on October 11, 2012
0 1 2 Miles
N

Signal strength on theoretical coverage

Signal strength

The theoretical maps to this point in the master plan illustrate general coverage area from identified sites. Propagation mapping is a process that illustrates the level of coverage from an individual antenna site. Signal strength, in this application, is a term used to describe the level of operability of a handheld portable phone. The stronger the signal between the elevated antenna and the handheld wireless phone, the more likely the phone and all the built-in features will work. A reduced signal decreases the opportunity for satisfactory service caused by dropped calls or failed calls on the wireless device. Distance between the wireless handset and the elevated antennas, in addition to existing obstructions such as topography, buildings, and the physical location of the person using the handset (indoors or outdoors) are variables that affect signal strength.

The level of propagation signal strength is shown through the gradation of colors from yellow to blue. The geographic areas in yellow identify superior signal strength; green equates to areas with average signal strength; shades of blue symbolize acceptable signal strength; and tan shades show marginal or no signal strength. Generally, the closer the proximity to the antenna, the brighter shades of yellow within the geographic service area; which means the better quality of wireless service between the elevated antenna and the wireless handset. As distance increases between the handset and the antenna the green, blue, and tan shades appear indicating geographic service areas with good, marginal, sporadic, or no signal strength, respectively. Table 3 below provides further explanation of the color-coding relative to propagation signals.

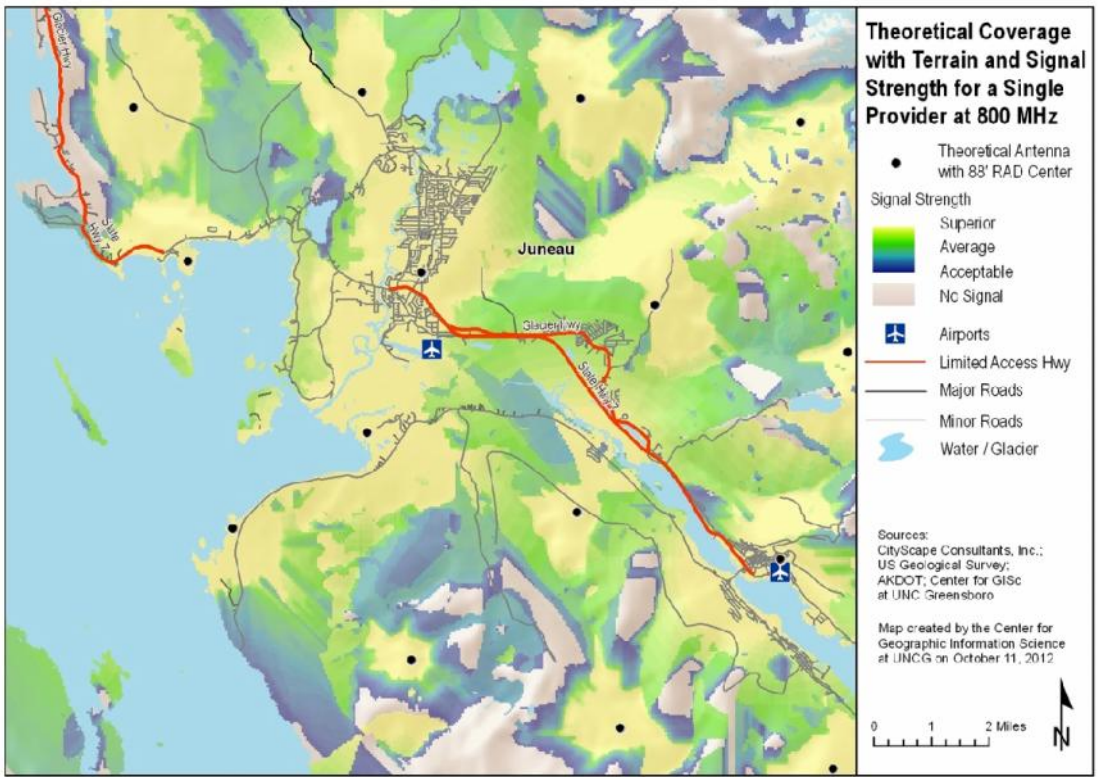
Signal Strength Color	Signal Strength Title	Signal Strength Description
Yellow	Superior	Signal strength strong enough to receive signal in many buildings
Green	Average	Signal strength strong enough to receive signal in a car, but not inside most buildings
Blue	Acceptable	Signal strength strong enough to receive signal outside for many handsets, but no expectation of receiving a signal in a car or building

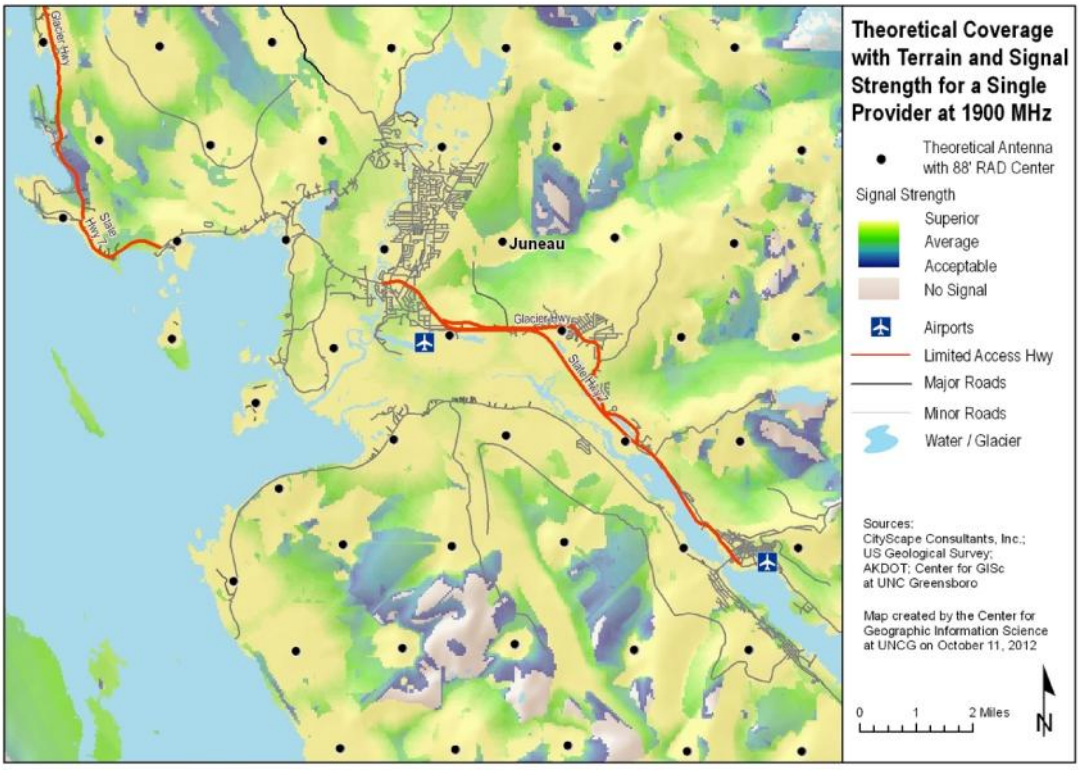
Table 3: Signal Strength

Seasonal variables

Vegetative land cover also affects radio frequency propagation. For example, pine needles absorb radio frequency emissions that distort the propagation from the antenna. Leaf foliage has a similar effect on propagation. Geographic land areas predominately covered by deciduous vegetation will have improved network coverage in the winter when the leaves are off the trees.

Using the same random antenna locations identified in Figure 6 and Figure 7; Figures 10 and 11 illustrate the various levels of signal coverage from the theoretical antenna locations including the foliage (clutter) variable. While the industry standards identify green and blue shades as "average" and "acceptable" coverage; customers tend to indicate otherwise. Most early twenty-first century wireless subscribers are demanding superior signal strength (yellow) in their residences, schools, offices, outdoor spaces and places frequented for shopping and entertainment. As consumers continue the trend of terminating traditional land line phone services and using the wireless handset as the primary mode of communication having signal strength inside buildings is paramount to meeting these expectations. The industries "average" and "acceptable" coverage variables do not meet customer demands and expectations. Figures 10 and 11 show many geographic areas with yellow/superior signal strength throughout most of the valley indicating generally a good level of coverage form these random locations.


Theoretical Coverage with Terrain and Signal Strength for a Single Provider at 800 MHz
Theoretical Antenna with 88' RAD Center
Signal Strength
Superior
Average
Acceptable
No Signal
Airports
Limited Access Hwy
Major Roads
Minor Roads
Water / Glacier
Juneau
Glacier Hwy
Sources:
CityScape Consultants, Inc.;
US Geological Survey;
AKDOT; Center for GISc
at UNC Greensboro
Map created by the Center for
Geographic Information Science
at UNCG on October 11, 2012
0 1 2 Miles
N


Theoretical Coverage with Terrain and Signal Strength for a Single Provider at 1900 MHz
Theoretical Antenna with 88' RAD Center
Signal Strength
Superior
Average
Acceptable
No Signal
Airports
Limited Access Hwy
Major Roads
Minor Roads
Water / Glacier
Juneau
Glacier Hwy
Sources:
CityScape Consultants, Inc.;
US Geological Survey;
AKDOT; Center for GISc
at UNC Greensboro
Map created by the Center for
Geographic Information Science
at UNCG on October 11, 2012
0 1 2 Miles
N

The industry and infrastructure

Prior to the granting of the cellular licenses in 1980 for the first phase of deployment, the United States was divided into 51 regions by Rand McNally and Company. These regions are described as Metropolitan Trading Areas (MTA). The spectrum auction conducted by the Federal Government for the 1900 MHz bands for 2G (PCS), further divided the United States into 493 geographic areas called Basic Trading Areas (BTA). The CBJ is located in the "Alaska" MTA (a.k.a. MTA 49) and the "Juneau-Ketchikan, AK" BTA (a.k.a. BTA 221).

Presently throughout the CBJ AT&T and Alaska Communications Systems are licensed to operate in the A and B blocks of cellular services allocated in the 800 MHz band.

Personal Communications Services (PCS) licensees and service providers for wireless phone and broadband operating in the 1700 - 2200 MHz bands include: AT&T Wireless; Alaska Communication Systems; MTA Wireless; T-Mobile; GCI and Sprint Nextel.

The recent transition to digital broadcasting (DTV) from the 700 MHz frequency has enabled the FCC to reassign the 700 MHz band for public safety radio communications and licensed wireless service providers. Public safety entities include police, fire, ambulance, rescue, and other emergency responders will use the spectrum to improve public safety networks. Licensed service providers and local and regional providers of wireless voice and/or data services will use 700 MHz to improve in-building network coverage.

The following service providers have purchased licenses to offer more advanced services in the 700 MHz frequencies: AT&T Wireless; Access 700, LLC; Echostar; Triad 700; and Verizon Wireless.

Per Section 704 of the Telecommunications Act of 1996, all service providers will require uninterrupted and continuous handoff service throughout the CBJ.

Combined there are ten known service providers that will each want to compete for the subscriber base the CBJ. Each of these wireless voice and data providers will need towers and/or above ground antenna mounting locations to improve network coverage and capacity equating to an ongoing need to deploy more infrastructure, especially in areas of greater residential density.

Existing antenna locations

Mapping the existing antenna sites creates a base map from which observations and analysis are derived relative to current and future deployment patterns. The CBJ provided existing facility locations to CityScape and other locations were attained from tower owners and the FCC database. Multiple facilities were found through various antenna locater search engines or found in the field during the site assessment process. Once these sites were mapped CityScape assessed each of the existing antenna locations throughout the CBJ study area to identify the following: 1) the location of existing telecommunications facilities currently within the CBJ; and 2) the availability of future potential collocations on the existing structures.

The assessment is achieved through actual site visits to each of the base station locations. The wireless infrastructure assessment for CBJ identifies 60 existing wireless communication facilities within the study area. Antennas mounted on towers and buildings are symbolized with a black dot. These antenna locations are identified in Figures 12 and 13. Figure 12 illustrates all the sites on a larger scale map and Figure 13 illustrates sites number 2-60 on a smaller scale map.

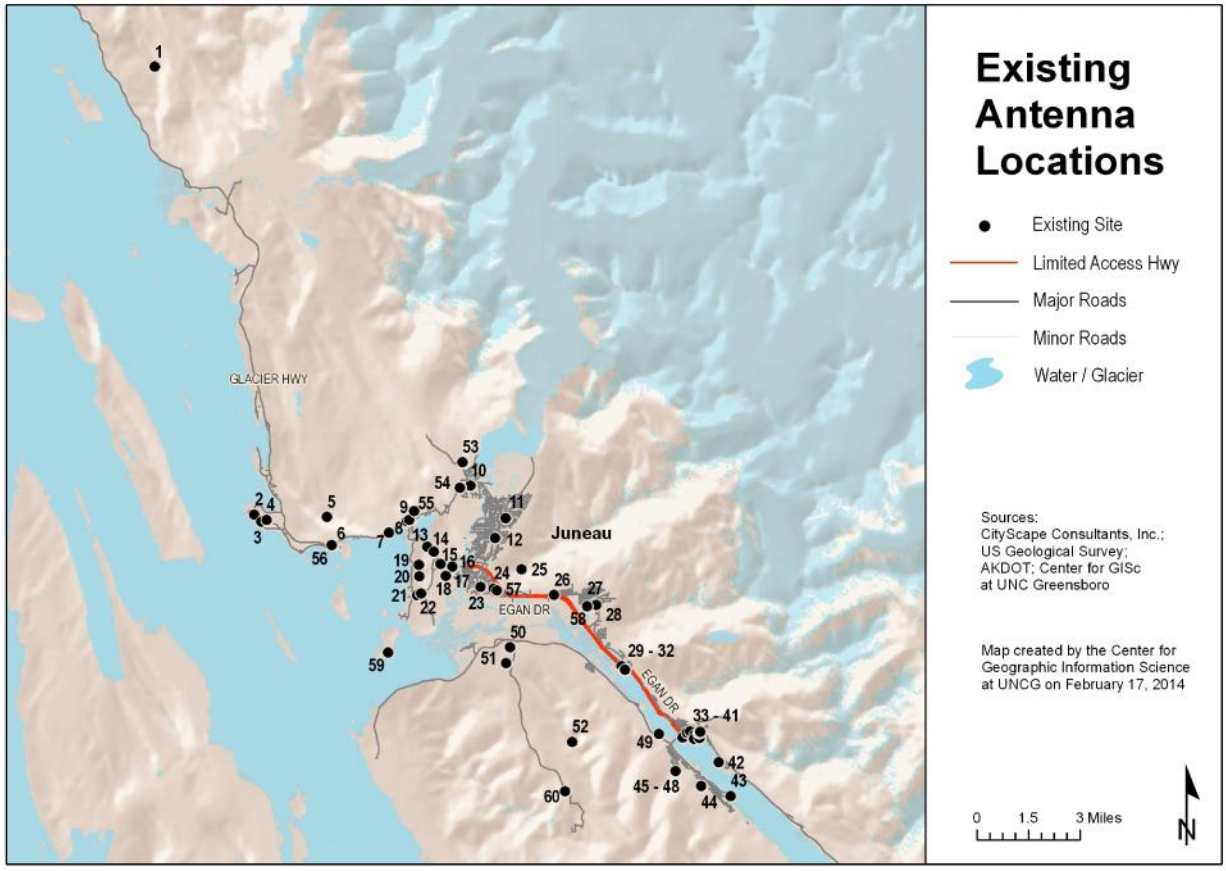


Figure 12: Existing Antenna Locations (large scale map)

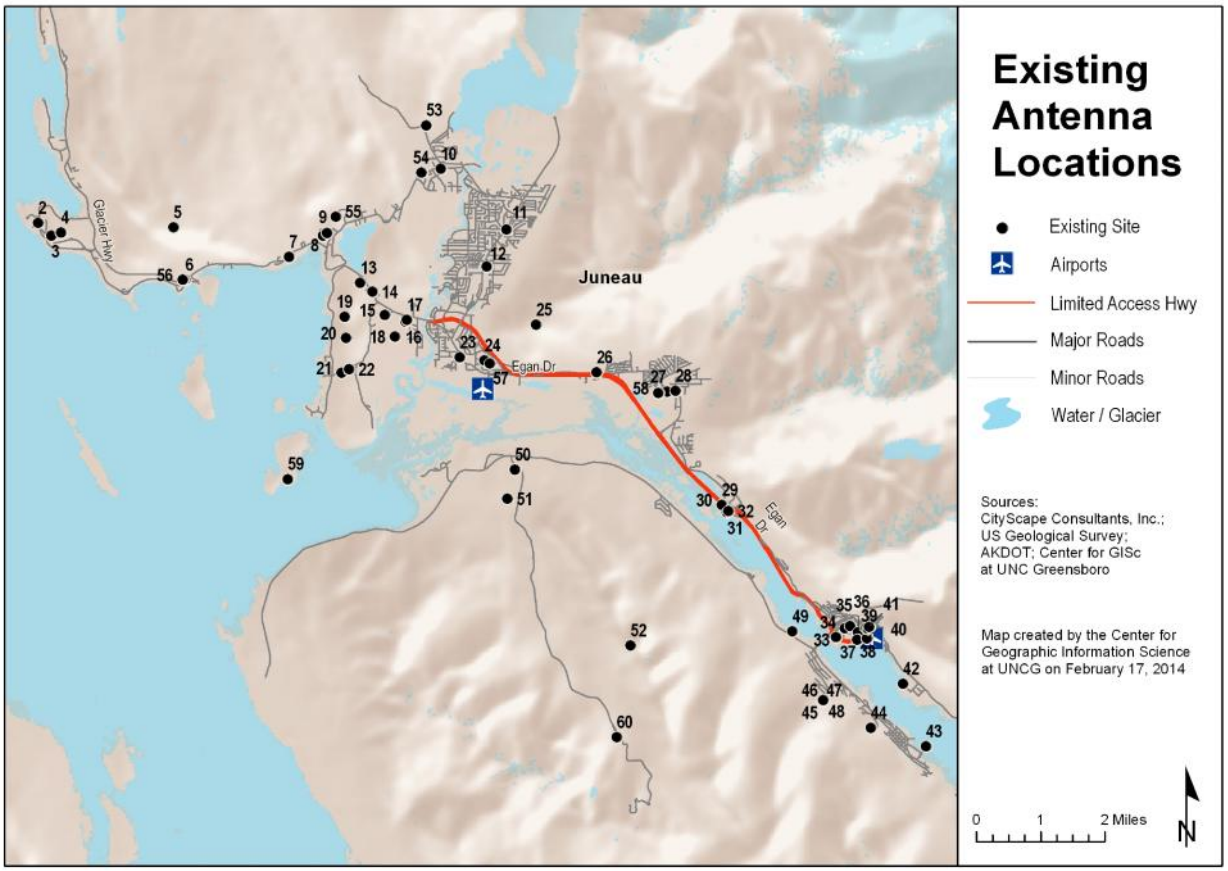


Figure 13: Existing Antenna Locations (small scale map)

Generally, the wireless infrastructure deployment patterns (antenna and tower locations) are concentrated in the downtown and airport areas with most of the remaining sites located parallel the major thoroughfares. Very few of the towers are located on the mountaintops. The FAA and other public safety agencies predominantly use the sites found in these locations.

