September 2017

Small Cell Infrastructure in Denver

The City and County of Denver is receiving growing numbers of requests from wireless providers and wireless infrastructure companies to construct small cell facilities in the public right of way.

What are Small Cell facilities?

- Small Cell facilities are low-powered antennas that provide cellular and data coverage to smaller geographic areas, supplementing the larger cellular network.
- Small Cell equipment is proposed to be located on poles, wires, or buildings.
- Small Cell equipment is allowed in the public right of way per Federal and State Law just like other utilities.
- Small Cell equipment will initially meet current 4G (LTE) voice and data demands, but we understand it may be modified with future 5G higher speed equipment as technology changes.

What is the role of Denver Public Works related to Small Cell infrastructure?