Table 4 provides a summary of the total number of sites assessed within the CBJ study area by type, height, and ownership. CityScape and the CBJ have identified 60 total sites and some of these sites are home to multiple structures. While doing the research on each of these properties CityScape identified some discrepancies between the height approved for certain antenna structured by the FCC and the actual height approved by the CBJ. This is likely because the tower applicant requested the Antenna Structure Registration permit prior to applying for approval by the CBJ for the new facility. In most cases the tower height approved by the CBJ is lower than what was approved by the FCC. In these cases both approved heights are listed in the infrastructure inventory in Chapter four; however, only the approved tower height by the CBJ is used in the summary provided in Table 4.

60 Total Number of Existing Antenna Locations Identified within Study Area	60 Total Facilities Identified Within CBJ Study Area
Guy Towers	5
Monopoles	7
Lattice Towers	22
Wooden Pole Towers	8
Painted Monopoles	5
Rooftop Guy Towers	4
Rooftop Lattice Towers	2
Rooftop Attached Antenna	2
Other	1
Unknown	4
Total	**60**
Heights of Infrastructure Identified within Study Area	
> = 35’ < 82’	18
> = 90 < = 110'	14
> = 130' < 160'	9
> = 175' < 199'	3
> = 200' < 350+'	4
Unknown	12
Total	**60**
Ownership of Infrastructure Identified within Study Area	
ACS (service provider)	2
AlaskaCom (service provider)	4
AT&T (service provider)	2
Atlas Tower USA	2
Broadcast Companies	5
Cingular (service provider)	4
CBJ (public safety)	7
GCI (service provider)	1
Global Tower Partners (tower owner)	6
Government other then CBJ (Federal/State)	12
Other	3
SBA (tower owner)	1
Unknown	10
Total	**60**

Table 4: Summary of Identified Antenna Locations

Theoretical coverage from existing antenna locations

The next step in the evaluation process is to examine the coverage from all known existing antenna locations to determine if any area of the CBJ has unsatisfactory or no service at all. CityScape theorizes how existing antenna locations might be used by the wireless industry.

For example, CityScape asks the following questions. First, "would network coverage gaps be visible if a single Cellular (800 MHz) and PCS (1900 MHz) provider utilized the identified antenna locations?" And second, "does the CBJ have adequate existing infrastructure suitable for providers to meet complete network coverage objectives?"

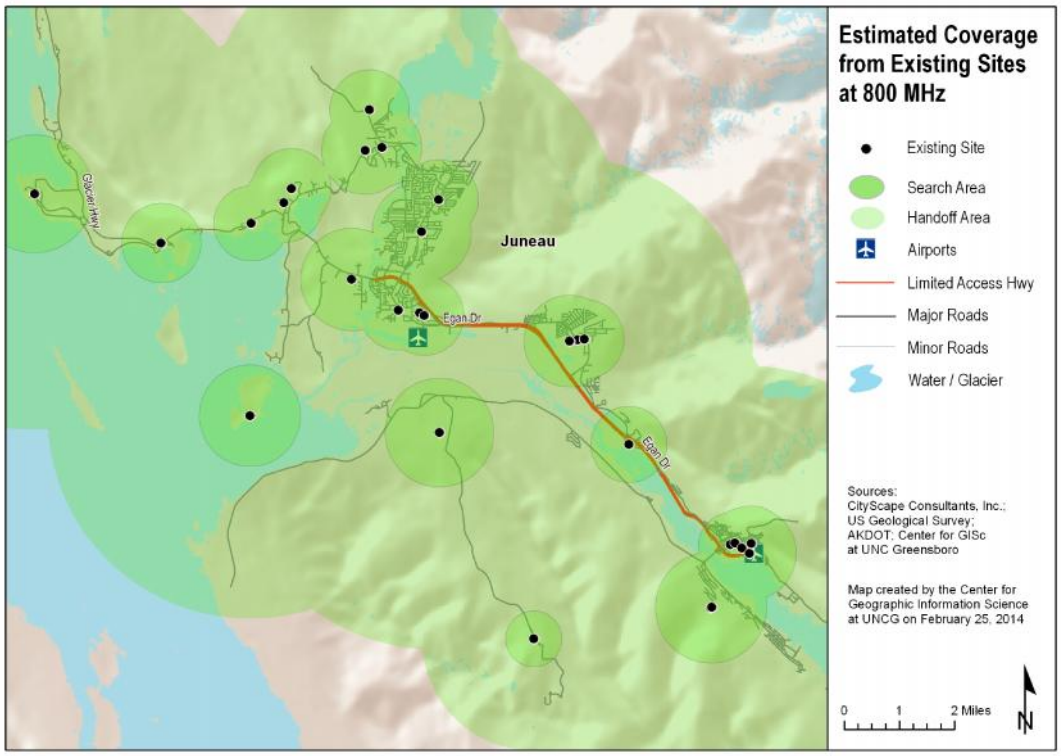
Figures 14 and 15 are RMS maps that demonstrate the theoretical coverage for a single 800 MHz service provider with antenna mounted at the top mounting position of all known support structures currently used for 800 MHz. Figure 14 does not include the terrain variable and 15 does include the variable of topography.

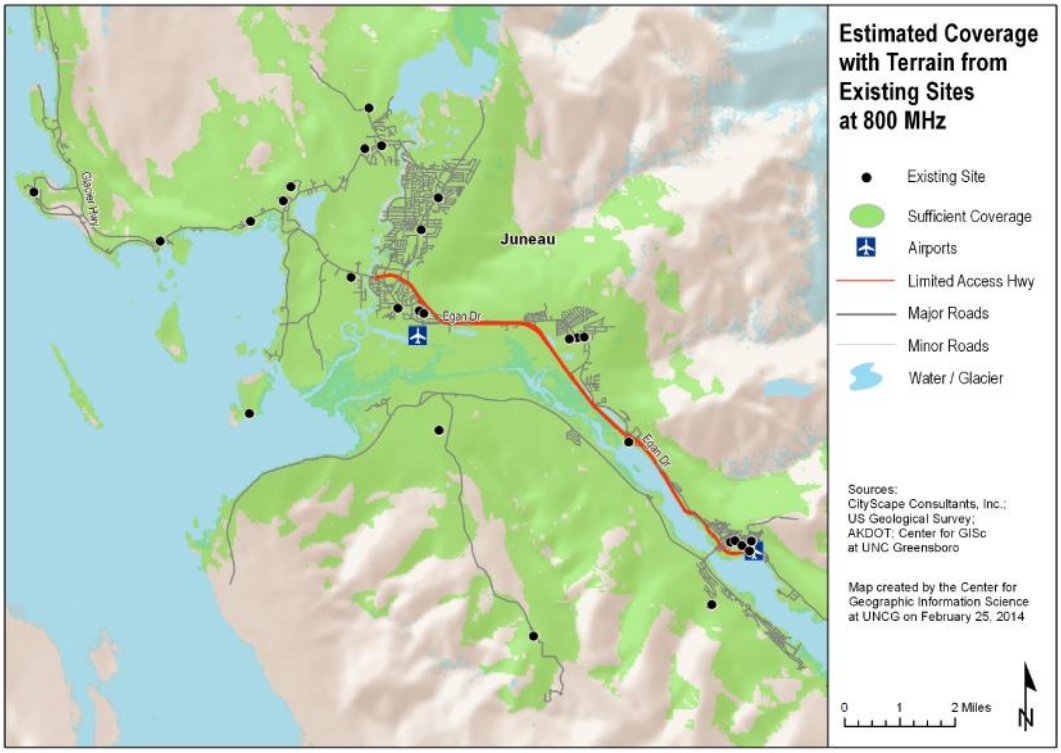
Figures 16 and 17 are RMS maps that illustrate the propagation (level of signal strength) for a single 1900 MHz network service provider from the top mounting elevation of all known support structures currently used for 1900 MHz. Figure 16 is without the terrain variable and Figure 17 includes the terrain variable.

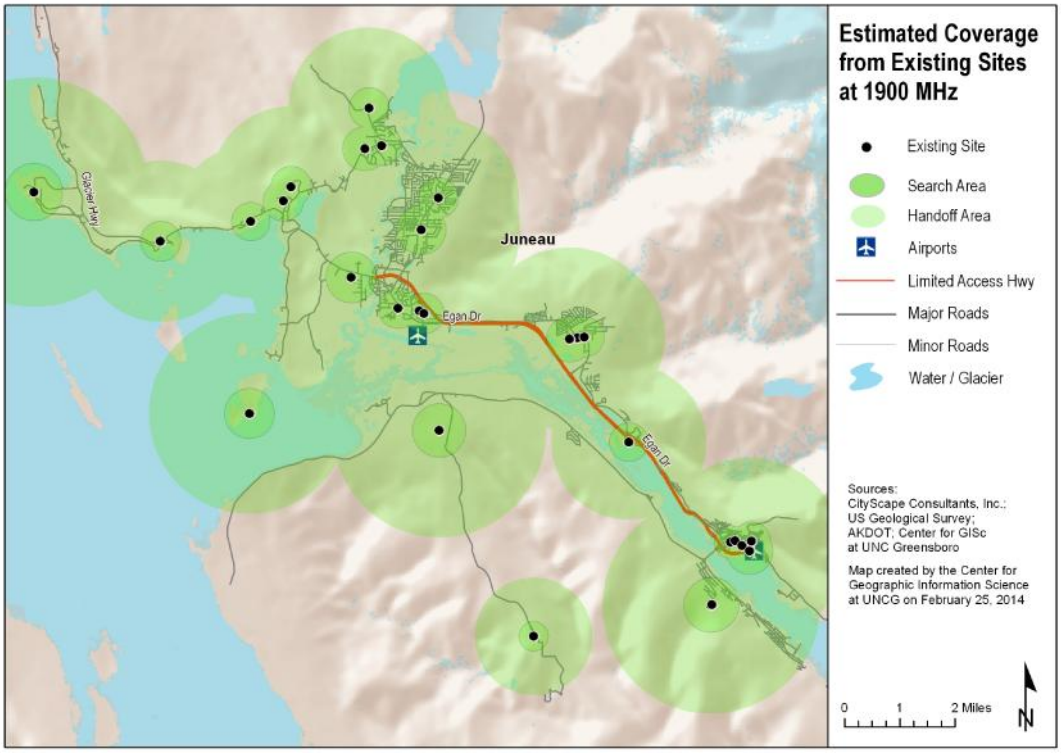
Figures 18 and 19 are propagation maps that illustrate the approximate quality of service coverage from the sites identified in Figures 14 and 15. These maps include topography, urban density (population and vegetative ground cover) and know tower height variables.

Please note, of the 60 antenna/tower locations only around 25 of the sites are utilized for wireless telecommunication purposes. Generally the public safety, government and broadcast towers do not have any of the wireless service providers equipment on them and it is unlikely that the public service agencies will allow future collocations by the industry. For this reason only the locations used by the wireless telecommunications industry are shown on this sequence of maps. Additionally, CityScape can generally determine the operating frequency of the service provider by the equipment at each site. The maps in this sequence also differentiate between the 700/800 MHz service providers and the 1700 - 2100 MHz service providers to give a more realistic perception of the generalize coverage.

The map sequence illustrate relatively good coverage from the existing towers for 800 MHz provided a single service provider had equipment at each of the sites identified; and it demonstrates that for 1900 MHz many areas throughout the valley have marginal network coverage and capacity. It is very important to keep in mind that no one single 800 MHz or 1900 MHz wireless provider has equipment at all of these sites. For this reason the coverage pattern by the individual wireless providers is not as widespread throughout much of the CBJ valley as shown on these map. However, the zoning policies in place presently appear to allow facilities in these locations and thus do not appear to be creating a barrier to entry.


Estimated Coverage from Existing Sites at 800 MHz
Existing Site
Search Area
Handoff Area
Airports
Limited Access Hwy
Major Roads
Minor Roads
Water / Glacier
Juneau
Egan Dr
Glacier Hwy
Sources:
CityScape Consultants, Inc.;
US Geological Survey;
AKDOT; Center for GISc
at UNC Greensboro
Map created by the Center for Geographic Information Science at UNCG on February 25, 2014
0 1 2 Miles
N


Estimated Coverage with Terrain from Existing Sites at 800 MHz
Existing Site
Sufficient Coverage
Airports
Limited Access Hwy
Major Roads
Minor Roads
Water / Glacier
Juneau
Egan Dr
Glacier Hwy
Sources:
CityScape Consultants, Inc.;
US Geological Survey;
AKDOT; Center for GISc
at UNC Greensboro
Map created by the Center for Geographic Information Science at UNCG on February 25, 2014
0 1 2 Miles
N



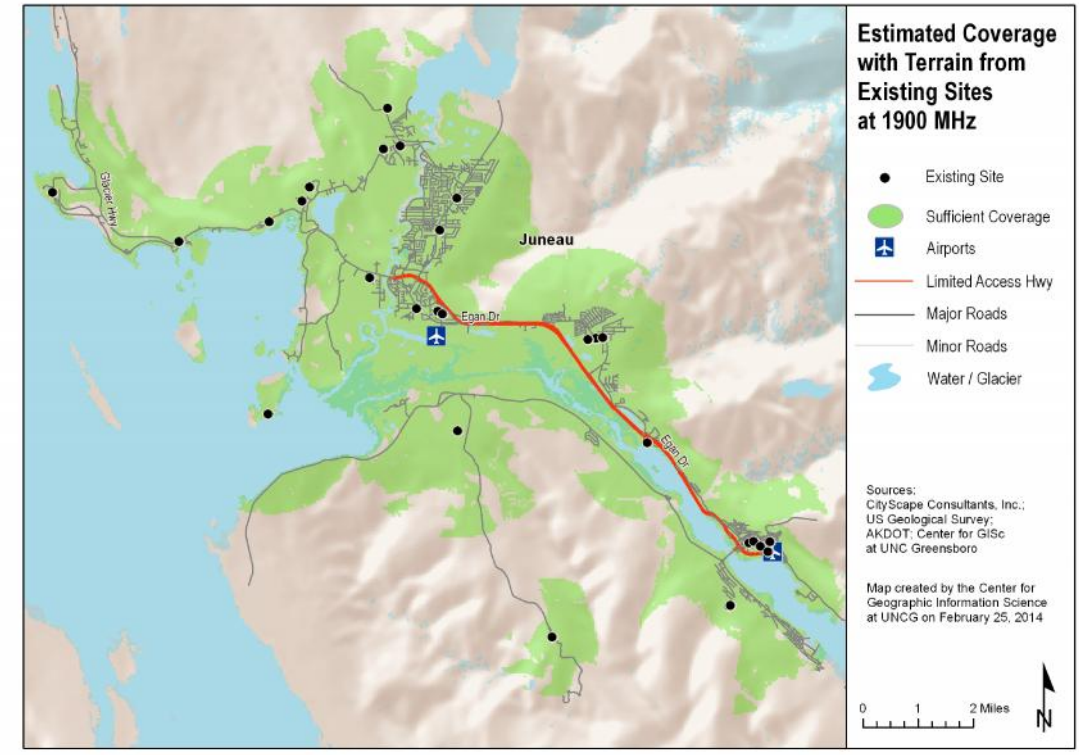


Figure 17: RMS Coverage for a Single Theoretical 1900 MHz Wireless Provider with Terrain

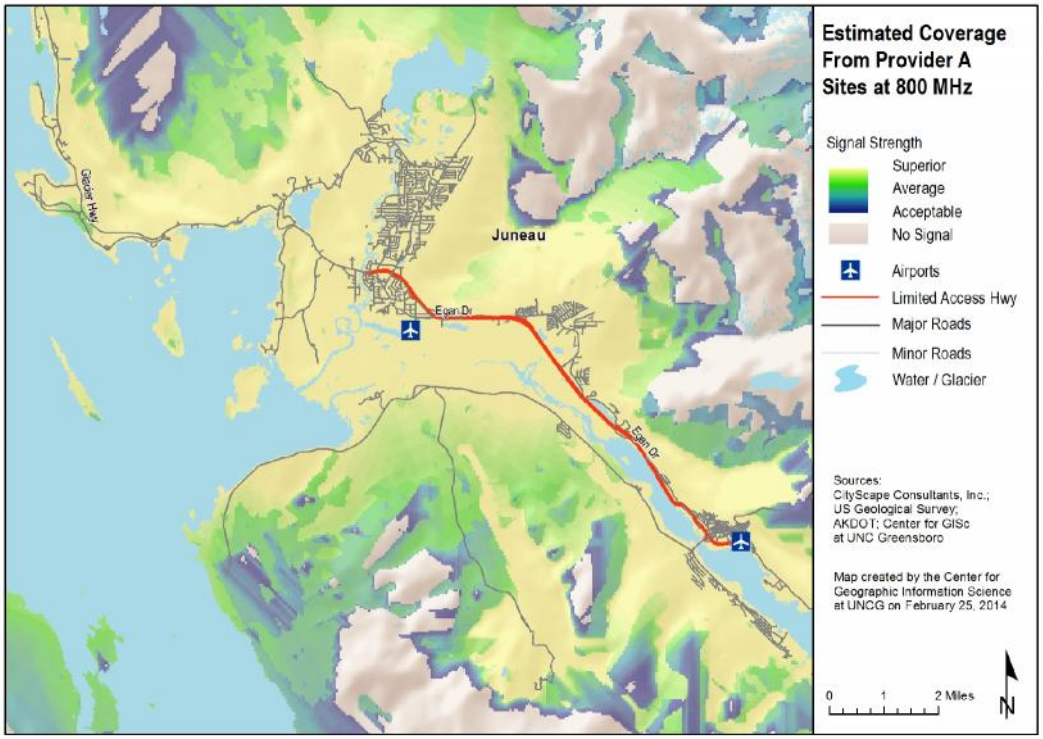
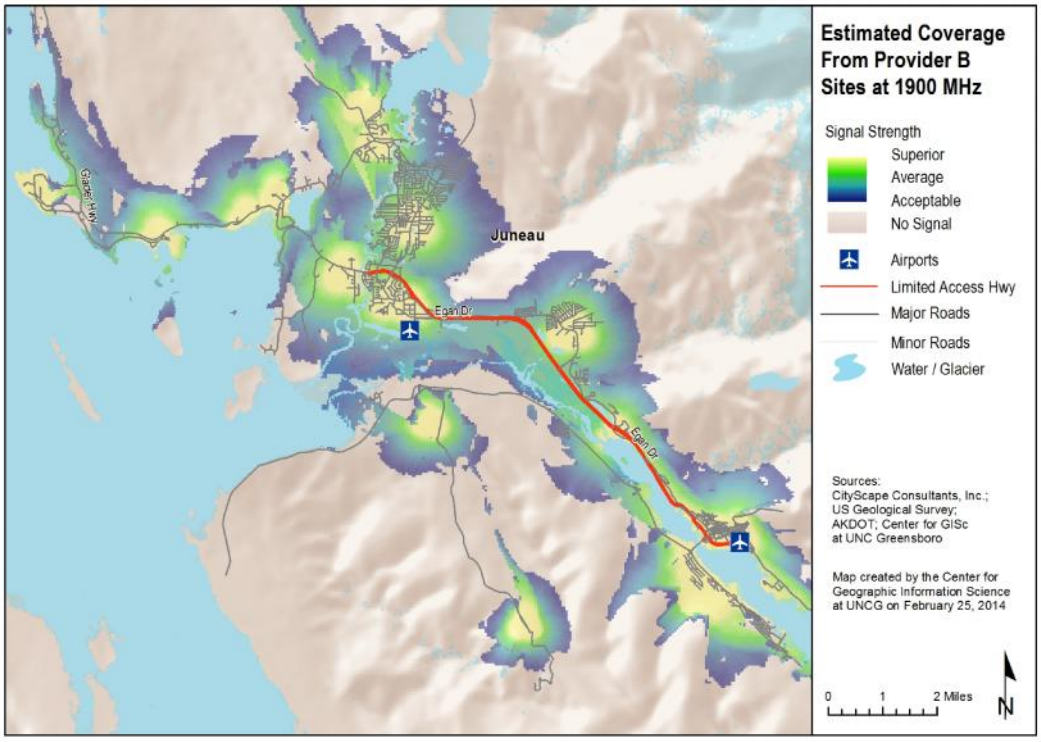


Figure 18: Coverage for a Single Wireless Provider from



Future tower site projections

Up to this point the Master Plan has focused on existing wireless base station coverage, however current network coverage is only one aspect of wireless service. The primary objective of the first phase of network development is to create coverage over a large service area. When network coverage is achieved wireless service providers begin to monitor the number of calls. Once the number of simultaneous calls reaches a predetermined maximum number, and the facility cannot support the subscriber base, the wireless network exceeds the capacity design of the system. Exceeding network capacity equates to overloading the network which results in lost service, dropped calls, rapid busy signals, and the inability to make calls. To overcome problems caused by over-capacity challenges, additional antenna and base stations are required.

According to 2009 data the federal penetration rates of subscribers with wireless telephone service for the United States indicate a level of around 77 percent. Cell phone service is projected to have increased to about 80 percent by the end of 2010, and may exceed that with the success of "smartphones."

Carriers use base population estimates for their network design. Population density is what controls the separation distance between base stations. The existing network design, based on local wireless penetration rates and usage, has each site facilitating the use of between 1750 and 2500 separate devices. As wireless devices increase in number AND usage (particularly more intensive bandwidth usage like email, facebook, and mobile tv), each site will need to *decrease* its geographic area and serve a smaller number of subscribers in order to avoid overloading its systems. In other words, the 1750 to 2500 users per site will shrink significantly over the next 10 years, with estimates ranging from 500 to 1200 devices per site, depending on the particular carrier, services offered, and number of overall subscribers. Concurrent with the shrinkage of number of users per site will be an increase in the total number of sites needed in order to provide service to subscribers.

Each wireless phone and/or broadband network has unique deployment needs, and might need antennas at varying heights. Just because one provider locates on a building, does not mean that building height will work for the next provider. Additionally, the rapid change in how people are using technology will continue to impact the existing network infrastructure. More and more devices on the market can transfer data via cell signals (Kindles, iPads, Nintendo DS, etc.) The addition of wireless objects such as these coupled with the ongoing popularity of text messaging will require new antenna locations not due to increased wireless network traffic, but the evolvement of high speed wireless broadband devices, even if the population is not growing at a similar rate.

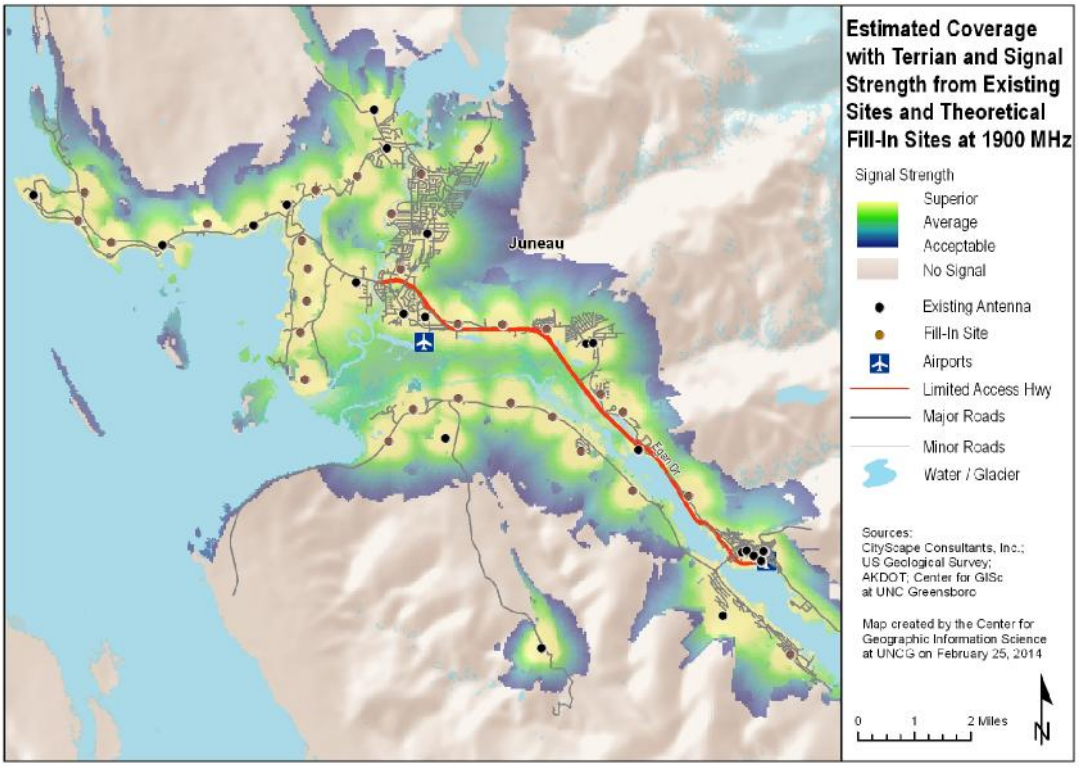
As a result of the present growth models and the current wireless market penetration rate, and the rate of wireless network evolution from 3G to 5G, CityScape's prediction for future antenna deployment is based on network growth from the existing antenna locations. Currently in the CBJ there are about twenty-five antenna locations used for wireless telecommunication purposes. Each year in the future the number of new collocations, antenna attachments, and tower facilities will vary. Subscriber demand on the network will control future deployments.

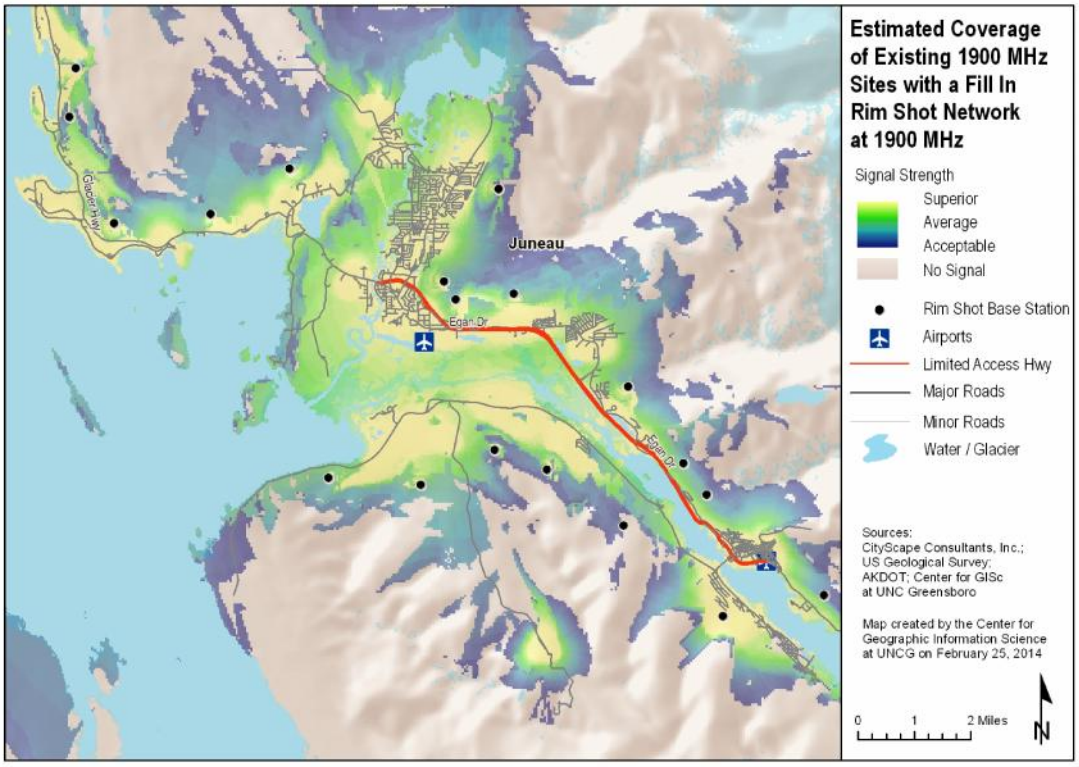
To effectively and efficiently provide network coverage throughout the Valley over the next ten years CityScape anticipates it will require about twenty-nine new antenna locations *following conventional deployment practices* to provide a comprehensive network to fill in the service coverage and capacity gaps. Yearly increases cannot be anticipated to increase evenly as customer demand on the network will control future deployments. As a rule of thumb the CBJ could anticipate an average (of any combination) of approximately two new tower sites and/or two to four collocations and/or antenna attachments per year over the next ten years. This estimation is based on the mathematics of the population density; subscriber base and usage; transient movement through the CBJ and how many calls a base station can simultaneously serve at any given time.

This projection model is based on new tower heights at the 88-foot mounting elevation on a tower estimated to be around 130' to allow for maximum collocation opportunities and the reduction of multiple towers within the same geographic search areas. The geographic areas of where these new facilities will be needed are shown by a brown dot in Figure 20.

Unique to the CBJ is another deployment scenario that offers a very different approach to wireless deployment. After studying the geographic area, CityScape had determined the vast majority of the Valley could be served by deploying "rim shots". Rim shot are directional signals from the transmitting antenna aimed toward the valley floor from an elevation on a tower located in the surrounding hillside. The towers are not proposed to be located on or near the mountain tops; rather from the 200' - 500' elevations above mean sea level to blend into the hillside.

This pattern of deployment is presently evidenced at one tower site in the CBJ. On the Global Tower Company tower located at the water reservoir site the collocations are all mounted on one side of the tower to provide a directional signal to the downtown Juneau area. CityScape believes this pattern of rim shots can be duplicated throughout the CBJ and would be an effective deployment method resulting in less required infrastructure throughout the Valley. CityScape estimates it would take approximately eighteen new antenna locations utilizing this *alternative deployment pattern* to meet the same coverage objectives of the proposed twenty-nine facilities anticipated for a more conventional deployment. The rim shot deployment pattern is shown in Figure 21.


Estimated Coverage with Terrian and Signal Strength from Existing Sites and Theoretical Fill-In Sites at 1900 MHz
Signal Strength
Superior
Average
Acceptable
No Signal
Existing Antenna
Fill-In Site
Airports
Limited Access Hwy
Major Roads
Minor Roads
Water / Glacier
Juneau
Egan Dr
Sources:
CityScape Consultants, Inc.;
US Geological Survey;
AKDOT; Center for GISc
at UNC Greensboro
Map created by the Center for
Geographic Information Science
at UNCG on February 25, 2014
0
1
2 Miles
N


Estimated Coverage of Existing 1900 MHz Sites with a Fill In Rim Shot Network at 1900 MHz
Signal Strength
Superior
Average
Acceptable
No Signal
Rim Shot Base Station
Airports
Limited Access Hwy
Major Roads
Minor Roads
Water / Glacier
Glacier Hwy
Juneau
Egan Dr
Sources:
CityScape Consultants, Inc.;
US Geological Survey;
AKDOT; Center for GISc
at UNC Greensboro
Map created by the Center for
Geographic Information Science
at UNCG on February 25, 2014
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Chapter 4 Federal Telecommunications Act, Rulings and Policies

Wireless infrastructure and local zoning

With the deployment of first generation wireless, there were only two competing wireless cellular (800 MHz) providers. But with the deployment of 2G, and six competing PCS (1900 MHz) providers, the wireless marketplace became furiously competitive. "Speed to market" and "location, location, location" became the slogans for the competing 1G and 2G providers. The concept of collocation or sharing base stations was not part of the initial tower deployment strategy as each provider sought to have the fastest deployment and largest customer base resulting in a quick return on their cost of deployment. This resulted in an extraneous amount of new tower construction without the benefit of local land use management.

Coincidently, as local governments began to adopt development standards for the wireless communications industry, the industry strategy changed again. The cost associated with each provider developing an autonomous inventory of base stations put a financial strain on their ability to deploy their networks. As a result, most of the wireless providers divested their internal real estate departments and tower inventories. This change gave birth to a new industry of vertical real estate; and it includes a consortium of tower builders, tower owners, site acquisition and site management firms.

No longer was a tower being built for an individual wireless service provider, but for a multitude of potential new tenants who would share the facility without the individual cost of building, owning and maintaining the facility. Sharing antenna space on the tower between wireless providers is called collocation.

This industry change could have benefited local governments who adopted new tower ordinances requiring collocation as a way to reduce the number of new towers. But, *initially* it did not; because the vertical real estate business model for new towers is founded on tall tower structures intended to support as many wireless providers and other wireless services as possible. As a result, local landscapes became dotted with all types of towers and communities began to adopt regulations to restrict or even prohibit tall communication towers within their jurisdictional boundaries.

Wireless deployment came to a halt in many geographical areas as all involved in wireless deployment became equally frustrated with the situation. Second generation wireless providers had paid a large sum of money for the rights to provide wireless services. Collectively the 2G wireless providers paid over twenty-three billion dollars to the US Treasury (which at that time helped the Federal government pay off the annual deficit by 1998) for the licenses to build and operate these networks. Furthermore, the license agreements between the wireless providers and the FCC mandated the networks be deployed within a specific time period and at that time many local government agencies were prohibiting the deployments through new zoning standards.

Robert F. Roche of the Cellular Telecommunications Industry Association (CTIA) stated in The Unpredictable Certainty: White Papers (1997)

> "…the wireless paradigm has resulted in more than 200,000 new jobs, and almost $19 billion in private-sector investment…and in spite of these gains and the promise of another $50 billion in investment over the next 10 years, there are impediments to this success…Some local jurisdictions are preventing the deployment of antennas, either through outright bans, extensive delays, or application of unscientific "local technical standards" to radio frequency emissions…"

Roche further suggests the CTIA should:

> "…1) urge President Clinton to direct federal agencies to make available federal land and sites for telecommunications infrastructure; 2) urge the FCC to develop national standards on radio frequency emissions over local standards; and 3) urge the FCC to advocate the primacy of national telecommunications policy over local policies that are hostile to competition…"

This perplexing situation prompted the adoption of Section 704 of the Federal Telecommunication Act of 1996.

Federal Telecommunications Act of 1996

The Federal Communications Commission (FCC) policies impacting deployment of wireless facilities are, with certain exceptions, unchanged since the enactment of the 1996 Telecommunications Act. The overall concept as passed by Congress was to facilitate the creation of a wireless infrastructure to parallel the wired infrastructure that existed in the United States. The FCC's mandate has been to work towards accomplishing that goal, and the current Commission in particular has paid great attention to moving that task forward.

Section 704 of the Federal Telecommunications Act of 1996 retains local governments' zoning authority over the deployment of wireless telecommunication facilities subject to several specific requirements.

First, zoning regulations and decisions may not unreasonably discriminate among the wireless providers, and may not prohibit or have the effect of prohibiting the deployment of wireless infrastructure. For example, some communities adopted development standards restricting the distance between towers to three miles. In some geographic locations with sparse populations this may have been adequate for 1G deployment; however the Laws of Physics make it impossible for 2G wireless deployments to meet this spacing requirement. Unknowingly some communities inadvertently prohibited the deployment of 2G.

Second, local governments must act on applications for new wireless infrastructure within a "reasonable" amount of time

Third, the local government must provide in writing a reason for any denials and the decision must be supported by substantial evidence.

Fourth, local government cannot deny an application for a new wireless facility or the expansion of an existing facility on the grounds that radio frequency emissions are harmful to the environment or to human health (provided federal standards are met by the wireless provider).

Additionally, the FCC provided two Fact Sheets to further explain the goals and objectives of the Act. Included in Fact Sheet 1 is the suggestion for local government to the use of third party professional review of site applications. Specifically stated, "Local zoning authorities may wish to retain a consulting engineer to evaluate the proposals submitted by wireless communications licensees. The consulting engineer may be able to determine if there is some flexibility as to the geographic location of the tower."

The full text of Section 704 of the 1996 Telecommunication Act is provided in Appendix A.

Federal Communications Commission Declaratory Ruling November 18, 2009

In states where there is no specific state statutory obligation on local jurisdictions (which includes the Commonwealth of Virginia) the FCC's Declaratory Ruling will apply and impose upon local jurisdictions a timeline in which it must act upon wireless siting applications. The November 18, 2009 *Declaratory Ruling*[1] regarding timelines for local government to act upon a wireless siting application specifies a local government agency has thirty (30) days from receipt of an application for a new tower or collocation to determine if the application is complete or incomplete. Additionally the FCC provided the following deadlines for the local government decision process:

> Collocation – local government agencies have ninety (90) days from the date the application is filed to render a decision for approval or denial of the collocation.
>
> New towers – government agencies have one hundred fifty (150) days from the date the application is filed to provide a decision on the proposed request.

If a jurisdiction fails to act on an application within those timelines, an applicant will have the opportunity to file suit in federal court and seek judicial determination of the application. Several jurisdictions challenged the FCC's authority to impose a "shot clock" on such local zoning decisions. On January 23, 2012, the Fifth Circuit Court of Appeals decided *City of Arlington, Texas v. FCC*, 668 F.3d 229 (5th Cir. 2012), and found that the FCC was legally empowered to impose the "shot clock" on local governments in jurisdictions without state statutory provisions that are more restrictive. There have been some other federal district court cases that have addressed the "shot clock" issue tangentially but are not relevant for this discussion. Of note and importance because of recent Congressional action was the FCC's definition in the *Declaratory Ruling* of what constitutes a collocation application, which the FCC defined as "a substantial increase in the size of the tower" as set forth in the National Programmatic Agreement.[2]

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[1] *Declaratory Ruling*, FCC 09-99 (Released November 18, 2009)

[2] . A "[s]ubstantial increase in the size of the tower" occurs if:

> (1) [t]he mounting of the proposed antenna on the tower would increase the existing height of the tower by more than 10%, or by the height of one additional antenna array with separation from the

Having established a procedural timeline for action on wireless siting applications, the FCC has recently also enacted regulations that impose additional burdens on applicants seeking to construct new towers for wireless services. Effective **June 18, 2012**, new federal procedural obligations (unrelated to any local procedural obligations) imposed on any applicant who is:

(1) planning to build *any* new tower that would have to register through the FCC's Antenna Structure Registration (ASR) system (typically towers that exceed 200 feet in height, but sometimes less). The only exceptions are for (a) towers to be built on sites for which some other federal agency has responsibility for environmental review or (b) cases in which an emergency waiver has been granted; or

(2) modifying an existing registered tower by (a) increasing its overall height by more than 10% or 20 feet, or (b) adding lighting to a previously unlit structure, or (c) modifying existing lighting from a more preferred configuration to a less preferred configuration; or

(3) amending a pending application involving either of the foregoing situations and the amendment would (a) change the type of structure, or (b) change the structure's coordinates, or (c) increase the overall height of the structure or (d) change from a more preferred to a less preferred lighting configuration or (e) an Environmental Assessment is required.

If an applicant's proposed tower or tower modifications fall into one of these categories, an applicant must follow new processes and procedures with the FCC in order to obtain approval of its proposed facility, including:

(1) Filing a partially-completed Form 854 in the FCC's ASR system. This will consist of information previously required on Form 854, plus tower lighting information ***and*** specification of the date on which the applicant wants the FCC to post the application on the Commission's website for comments; and

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nearest existing antenna not to exceed twenty feet, whichever is greater, except that the mounting of the proposed antenna may exceed the size limits set forth in this paragraph if necessary to avoid interference with existing antennas; or (2) [t]he mounting of the proposed antenna would involve the installation of more than the standard number of new equipment cabinets for the technology involved, not to exceed four, or more than one new equipment shelter; or (3) [t]he mounting of the proposed antenna would involve adding an appurtenance to the body of the tower that would protrude from the edge of the tower more than twenty feet, or more than the width of the tower structure at the level of the appurtenance, whichever is greater, except that the mounting of the proposed antenna may exceed the size limits set forth in this paragraph if necessary to shelter the antenna from inclement weather or to connect the antenna to the tower via cable; or (4) [t]he mounting of the proposed antenna would involve excavation outside the current tower site, defined as the current boundaries of the leased or owned property surrounding the tower and any access or utility easements currently related to the site.

47 C.F.R. Part 1, App. B—Nationwide Programmatic Agreement for the Collocation of Wireless Antennas, Definitions, Subsection C.

(2) Publishing a notice ("in a local newspaper or by other means") regarding the application on or before the date the applicant has designated in its application for posting of the application on the FCC's website. The comment period will be open for 30 days, during which time members of the public can ask the FCC for further environmental review.

(3) If, after the comment period, FCC staff concludes that no additional environmental review is required, the applicant will then move on to Table 1, Step 1 of the process. In that step, the applicant will have to amend its application to reflect (a) the FAA's study number and issue date (if those haven't already been provided in the initial application), (b) the date of the local public notice, and (c) a certification that the proposed construction will have no significant environmental impact; OR,

(4) If, after considering the initial filing and any public comments, the FCC decides that more review is required, it will require the submission of an Environmental Assessment. If an Environmental Assessment is required, the FCC will first have to issue a Finding of No Significant Impact before the applicant can proceed to Step Two with the necessary amendment of its application.

All of the foregoing processes were adopted after FCC consideration of multiple petitions by parties concerned about the effect of tower construction on the environment, including the effect on migratory birds and tower strikes by such birds.

These new provisions will significantly extend the timeline for federal approval of new construction or modification of towers that meet the conditions above[3], which may have the effect in some instances of slowing the deployment of wireless facilities where the proposed facilities fall into one of the three (3) categories above.

Applicants may also seek local approval of their proposal at the same time the federal processes are underway on parallel paths, and thus it is unclear at this time what impact the federal processes may have on the processing and adjudication by local government of wireless siting applications.

In addition to the FCC's recent actions, Congress also recently involved itself in wireless siting issues by including language in recent legislation signed by the President on February 22, 2012 that impacts local governments' consideration of wireless siting applications.

The Middle Class Tax Relief & Job Creation Act of 2012 – HR 3630

In Section 6409 of the Middle Class Tax Relief and Job Creation Act of 2012, Congress further eroded local government's jurisdiction over wireless facilities through the following language:

(a) FACILITY MODIFICATIONS.—

[3] The new requirements are imposed on proposals for either new towers or modifications that, generally speaking, do constitute a "substantial change" as that term is defined by the FCC.

(1) IN GENERAL.—Notwithstanding section 704 of the Telecommunications Act of 1996 (Public Law 104–104) or any other provision of law, a State or local government may not deny, and shall approve, any eligible facilities request for a modification of an existing wireless tower or base station that does not substantially change the physical dimensions of such tower or base station.

(2) ELIGIBLE FACILITIES REQUEST.—For purposes of this subsection, the term ''eligible facilities request'' means any request for modification of an existing wireless tower or base station that involves—
(A) collocation of new transmission equipment;
(B) removal of transmission equipment; or
(C) replacement of transmission equipment.

(3) APPLICABILITY OF ENVIRONMENTAL LAWS.—Nothing in paragraph (1) shall be construed to relieve the Commission from the requirements of the National Historic Preservation Act or the National Environmental Policy Act of 1969.

Note that Section 6409 applies where an application for modification of an existing wireless facility does not involve a "substantial change" to the physical dimensions of such tower or base station.

Congress did not define "substantial change" in the legislation. In order to determine what constitutes "substantial change", the only currently available definition arises from the FCC's National Programmatic Agreement (see footnote 2), which is also the definition endorsed by the wireless industry.

Under this new Congressional requirement, local governments must approve any application for collocation, removal or replacement of wireless equipment if the proposed modifications to an existing facility do not involve a "substantial change" (and as noted above, the only currently available definition of "substantial change" is that defined by the FCC in the National Programmatic Agreement). This further degradation of local governmental authority over wireless facilities (and the willingness of wireless providers to suggest to local governments that this new statutory mandate provides a basis to immediately grant their application) is impacting wireless deployment by emboldening the wireless industry to increase deployment efforts despite local government concerns. Although this is recent legislation and there does not yet appear to be any reported decisions involving Section 6409, Cityscape is aware of at least one lawsuit being commenced citing Section 6409 as jurisdictional authority (despite the fact that the applicant who has sought judicial relief was *granted* authority by the local government to modify their facility with certain conditions).

Since the CBJ adopted the Personal Wireless Services Facility Development Standards the Federal government has adopted additional policies that should be integrated into the existing regulations in order to harmonize them with applicable federal law. For example, the timeline as described in the "shot clock" *Declaratory Ruling* should be integrated to indicate that collocation applications shall be reviewed and adjudicated by the CBJ within ninety days of completed submission, and an application for a new facility shall be reviewed and adjudicated by the CBJ within one hundred fifty days of complete application submission.

Furthermore, the CBJ's regulations should recognize the provisions of Section 6409 of the Middle Class Tax Relief and Job Creation Act of 2012 to permit equipment collocations, removals and replacements on existing eligible facilities that do not "substantially change" the physical dimensions of the tower structure, via well-defined collocation and related approval processes that meet the ninety (90) day shot clock standards.

Additionally the existing Ordinance utilizes too many terms that mean the same or very similar definitions throughout the document. For example, the use of the terms "antenna support structure" and "tower" are used interchangeably. The CBJ should pick one term to eliminate confusion.

Chapter 5 Inventory

Purpose of the inventory

Procedure

CityScape conducted an assessment of the existing antenna locations throughout the CBJ by driving to all locations. Data for the assessments was obtained from a number of sources including actual permits obtained from the CBJ for wireless infrastructure, research of FCC registered site locations, direct information from existing wireless service providers and tower owners active in the CBJ, the CBJ GIS, and through actual site visits to each location.

Inventory catalog existing antenna(s) and towers

Pictures of existing antennas mounted on towers and rooftops are included in the inventory catalog. Existing antenna site locations are identified numerically in Figure 21.

Structural evaluation

Based on a visual inspection of antenna arrays already on existing antenna support structures, CityScape has made a judgment as to whether each support structure is likely to physically accommodate more antennas. The number of estimated collocations is referenced as future antenna collocation possibilities. The suggested collocation is based on visual observations only. In this consideration, adding antennas equates to adding another wireless antenna platform consisting of several antennas and associated heavy coaxial cable. Prior to mounting new antennas and related equipment, the structure must be examined and analyzed by a structural engineer for its ability to support the proposed addition.

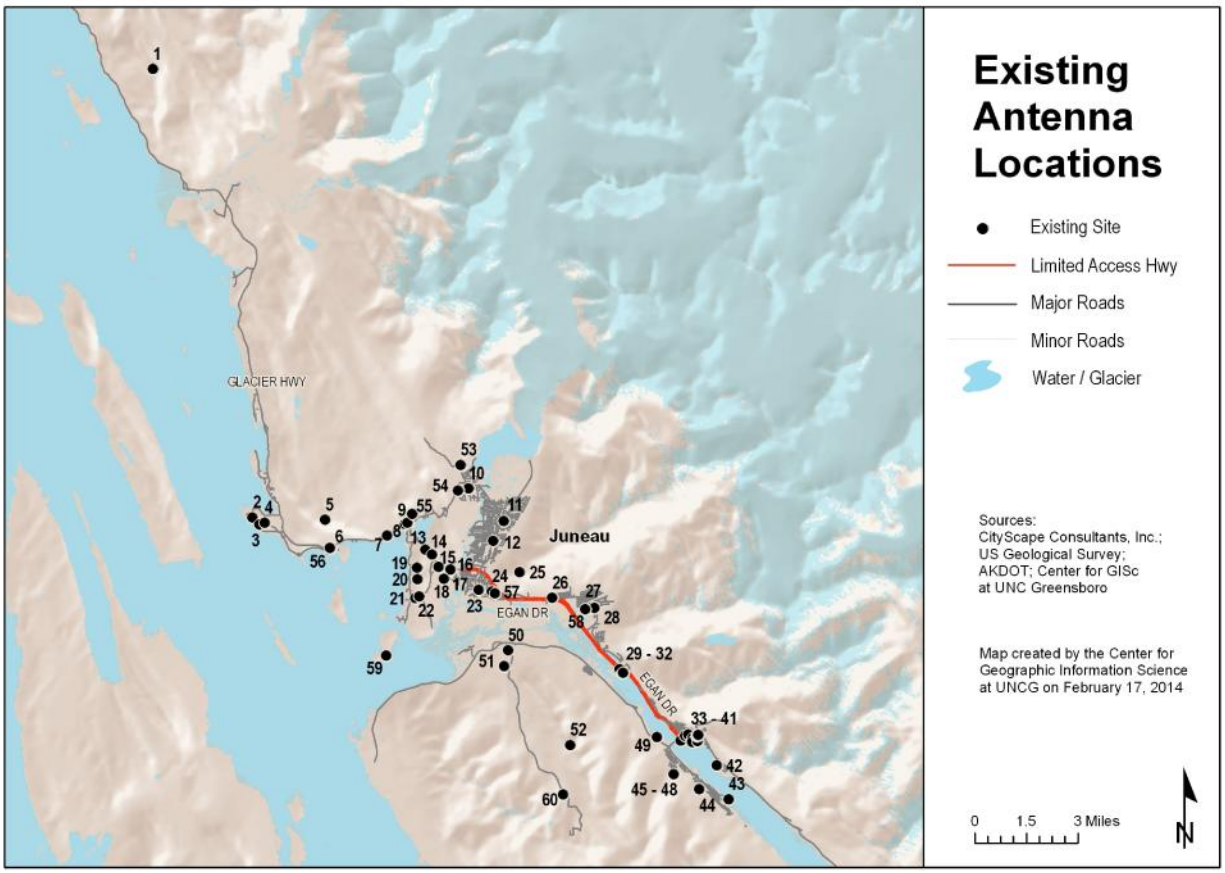
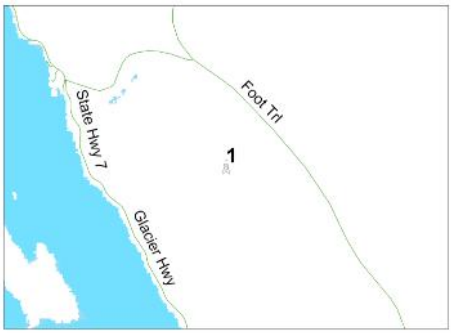
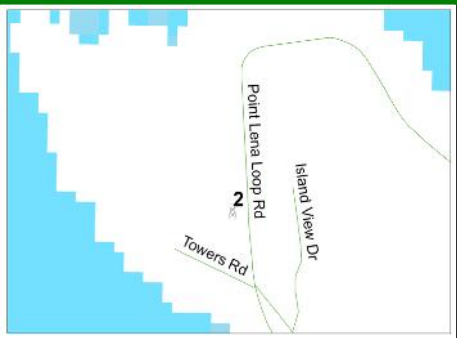
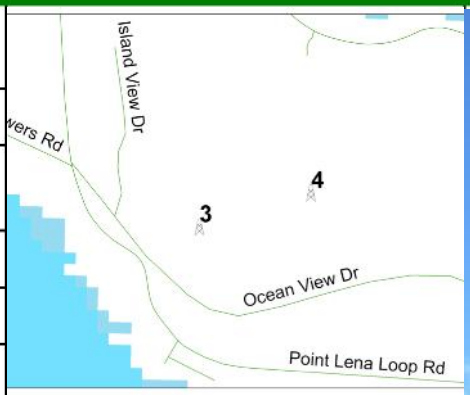
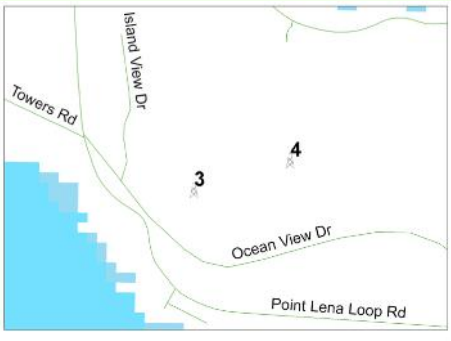


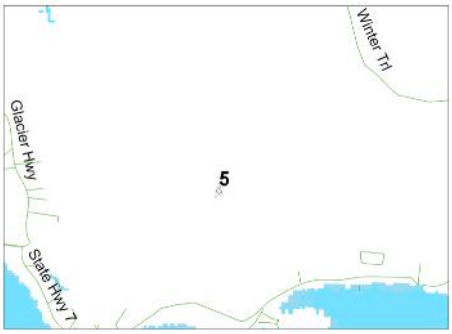
Figure 21: Existing Inventory

Site 1		Site Map	Site Photo
Owner:	AT&T/AlaskaCom		
Identification:	Bessie Mountain		
Address:	Unknown		
Latitude:	58-34-42.82 N		
Longitude:	-134-51-16.49 W		
Access:	Air		
Site Details			
Type:	Lattice used primarily for microwave backhaul.		
Height:	60’ per the CBJ		
Collocations:	Existing: Yes, approximately 2	Future: 2	
Observations:	Site was not assessed by CityScape Consultants, Inc.		
Comments:	Photo provided by the CBJ.		

Site 2		Site Map	Site Photo
Owner:	AlaskaCom		
Identification:	FCC: 1005565		
Address:	17103 Lena Loop Rd.		
Latitude:	58-23-27.8 N		
Longitude:	-134-46-6.5 W		
Access:	Vehicle		
Site Details			
Type:	Lattice used for microwave backhaul and collocations.		
Height:	FCC antenna structure registration indicates 220’.		
Collocations:	Existing: Yes, approximately 2	Future: 3	
Observations:	Ground space available for base stations; site secured by fence and locked gate.		
Comments:	Lattice tower will provide great opportunities for collocation.		

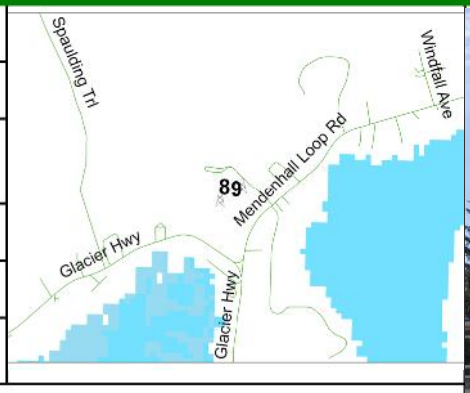
Site 3		Site Map	Site Photo
Owner:	City and Borough of Juneau		
Identification:	FCC: 1247302		
Address:	17099 Point Lena Loop Road		
Latitude:	58-23-17.5 N		
Longitude:	-134-45-45.8 W		
Access:	Vehicle		
Site Details			
Type:	Lattice used primarily for microwave backhaul		
Height:	80’ per the CBJ.		
Collocations:	Tower is not available for collocation.	Future 3	
Observations:	Site was not assessed by CityScape Consultants Inc. Photo provided by the CBJ.		
Comments:	The CBJ should establish a policy for use of this tower by the wireless industry.		

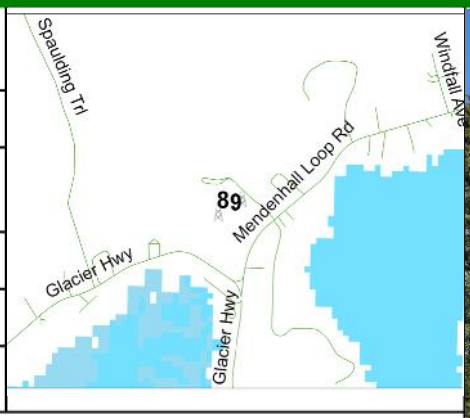
Site 4		Site Map	Site Photo
Owner:	State of Alaska		
Identification:	FCC: 1241297		
Address:	Lena Point		
Latitude:	58-23-20 N		
Longitude:	-134-45-31 W		
Access:	Vehicle		
Site Details			
Type:	Guy		
Height:	185’		
Collocations:	No	Future 0	
Observations:	Site is not accessible to the public.		
Comments:	Tower is used for air traffic safety and not available for collocations.		

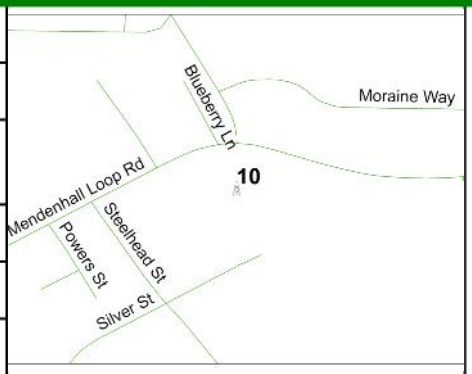
Site 5		Site Map	Site Photo
Owner:	Unknown		Photograph Unavailable
Identification:	Auke Mountain		
Address:	Unknown		
Latitude:	58-23-25.98 N		
Longitude:	-134-42-37.01 W		
Access:	Unsure		
Site Details			
Type:	Not Available		
Height:	60’		
Collocations:	Existing: Unsure	Future: Unsure	
Observations:	Site was not found or assessed by CityScape Consultants Inc.		
Comments:	Site Provided to CityScape by the CBJ; very little information is available.		

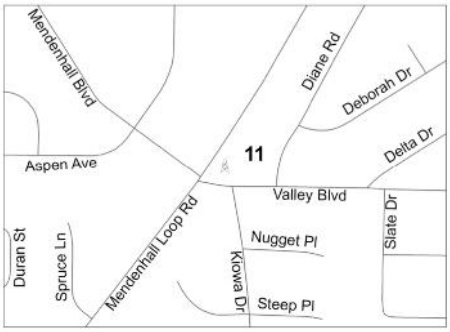
Site 6		Site Map	Site Photo
Owner:	New Cingular Wireless		
Identification:	FCC: 1282723		
Address:	14080 Glacier Highway		
Latitude:	58-22-43.35 N		
Longitude:	-134-42-17.71 W		
Access:	Vehicle		
Site Details			
Type:	Wood Pole		
Height:	FCC indicates 98’; CBJ indicates 100’		
Collocations:	Existing: Yes, approximately 2	Future: 1-2	
Observations:	FCC identification on tower but no other tower ownership or contact information on site.		
Comments:	Site is clean with easy access directly off of Glacier Highway.		

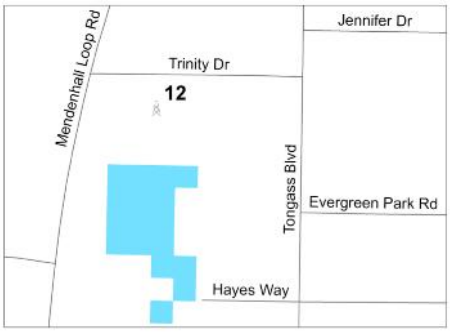
Site 7		Site Map	Site Photo
Owner:	New Cingular Wireless PCS, LLC		
Identification:	FCC: 1282723		
Address:	12401 Glacier Highway		
Latitude:	58-23-3.2 N		
Longitude:	-134-39-37 W		
Access:	Vehicle		
Site Details			
Type:	Wood Pole		
Height:	90' per the CBJ		
Collocations:	Existing: Yes, approximately 2	Future 2	
Observations:	No site ownership identification and no FAA ASR number posted.		
Comments:	Site is on a small hill and easily accessible from Glacier Highway.		

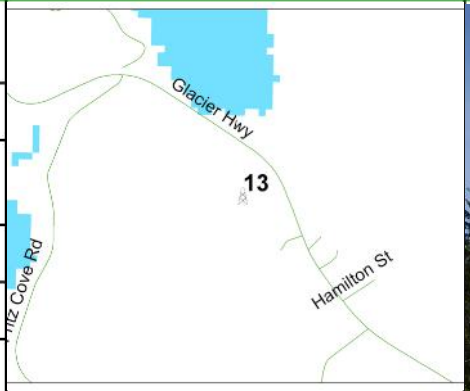
Site 8		Site Map	Site Photo
Owner:	First Student		
Identification:	Unknown		
Address:	12364 Glacier Highway		
Latitude:	58-23-20.94 N		
Longitude:	-134-38-45.52 W		
Access:	Vehicle		
Site Details			
Type:	Rooftop Tower		
Height:	Unknown		
Collocations:	Existing: Yes, approximately 2	Future: none	
Observations:	The rooftop tower appears to be used for both dispatch and a wireless collocation		
Comments:	Ownership of the tower is assumed to be by the business owner.		

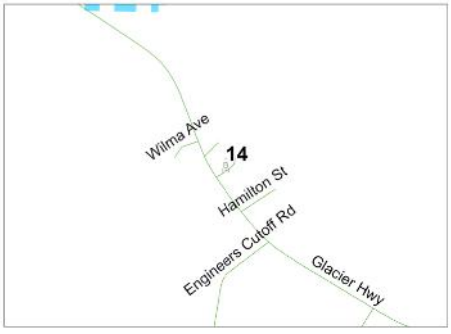
Site 9		Site Map	Site Photo
Owner:	GCI Communications Corp		
Identification:	FCC: 1263789		
Address:	12364 Glacier Highway		
Latitude:	58-23-23 N		
Longitude:	-134-38-39 W		
Access:	Vehicle		
Site Details			
Type:	Monopole		
Height:	100' per the CBJ		
Collocations:	Existing: Yes, 2	Future: 1	
Observations:	Site has FAA and ownership information.		
Comments:	Tower has wires from the tower to a nearby tree and wrapping around the tree and leading to a nearby utility pole.		

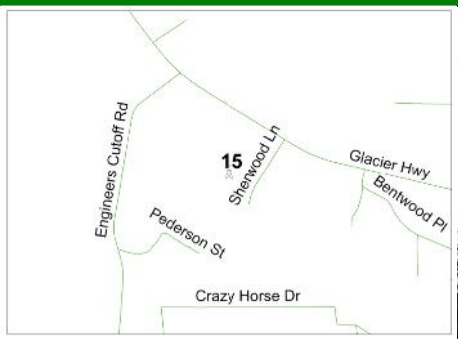
Site 10		Site Map	Site Photo
Owner:	Unknown		
Identification:	Not posted on site		
Address:	9741 Mendenhall Loop Road		
Latitude:	54-24-16.51 N		
Longitude:	-134-35-44.21 W		
Access:	Vehicle		
Site Details			
Type:	Wood Pole		
Height:	100' per the CBJ.		
Collocations:	Existing: 1 tenant	Future: 1	
Observations:	No tower ownership identification on the site and outside storage of non-tower related items are in the green shelter.		
Comments:	Site is easily accessible.		

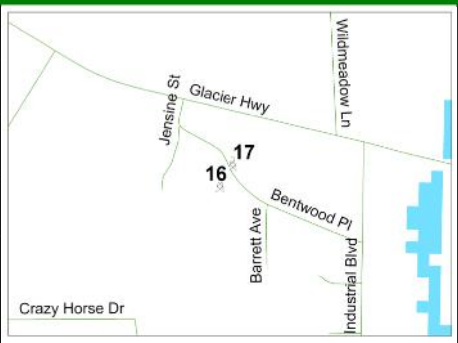
Site 11		Site Map	Site Photo
Owner:	ACS Wireless, Inc.		
Identification:	FCC: 1241641		
Address:	8503 Valley Boulevard		
Latitude:	58-23-29.5 N		
Longitude:	-134-33-53 W		
Access:	Vehicle		
Site Details			
Type:	Brown Monopole		
Height:	100’		
Collocations:	Existing: 1 Tenant	Future: 0 - 1	
Observations:	No tower ownership or FAA identification posted on site.		
Comments:	Site is secured with a fence and locking gate and is easily accessible by vehicle.		

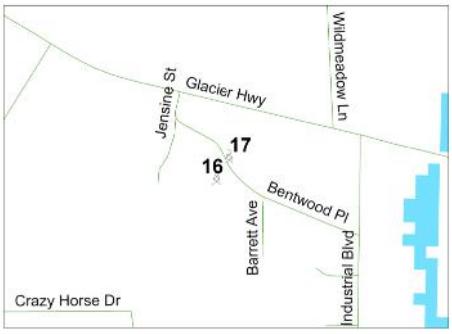
Site 12		Site Map	Site Photo
Owner:	Global Tower, LLC		
Identification:	FCC: 1242713		
Address:	8748 Trinity Drive		
Latitude:	58-22-55.8 N		
Longitude:	-134-34-26.3 W		
Access:	Vehicle		
Site Details			
Type:	Monopole		
Height:	163’ per the FCC antenna structure registration and the CBJ indicates 150’ tower height.		
Collocations:	Existing: Yes, 4	Future: none	
Observations:	Tower has reinforced metal strips to increase structural capacity of the tower.		
Comments:	Tower is used by multiple service providers indicating this is a good location for a site. It is likely another tower will be needed in the vicinity to accommodate future service providers.		

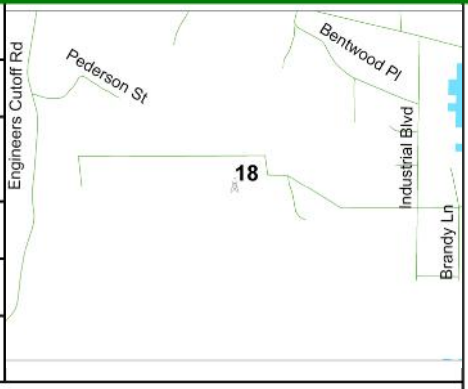
Site 13		Site Map	Site Photo
Owner:	City and Borough of Juneau		
Identification:	FCC: 1205353		
Address:	10745 Glacier Highway		
Latitude:	58-22-42.8 N		
Longitude:	-134-37-46.4 W		
Access:	Vehicle		
Site Details			
Type:	Guy tower used for public safety		
Height:	150' per the CBJ.		
Collocations:	Existing: No, public safety equipment only	Future: 1	
Observations:	FAA identification is posted on the tower.		
Comments:	The CBJ should to decide if they are going to lease space on tower for collocations.		

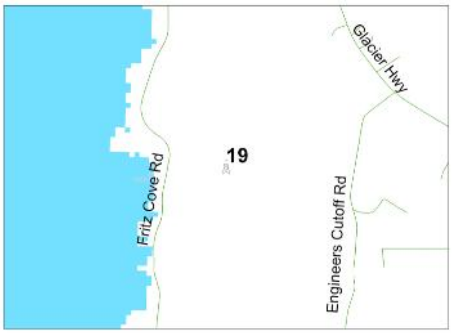
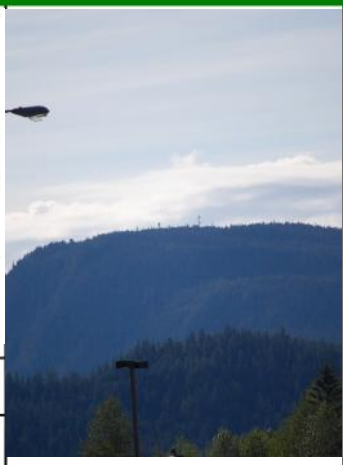
Site 14		Site Map	Site Photo
Owner:	Calvary Fellowship		
Identification:	FCC: 1250045		
Address:	Glacier Highway		
Latitude:	58-22-35.8 N		
Longitude:	-134-37-27.4 W		
Access:	Vehicle		
Site Details			
Type:	Tree with broadcast equipment		
Height:	FCC indicates approval for 82'; the CBJ indicates a height of 90'.		
Collocations:	Existing: No	Future: 0	
Observations:	Tree branches removed and equipment mounted onto tree		
Comments:	Regulations should be amended to prevent future similar installations.		

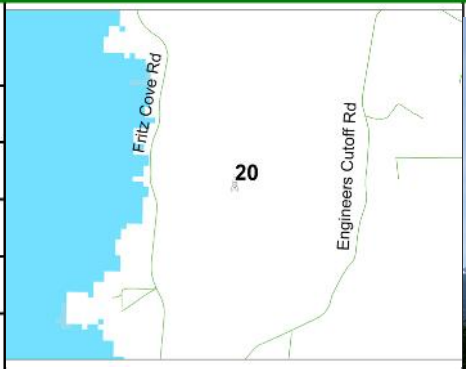
Site 15		Site Map	Site Photo
Owner:	State of Alaska		
Identification:	FCC: 1003201		
Address:	2760 Sherwood Lane		
Latitude:	58-22-17 N		
Longitude:	-134-37-8 W		
Access:	Vehicle		
Site Details			
Type:	Lattice used primarily for microwave backhaul		
Height:	142' per the FCC antenna structure registration.		
Collocations:	Existing: No	Future: 0	
Observations:	Tower is secured with a fence and locked gate. FAA identification not posted on tower.		
Comments:	Tower is located at the DMV and an unlikely candidate for collocations.		

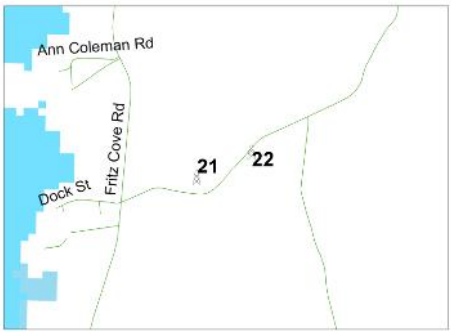
Site 16		Site Map	Site Photo
Owner:	Alascom, Inc.		
Identification:	FCC: 1005560		
Address:	10087 Jensine Street		
Latitude:	58-21-11.8 N		
Longitude:	-134-36-35.4		
Access:	Vehicle		
Site Details			
Type:	Lattice Tower		
Height:	158' per the FCC antenna structure registration.		
Collocations:	Existing: Yes, approximately 2	Future: 2	
Observations:	Site is secured with a fence and locked gate.		
Comments:	The lattice tower is a very good tower for future collocations.		

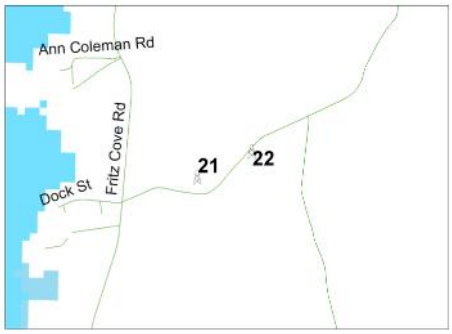
Site 17	Site Map	Site Photo
Owner:	AlaskaCom		
Identification:	Not available		
Address:	10087 Jensine Street		
Latitude:	58-22-12.23 N		
Longitude:	-134-36-33.77 W		
Access:	Vehicle		
Site Details			
Type:	Small Guy tower next to lattice tower		
Height:	60' per the CBJ (although it appears shorter)		
Collocations:	Existing: No	Future: 0	
Observations:	Shorter tower is to the right of the lattice tower identified as Site 16.		
Comments:	Height and type of tower structure made it not a good option for collocation.		

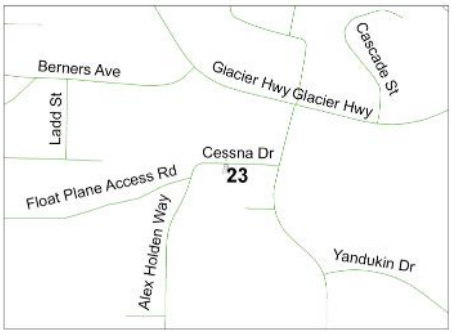
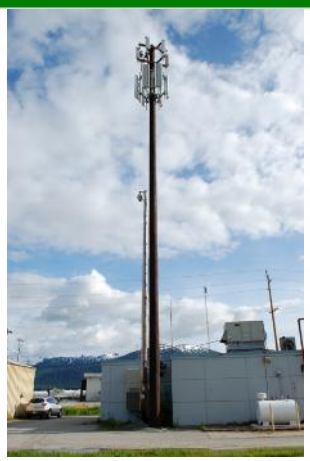
Site 18	Site Map	Site Photo
Owner:	Unsure		
Identification:	FAA Tower		
Address:	10020 Crazy Horse Drive		
Latitude:	58-21-59.71 N		
Longitude:	-134-36-51.78 W		
Access:	Vehicle		
Site Details			
Type:	Monopole		
Height:	60' per the CBJ.		
Collocations:	Existing: No	Future: 0	
Observations:	No tower ownership posted on tower.		
Comments:	Signage at the site indicates the tower is used for air traffic control purposes.		

Site 19		Site Map	Site Photo
Owner:	Unknown		
Identification:	Fritz Cove		
Address:	Fritz Cove Road		
Latitude:	58-22-15.19 N		
Longitude:	-134-38-9.75 W		
Access:	Unsure		
Site Details			
Type:	Unsure		
Height:	90' per the CBJ		
Collocations:	Existing: Unsure	Future: Unsure	
Observations:	CityScape Consultants, Inc. was not able to assess this site.		
Comments:	Site information provided by the CBJ. The ridgeline photo showes three towers but CityScape could not find access to this facility.		

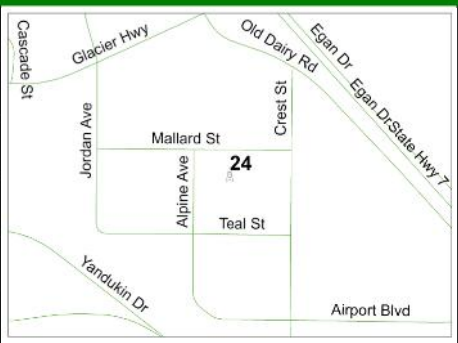
Site 20		Site Map	Site Photo
Owner:	City and Borough of Juneau		
Identification:	FCC: 1247301		
Address:	Pederson Hill		
Latitude:	58-21-58 N		
Longitude:	-134-38-7.5 W		
Access:	Vehicle		
Site Details			
Type:	Guy Tower		
Height:	40' per the CBJ		
Collocations:	Existing: No	Future: 0	
Observations:	The tower (a.k.a. "Mendenhall Peninsula) is used by the CBJ for public safety communications.		
Comments:	Site was not assessed by CityScape Consultants. The photo was provided by the CBJ.		

Site 21		Site Map	Site Photo
Owner:	Unsure		
Identification:	FAA Tower		
Address:	1600 Engineers Cut Off		
Latitude:	58-21-29.64 N		
Longitude:	-134-38-13.44 W		
Access:	Vehicle		
Site Details			
Type:	Lattice Tower		
Height:	60' per the CBJ.		
Collocations:	Existing: No	Future: 0	
Observations:	Tower will likely be exclusively used by the FAA.		
Comments:	Signage at the site indicates the tower is used for air traffic control purposes.		

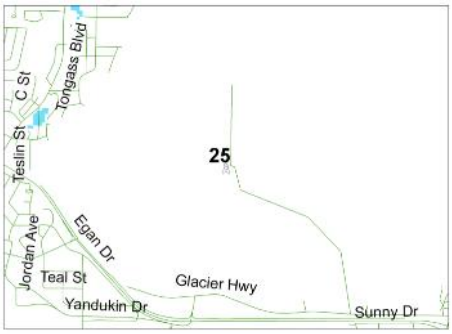
Site 22		Site Map	Site Photo
Owner:	Unsure		
Identification:	FAA Tower		
Address:	Engineers Cut Off		
Latitude:	58-21-32.51 N		
Longitude:	-134-38-2.22 W		
Access:	Vehicle		
Site Details			
Type:	Lattice Tower		
Height:	Unknown		
Collocations:	Existing: No	Future: 0	
Observations:	Tower is likely used exclusively by the FAA		
Comments:	Signage at the site indicates the tower is used for air traffic control purposes.		

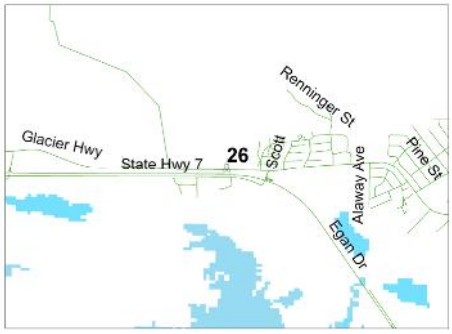
Site 23		Site Map	Site Photo
Owner:	ACS Wireless Inc.		
Identification:	FCC: 1275626		
Address:	9229 Cessna Drive		
Latitude:	58-21-43.4 N		
Longitude:	-134-35-10.7 W		
Access:	Vehicle		

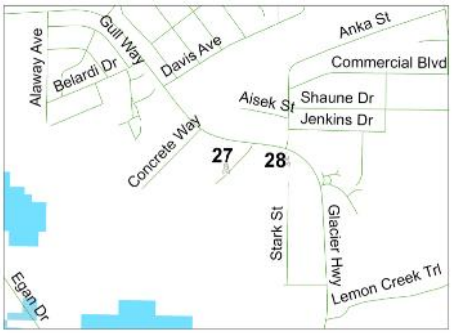
Site Details		
Type:	Wood Pole	
Height:	100' per FCC antenna structure registration.	
Collocations:	Existing: Yes, 2	Future: 2
Observations:	Future collocations will likely require structural reinforcements of the tower.	
Comments:	Actually 2 wood poles side by side. The shorter pole hosts a microwave dish.	

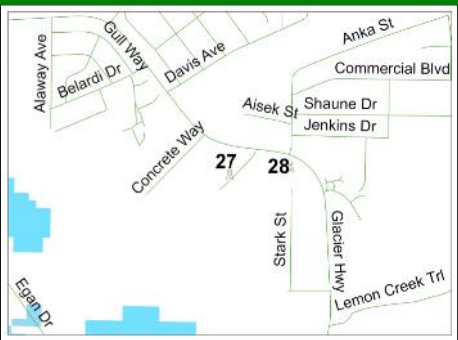
Site 24		Site Map	Site Photo
Owner:	Global Tower, LLC		
Identification:	FCC: 1236722		
Address:	8725 Mallard Street		
Latitude:	58-21-41.08 N		
Longitude:	-134-34-32.7 W		
Access:	Vehicle		

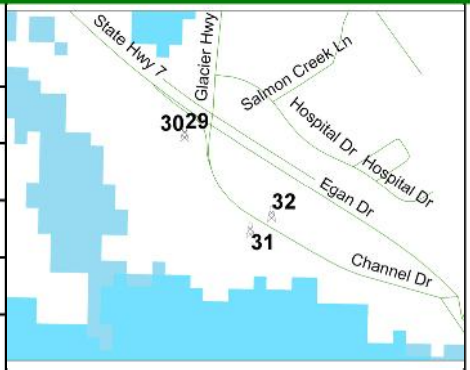
Site Details		
Type:	Wood Pole	
Height:	FCC antenna structure registration indicates 80'; the CBJ indicates 70'.	
Collocations:	Existing: Yes, approximately 2	Future: 0-1
Observations:	Future collocations will likely require structural reinforcements of the tower.	
Comments:	Equipment shelter(s) match principal building on site.	

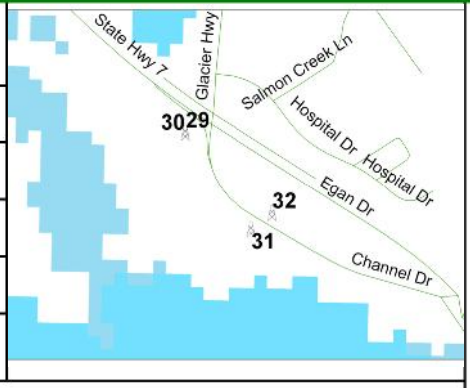
Site 25		Site Map	Site Photo
Owner:	Unknown		Picture Unavailable
Identification:	Heintzleman Ridge		
Address:	Unknown		
Latitude:	58-22-10.97 N		
Longitude:	-134-33-13.7 W		
Access:	Unknown		
Site Details			
Type:	Unknown		
Height:	Unknown		
Collocations:	Existing: Unknown	Future: Unknown	
Observations:	CityScape Consultants, Inc. did not assess this site.		
Comments:	Site location was provided by the CBJ and was not found by CityScape Consultants, Inc.		

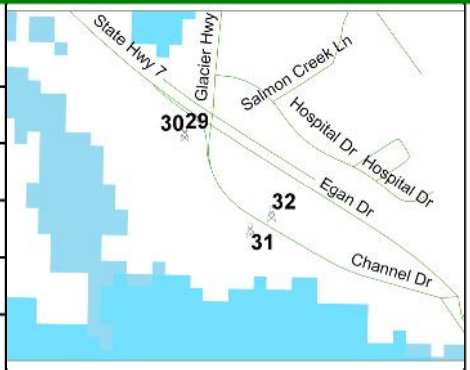
Site 26		Site Map	Site Photo
Owner:	State of Alaska		
Identification:	FCC: 1244555		
Address:	6860 Glacier Highway		
Latitude:	58-21-32.8 N		
Longitude:	-134-31-39.4 W		
Access:	Vehicle		
Site Details			
Type:	Lattice used primarily for microwave backhaul		
Height:	70' per the FCC antenna structure registration		
Collocations:	Existing: No	Future: 0	
Observations:	Tower is easily accessible from Glacier Highway and would likely have to be rebuilt to accommodate collocations.		
Comments:	Tower is owned by the State and used by the AK Marine Highway System.		

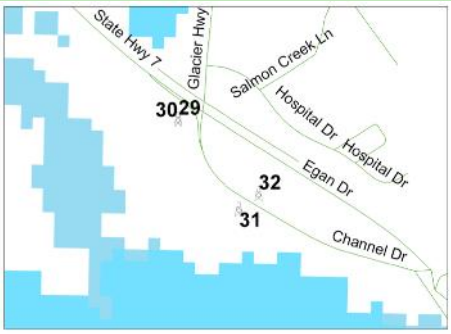
Site 27		Site Map	Site Photo
Owner:	Global Tower, LLC		
Identification:	FCC: 1242712		
Address:	5594 Tonsgard Court		
Latitude:	58-21-17.8 N		
Longitude:	-134-29-49.4 W		
Access:	Vehicle		
Site Details			
Type:	Wood Pole		
Height:	FCC antenna structure registration identifies tower height at 105'; the CBJ indicates 80'.		
Collocations:	Existing: Yes, 3	Future: 0-2	
Observations:	Tower property identified.		
Comments:	Future collocations will likely require structural reinforcements of the tower.		

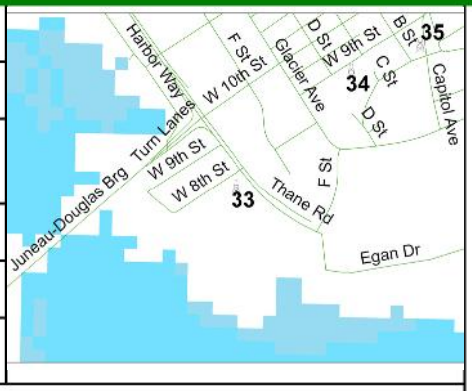
Site 28		Site Map	Site Photo
Owner:	Unknown		
Identification:	Unknown		
Address:	5541 Glacier Highway		
Latitude:	58-21-18.58 N		
Longitude:	-134-29-37 W		
Access:	Vehicle		
Site Details			
Type:	Lattice Tower		
Height:	100' per the CBJ.		
Collocations:	Existing: Yes, 2	Future: 3	
Observations:	No tower ownership information provided on site.		
Comments:	Site is easily accessible off Glacier Highway.		

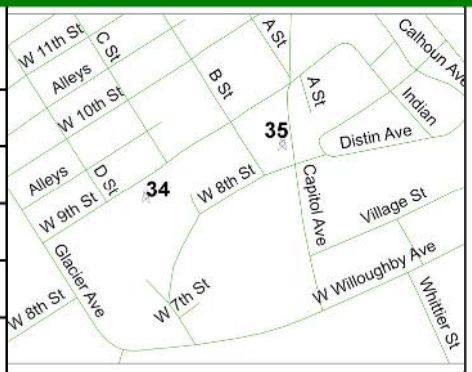
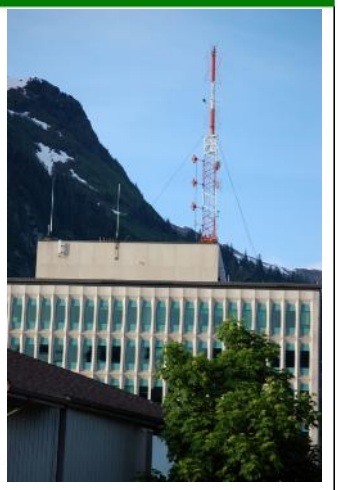
Site 29		Site Map	Site Photo
Owner:	Alaska Broadcast Communications, Inc.		
Identification:	FCC: 1029038		
Address:	3161 Channel Drive		
Latitude:	58-19-46 N		
Longitude:	-134-28-23 W		
Access:	Vehicle		
Site Details			
Type:	Lattice used for radio broadcasting		
Height:	325' per the FCC antenna structure registration.		
Collocations:	Existing: No	Future: 3	
Observations:	A good site for future collocations.		
Comments:	Presently a broadcast tower for KINO		

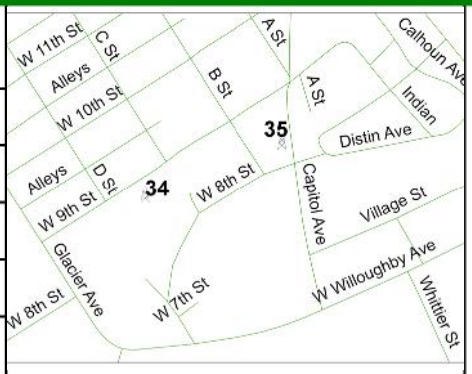
Site 30		Site Map	Site Photo
Owner:	Alaska Broadcast Communications, Inc.		
Identification:	Unknown		
Address:	3161 Channel Drive		
Latitude:	58-19-46 N		
Longitude:	-134-28-23 W		
Access:	Vehicle		
Site Details			
Type:	Short lattice tower next to Site 29		
Height:	80'		
Collocations:	Existing: No	Future: 0	
Observations:	Tower used for microwave backhaul to support broadcast signal.		
Comments:	Use of shorter tower for collocation is very unlikely.		

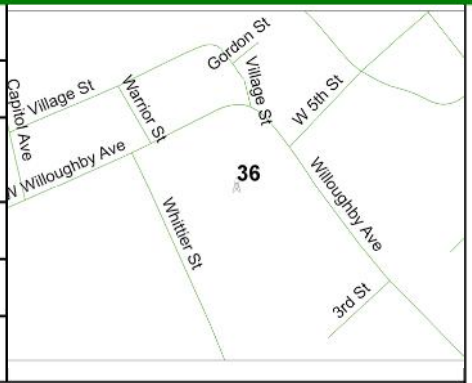
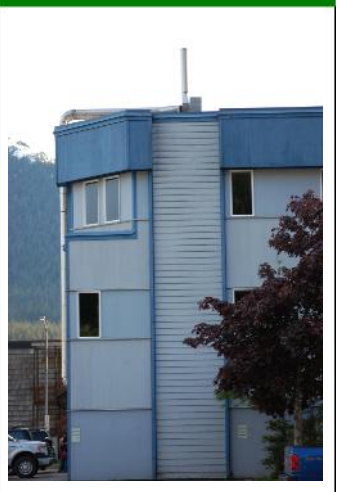
Site 31		Site Map	Site Photo
Owner:	New Cingular Wireless		
Identification:	FCC: 1283764		
Address:	3156 Channel Drive		
Latitude:	58-19-40 N		
Longitude:	-134-28-15 W		
Access:	Vehicle		
Site Details			
Type:	Monopole Tower		
Height:	FCC antenna structure registration indicates a height of 98; the CBJ indicates 92'.		
Collocations:	Existing: No	Future: 2	
Observations:	Tower ownership property identified.		
Comments:	This tower is a good facility for future collocations.		

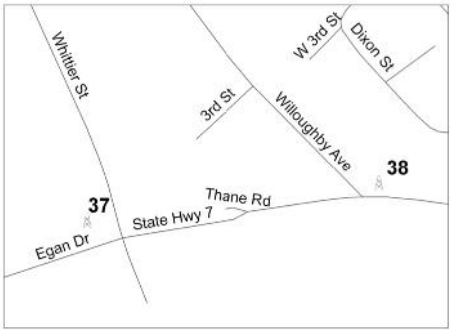
Site 32		Site Map	Site Photo
Owner:	State of Alaska		
Identification:	Unsure		
Address:	3132 Channel Drive		
Latitude:	58-19-41.04 N		
Longitude:	-134-28-12.54 W		
Access:	Vehicle		
Site Details			
Type:	Lattice used primarily for microwave backhaul		
Height:	50' per the CBJ.		
Collocations:	Existing: No	Future: 0	
Observations:	The base station equipment for the is tower is located within the adjacent building.		
Comments:	Tower is owned by the AK DOT and Public Facilities and collocation is unlikely.		

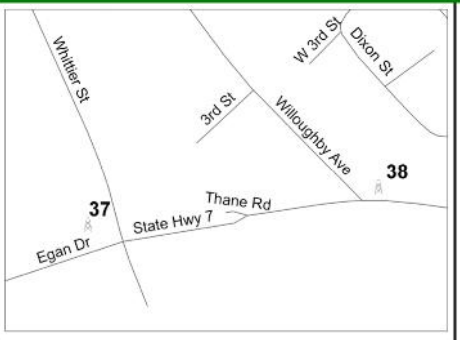
Site 33		Site Map	Site Photo
Owner:	Cycle Alaska		
Identification:	Unknown		
Address:	8th Street & Egan Drive Latitude:		
58-17-59.5 N Longitude:	-		
134-25-24.49 W Access:			
Vehicle			
Site Details			
Type:	Rooftop Guy Tower		
Height:	Unknown		
Collocations:	Existing: No	Future: None	
Observations:	Facility appears to be used for dispatch and surveillance devices by retailer.		
Comments:	Unlikely candidate for collocation unless tower is improved structurally.		

Site 34		Site Map	Site Photo
Owner:	US Federal Government		
Identification:	FCC: 1046332		
Address:	Ninth Street		
Latitude:	58-18-6.8 N		
Longitude:	-134-25-11 W		
Access:	Vehicle		
Site Details			
Type:	Rooftop Guy Tower; Rooftop Attachments		
Height:	220' per the FCC antenna structure registration.		
Collocations:	Existing on tower: No	Future Rooftop Attachments: Unlimited	
Observations:	Rooftop and sides are building are used presently by multiple entities and service providers.		
Comments:	Rooftop tower is owned by Capital Community Broadcasting Ind., DBA KTOO FM & TV		

Site 35		Site Map	Site Photo
Owner:	New Cingular Wireless		
Identification:	FCC: 1265743		
Address:	740 Capitol Ave		
Latitude:	58-18-8.5 N		
Longitude:	-134-25-2.9 W		
Access:	Vehicle		
Site Details			
Type:	Monopole Tower Painted Brown		
Height:	FCC antenna structure registration indicates 50'; CBJ indicates 40'.		
Collocations:	Existing: 1 Tenant	Future: 0-1	
Observations:	FAA identification not found on tower or on tower site.		
Comments:	Low tower height will not likely support additional collocations.		

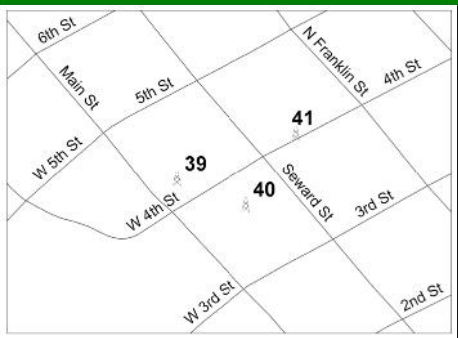
Site 36		Site Map	Site Photo
Owner:	Unknown		
Identification:	Unknown		
Address:	410 W. Willoughby Avenue		
Latitude:	58-18-3.71 N		
Longitude:	-134-24-50.4 W		
Access:	Vehicle		
Site Details			
Type:	Potential Location for a Concealed Rooftop Attachment		
Height:	Unknown		
Collocations:	None	Future: Unlimited	
Observations:	The metal tubing along side the building going up to rooftop is similar to concealment rooftop infrastructure found in Wasilla, AK.		
Comments:	This type installation would be a good use of rooftop antenna concealment.		

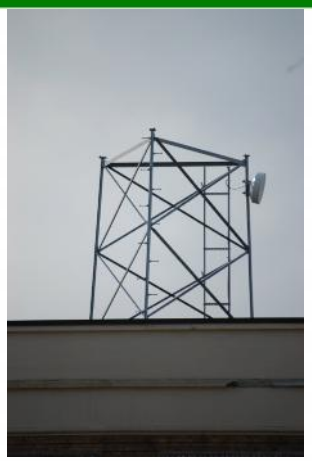
Site 37		Site Map	Site Photo
Owner:	KTOO		
Identification:	Unknown		
Address:	Egan Drive & Whittier Street Latitude:		
58-17-57.7 N Longitude:	-		
134-24-51.49 W Access:			
Vehicle			
Site Details			
Type:	Short Lattice Rooftop Tower; Rooftop Satellite Dishes		
Height:	Unknown		
Collocations:	Existing: Maybe 1 tenant	Future: 0	
Observations:	Short lattice rooftop tower (not shown in picture) appears to have 1 collocation.		
Comments:	Potential for collocation is minimal.		

Site 38		Site Map	Site Photo
Owner:	Goldbelt Hotel		
Identification:	Unknown		
Address:	51 Egan Drive		
Latitude:	58-17-59.01 N		
Longitude:	-134-24-46.31 W		
Access:	Vehicle		
Site Details			
Type:	Rooftop Attachments		
Height:	Unknown		
Collocations:	Existing: Yes, approximately 2	Future: Unlimited	
Observations:	Antenna attachments appear to be only on the parapet.		
Comments:	Rooftop could likely support a new structure on which additional attachments could be placed.		

Site 39	Site Map	Site Photo

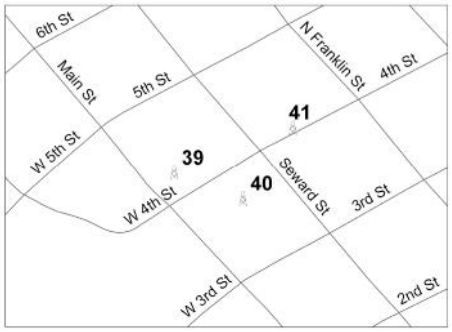
Owner:	State of Alaska	
Identification:	Unknown	
Address:	120 E. 4th Street	
Latitude:	58-18-6.12 N	
Longitude:	-134-24-38.45 W	
Access:	Vehicle	
Site Details		
Type:	Lattice Rooftop Tower with Small Dish	
Height:	Unknown	
Collocations:	Existing: No	Future: Unlimited
Observations:	A good location for future collocations.	
Comments:	The existing rooftop tower could be concealed by a faux architectural feature.	

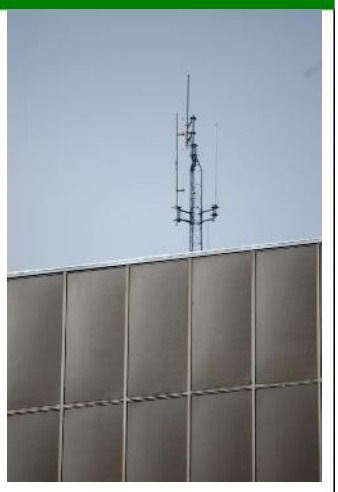


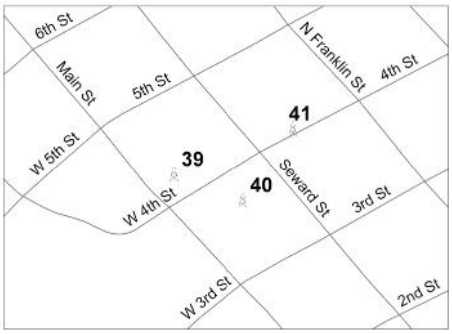
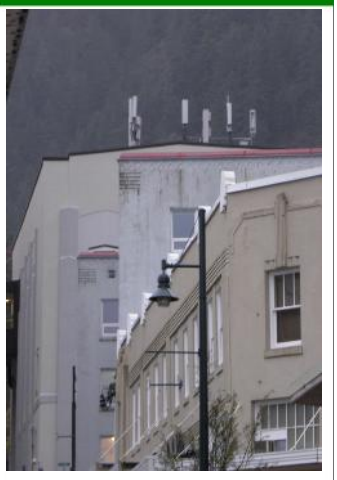


Site 40	Site Map	Site Photo

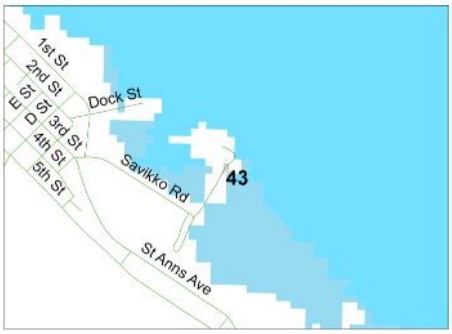
Owner:	Federal Government	
Identification:	District Courthouse	
Address:	Main Street & East 4th Street	
Latitude:	58-18-5.33 N	
Longitude:	-134-24-36.58 W	
Access:	Vehicle	
Site Details		
Type:	Guy Rooftop Mount	
Height:	Unknown	
Collocations:	Existing: No	Future: Unlimited rooftop attachments
Observations:	A good location for future collocations.	
Comments:	The existing rooftop tower could be concealed by a faux architectural feature.	

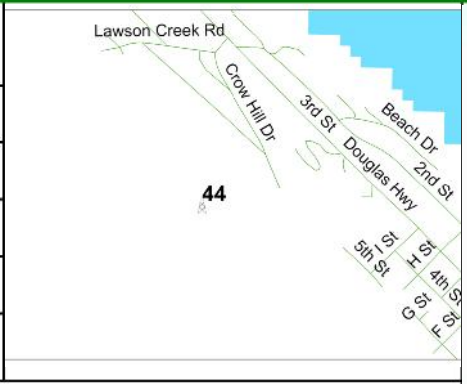
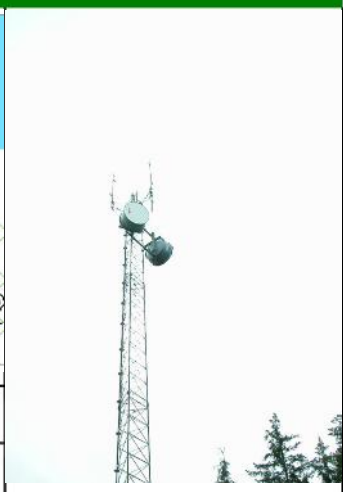


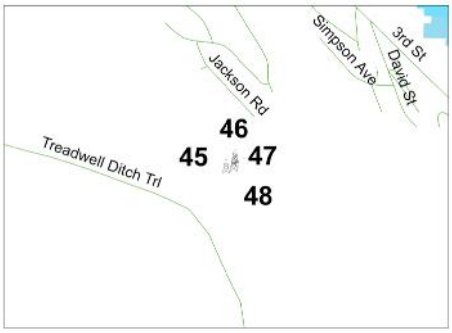


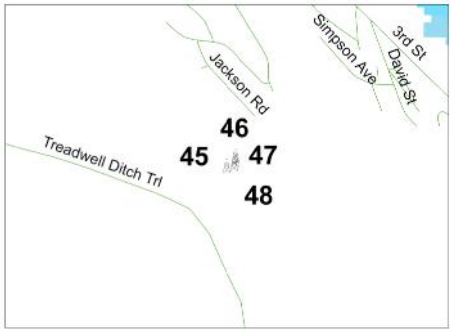
Site 41		Site Map	Site Photo
Owner:	Unknown		
Identification:	Thomas B. Stewart Legislative Building		
Address:	206 4th Street		
Latitude:	58-18-8.1 N		
Longitude:	-134-24-33.55 W		
Access:	Vehicle		
Site Details			
Type:	Rooftop Attachments		
Height:	Unknown		
Collocations:	Existing: Yes, approximately 2	Future: Unlimited	
Observations:	Antenna attachments not clearly visible for most angles of the street.		
Comments:	The existing rooftop attachments could be concealed by a faux architectural feature.		

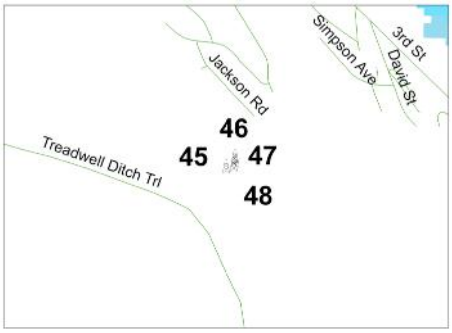
Site 42		Site Map	Site Photo
Owner:	SBA Towers III, LLC		
Identification:	FCC: 1278455		
Address:	1076 Jacobsen Drive		
Latitude:	58-17-22.2 N		
Longitude:	-134-23-40.1 W		
Access:	Vehicle		
Site Details			
Type:	Lattice Tower		
Height:	130' per the FCC antenna structure registration.		
Collocations:	Existing: No	Future: 4	
Observations:	Tower appears vacant.		
Comments:	Typically if a tower is abandoned then the local government has policies in place to require the removal of the facility. This tower is in a good location for future collocations but visually a different type and lower height would benefit the viewshed.		

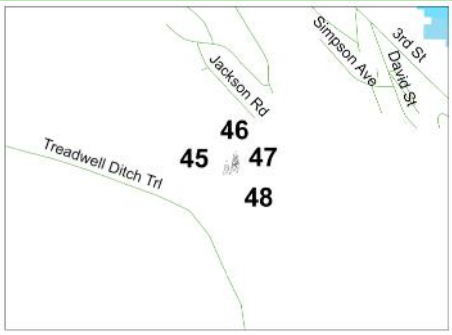
Site 43		Site Map	Site Photo
Owner:	US Coast Guard		
Identification:	Unknown		
Address:	Savikko Road		
Latitude:	58-16-31.44 N		
Longitude:	-134-23-3.91 W		
Access:	Vehicle		
Site Details			
Type:	Lattice Tower		
Height:	Unknown		
Collocations:	Existing: No	Future: 0	
Observations:	A good location for collocation but the tower would need to rebuilt.		
Comments:	The US Coast Guard may not be willing to lease space on their tower.		

Site 44		Site Map	Site Photo
Owner:	City and Borough of Juneau		
Identification:	Crow Hill		
Address:	4000 Crow Hill Drive		
Latitude:	58-16-45.95 N		
Longitude:	-134-24-29.02 W		
Access:	Vehicle		
Site Details			
Type:	Lattice Tower		
Height:	80' per the CBJ.		
Collocations:	Existing: No	Future: 2	
Observations:	CityScape Consultants, Inc. did not assess this site. The site photo was provided by the CBJ.		
Comments:	The CBJ should establish a policy for use of this tower by the wireless industry.		

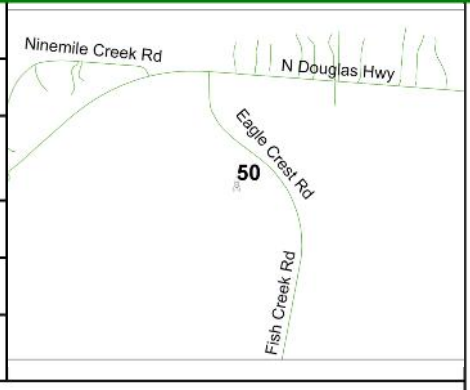
Site 45		Site Map	Site Photo
Owner:	Unknown		
Identification:	Water Reservoir		
Address:	3000 Jackson Road		
Latitude:	58-17-7.24 N		
Longitude:	-134-25-44.98 W		
Access:	Vehicle		
Site Details			
Type:	Lattice Tower		
Height:	150' per the CBJ.		
Collocations:	Existing: Yes, approximately 2	Future: 3	
Observations:	A good opportunity for collocations.		
Comments:	Tower ownership is not provided on this site. The CBJ should require nameplate ownership signage.		

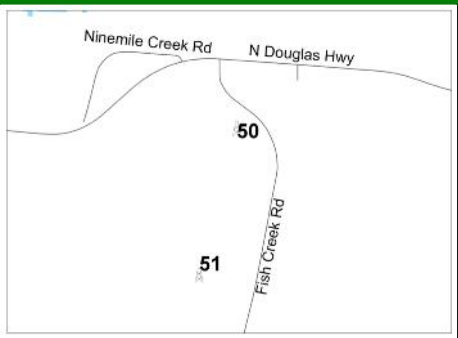
Site 46		Site Map	Site Photo
Owner:	Global Tower, LLC		
Identification:	FCC: 1282197		
Address:	3000 Jackson Road		
Latitude:	58-17-7.44 N		
Longitude:	-134-25-43.36 W		
Access:	Vehicle		
Site Details			
Type:	Lattice Tower		
Height:	185' per the FCC antenna structure registration.		
Collocations:	Existing: Yes, 2	Future: 3	
Observations:	A good location for collocations. The antenna on this tower is mounted "directionally".		
Comments:	Directionally mounted antenna on towers at a similar ground elevation may be a solution to having fewer towers in the valley.		

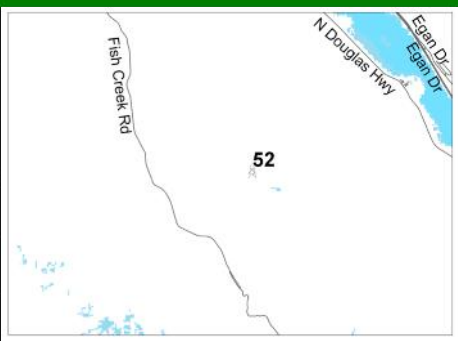
Site 47		Site Map	Site Photo
Owner:	Unknown		
Identification:	Water Reservoir		
Address:	3000 Jackson Road		
Latitude:	58-17-7.9 N		
Longitude:	-134-25-43.2 W		
Access:	Vehicle		
Site Details			
Type:	Monopole Tower		
Height:	90' per the CBJ.		
Collocations:	Existing: No	Future: 0	
Observations:	This tower could be removed provided the equipment could be mounted on one of the other existing towers within the compound.		
Comments:	CBJ policy should promote collocation over multiple towers on the same zone lot with ample space available for collocations.		

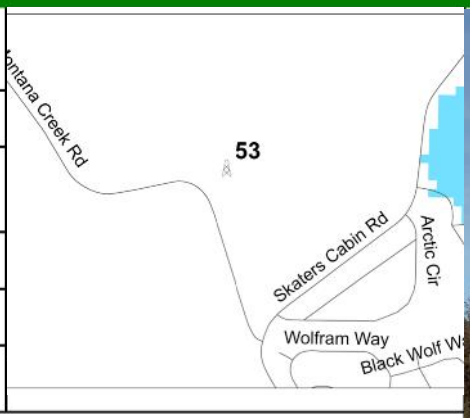
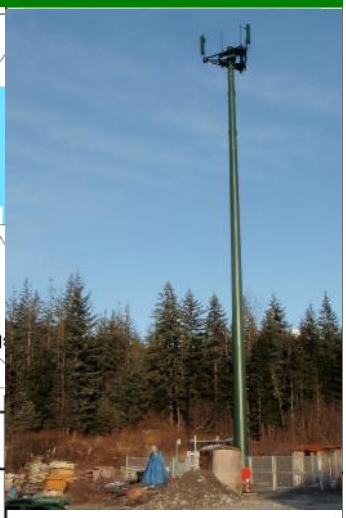
Site 48		Site Map	Site Photo
Owner:	Unknown		
Identification:	Water Reservoir		
Address:	3000 Jackson Road		
Latitude:	58.17.8 N		
Longitude:	-134-25-43 W		
Access:	Vehicle		
Site Details			
Type:	Wood Pole		
Height:	50' per the CBJ.		
Collocations:	Existing: No	Future: 0-1	
Observations:	This tower could be removed provided the equipment could be mounted on one of the other existing towers within the compound.		
Comments:	CBJ policy should promote collocation over multiple towers on the same zone lot with ample space available for collocations.		

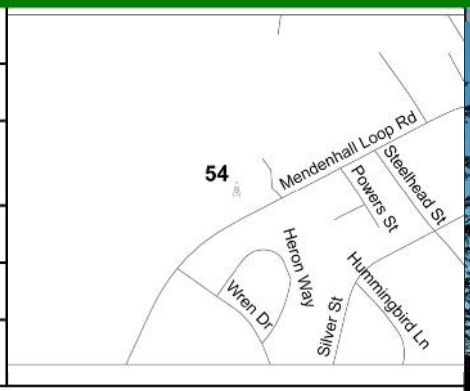
Site 49		Site Map	Site Photo
Owner:	Alaska-Juneau Communications, Inc.		
Identification:	FCC: 1028325		
Address:	North Douglas Highway		
Latitude:	58-18-4 N		
Longitude:	-134-26-32 W		
Access:	Vehicle		
Site Details			
Type:	Lattice Tower		
Height:	FCC antenna structure registration indicates height of 278'; the CBJ indicates 300'.		
Collocations:	Existing: No	Future: 5	
Observations:	The equipment within and around the tower compound needs improvement. Copper cables between the tower base and equipment shelter are in areas overgrown with vegetation.		
Comments:	Ongoing site maintenance should be required through the zoning ordinance.		

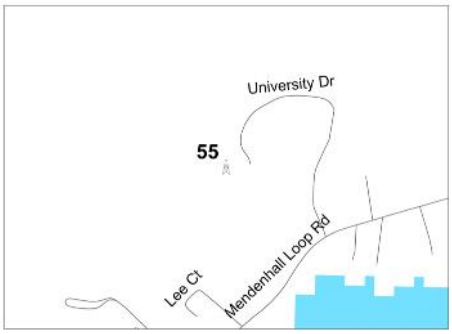
Site 50		Site Map	Site Photo
Owner:	United States		
Identification:	Unknown		
Address:	4000 Eagle Crest Road Latitude:		
58-20-12.6 N Longitude:			
134-33-43.4 W Access:			
Vehicle & Foot			
Site Details			
Type:	Guy Tower		
Height:	Unknown		
Collocations:	Existing: No	Future: 0	
Observations:	Site is nicely developed with long boardwalks to preserve ground cover.		
Comments:	Facility is used for monitoring and recording weather conditions. Collocations are unlikely.		

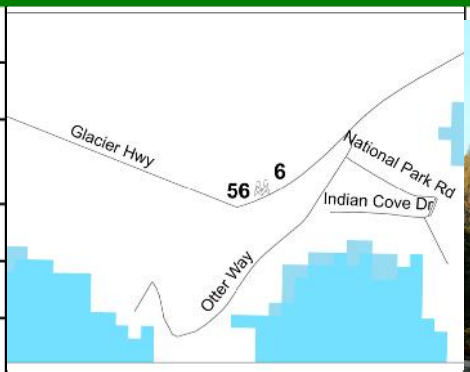
Site 51		Site Map	Site Photo
Owner:	Atlas Tower, LLC		
Identification:	FAA: 1284253		
Address:	Fish Creek Road		
Latitude:	58-19-50 N		
Longitude:	-134-33-54.9 W		
Access:	Vehicle		
Site Details			
Type:	Monopole painted green		
Height:	175' per the FAA.		
Collocations:	Existing: 1 tenant	Future: 3	
Observations:	The tower appears to be new.		
Comments:	Painted green tower appear to be visually effective in the natural setting. A light was added to this pole by the applicant at the request of local helicopter companies; this light conflicts with the issued Conditional Use permit for the facility.		

Site 52		Site Map	Site Photo
Owner:	CBJ		
Identification:	Unknown		
Address:	Saddle Mountain		
Latitude:	58-17-50.7 N		
Longitude:	-134-30-41.2 W		
Access:	Airplane		
Site Details			
Type:	Lattice Towers		
Height:	40'; 40'; and 35' per the CBJ.		
Collocations:	Existing: None	Future: 4	
Observations:	CityScape Consultants, Inc. did not assess this site. The site photo was provided by the CBJ.		
Comments:	The CBJ should establish a policy for use of this tower by the wireless industry.		

Site 53		Site Map	Site Photo
Owner:	Alaska Wireless Network		
Identification:	FCC: 1284234		
Address:	5600 Montana Creek Road		
Latitude:	58-24-51.74 N		
Longitude:	-134-36-7.59 W		
Access:	Vehicle		
Site Details			
Type:	Monopole painted green		
Height:	CBJ approved 100'; FCC approved 104' per the antenna structure registration.		
Collocations:	Existing: 1 tenant	Future: 0-2	
Observations:	CityScape Consultants, Inc. did not assess this site. The site photo was provided by the CBJ.		
Comments:	Tower built for GCI as the launch tenant. Site is also known as Coogan. Painted green tower appear to be visually effective in the natural setting.		

Site 54		Site Map	Site Photo
Owner:	Global Tower, LLC		
Identification:	FCC: 1284964		
Address:	10200 Mendenhall Loop Road		
Latitude:	58-24-13.19 N		
Longitude:	-134-36-14.46 W		
Access:	Vehicle		
Site Details			
Type:	Monopole		
Height:	CBJ approved 119'; FCC approved 130' per the antenna structure registration.		
Collocations:	Existing: 1 tenant	Future: 0-4	
Observations:	CityScape Consultants, Inc. did not assess this site. The site photo was provided by the CBJ.		
Comments:	Tower built for Verizon as the launch tenant. Site is also known as Mendenhall Glacier.		

Site 55		Site Map	Site Photo
Owner:	AT&T Towers		
Identification:	FCC: 1286087		
Address:	4300 University Drive		
Latitude:	58-23-36.59 N		
Longitude:	-134-38-25.59 W		
Access:	Vehicle		
Site Details			
Type:	Monopole		
Height:	CBJ approved 100'; FCC approved 110' per the FCC antenna structure registration.		
Collocations:	Existing: 1 tenant	Future: 0-1	
Observations:	CityScape Consultants, Inc. did not assess this site. The site photo was provided by the CBJ.		
Comments:	Site is also known as Auke Bay.		

Site 56		Site Map	Site Photo
Owner:	Cellco Partnership		
Identification:	FCC: 1285072		
Address:	14080 Glacier Highway		
Latitude:	58-22-43.32 N		
Longitude:	-134-42-21.24 W		
Access:	Vehicle		
Site Details			
Type:	Painted Monopole		
Height:	CBJ approved 100'; FCC approved 69' per the FCC antenna structure registration.		
Collocations:	Existing: 1 tenant	Future: 0-2	
Observations:	CityScape Consultants, Inc. did not assess this site. The site photo was provided by the CBJ.		
Comments:	Tower built for Verizon as the launch tenant. Site is also known as Auke Bay Alt #3. The tower at site 6 which is 100' should have accommodated this collocation.		

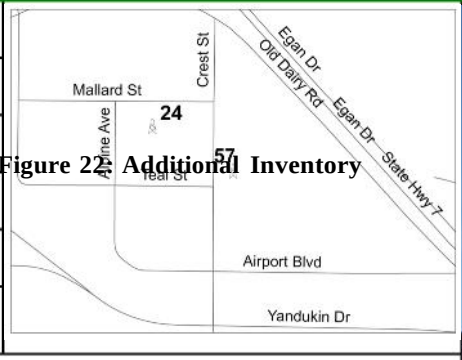
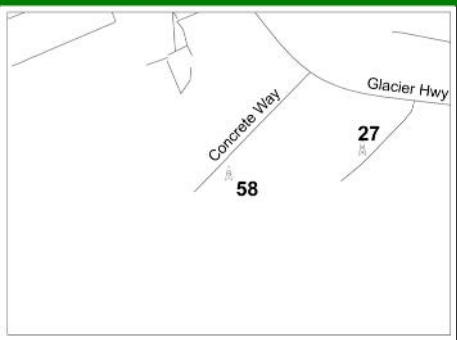
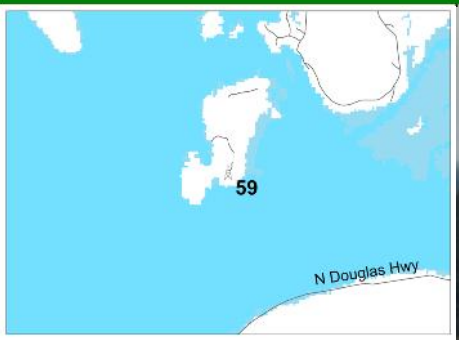
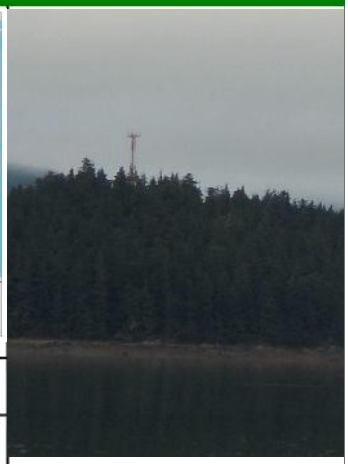
Site 57		Site Map	Site Photo
Owner:	Global Tower, LLC		
Identification:	FCC: 1236722		
Address:	Crest Street		
Latitude:	58-21-38.75 N		
Longitude:	-134-34-24.41 W		
Access:	Vehicle		
Site Details			
Type:	Lattice Tower		
Height:	CBJ approved 100'; FCC approved 70' per the FCC antenna structure registration		
Collocations:	Existing: 1 tenant	Future: 0-2	
Observations:	CityScape Consultants, Inc. did not assess this site. The site photo was provided by the CBJ.		
Comments:	Tower built for Verizon as the launch tenant. Had site 24 (70') been modified or constructed originally 15' - 20' taller then this site (#57) would not have been necessary.		

Figure 22. Additional Inventory

Site 58		Site Map	Site Photo
Owner:	Atlas Tower USA		
Identification:	FCC: 1284968		
Address:	5753 Concrete Way		
Latitude:	58-21-16.36 N		
Longitude:	-134-30-3.06 W		
Access:	Vehicle		
Site Details			
Type:	Lattice Towers		
Height:	CBJ approved 130'; FCC approved 135' per the FCC antenna structure registration.		
Collocations:	Existing: 1 tenant	Future: 0-3	
Observations:	CityScape Consultants, Inc. did not assess this site. The site photo was provided by the CBJ.		
Comments:	Tower built for Verizon as the launch tenant. Site also known as Lemon Creek. Had site 27 (70') been modified or constructed originally 15' - 20' taller then this site (#58) would not have been necessary.		

Site 59		Site Map	Site Photo
Owner:	Atlas Tower USA		
Identification:	FCC: 1287767		
Address:	Unknown		
Latitude:	58-20-2.32 N		
Longitude:	-134-39-34.46 W		
Access:	Vehicle		
Site Details			
Type:	Lattice Tower		
Height:	155' per CBJ and the FCC antenna structure registration.		
Collocations:	Existing: 1 tenant	Future: 0-4	
Observations:	CityScape Consultants, Inc. did not assess this site. The site photo was provided by the CBJ.		
Comments:	Tower built for Verizon as the launch tenant.		

Site 60		Site Map	Site Photo
Owner:	AT&T		
Identification:	FCC: 1288896		
Address:	3000 Fish Creek Road		
Latitude:	58-16-36.01 N		
Longitude:	-134-31-0.88 W		
Access:	Vehicle		
Site Details			
Type:	Wood Pole		
Height:	50' per the CBJ and the FCC antenna structure registration		
Collocations:	Existing: 1 tenant	Future: 0-1	
Observations:	CityScape Consultants, Inc. did not assess this site. The site photo was provided by the CBJ.		
Comments:	Given the low height if this tower is it not likely to support any additional collocations.		

Appendix A

SEC. 704. FACILITIES SITING; RADIO FREQUENCY EMISSION STANDARDS.

(a) NATIONAL WIRELESS TELECOMMUNICATIONS SITING POLICY- Section 332(c) (47 U.S.C. 332(c)) is amended by adding at the end the following new paragraph:

`(7) PRESERVATION OF LOCAL ZONING AUTHORITY-

`(A) GENERAL AUTHORITY- Except as provided in this paragraph, nothing in this Act shall limit or affect the authority of a State or local government or instrumentality thereof over decisions regarding the placement, construction, and modification of personal wireless service facilities.

`(B) LIMITATIONS-

`(i) The regulation of the placement, construction, and modification of personal wireless service facilities by any State or local government or instrumentality thereof--

`(I) shall not unreasonably discriminate among providers of functionally equivalent services; and

`(II) shall not prohibit or have the effect of prohibiting the provision of personal wireless services.

`(ii) A State or local government or instrumentality thereof shall act on any request for authorization to place, construct, or modify personal wireless service facilities within a reasonable period of time after the request is duly filed with such government or instrumentality, taking into account the nature and scope of such request.

`(iii) Any decision by a State or local government or place, construct, or modify personal wireless service facilities shall be in writing and supported by substantial evidence contained in a written record.

`(iv) No State or local government or instrumentality thereof may regulate the placement, construction, and modification of personal wireless service facilities on the basis of the environmental effects of radio frequency emissions to the extent that such facilities comply with the Commission's regulations concerning such emissions.

`(v) Any person adversely affected by any final action or failure to act by a State or local government or any instrumentality thereof that is inconsistent with this subparagraph may, within 30 days after such action or failure to act, commence an action in any7 court of competent jurisdiction. The court shall hear and decide such action on an expedited basis. Any

person adversely affected by an act or failure to act by a State or local government or any instrumentality thereof that is inconsistent with clause (iv) may petition the Commission for relief.

`(C) DEFINITIONS- For purposes of this paragraph--

`(i) the term `personal wireless services' means commercial mobile services, unlicensed wireless services, and common carrier wireless exchange access services;

`(ii) the term `personal wireless service facilities' means facilities for the provision of personal wireless services; and

`(iii) the term `unlicensed wireless service' means the offering of telecommunications services using duly authorized devices which do not require individual licenses, but does not mean the provision of direct-to-home satellite services (as defined in section 303(v)).'.

(b) RADIO FREQUENCY EMISSIONS- Within 180 days after the enactment of this Act, the Commission shall complete action in ET Docket 93-62 to prescribe and make effective rules regarding the environmental effects of radio frequency emissions.

(c) AVAILABILITY OF PROPERTY- Within 180 days of the enactment of this Act, the President or his designee shall prescribe procedures by which Federal departments and agencies may make available on a fair, nondiscriminatory basis, property, rights-of-way, and easements under their control for the placement of new telecommunications services that are dependent, in whole or in part, upon the utilization of Federal spectrum rights for the transmission or reception of such services. These procedures may establish a presumption that requests for the use of property, rights-of-way, and easements by duly authorized providers should be granted absent unavoidable direct conflict with the department or agency's mission, or the current or planned use of the property, rights-of-way, and easements in question. Reasonable fees may be charged to providers of such telecommunications services for use of property, rights-of-way, and easements. The Commission shall provide technical support to States to encourage them to make property, rights-of-way, and easements under their jurisdiction available for such purposes.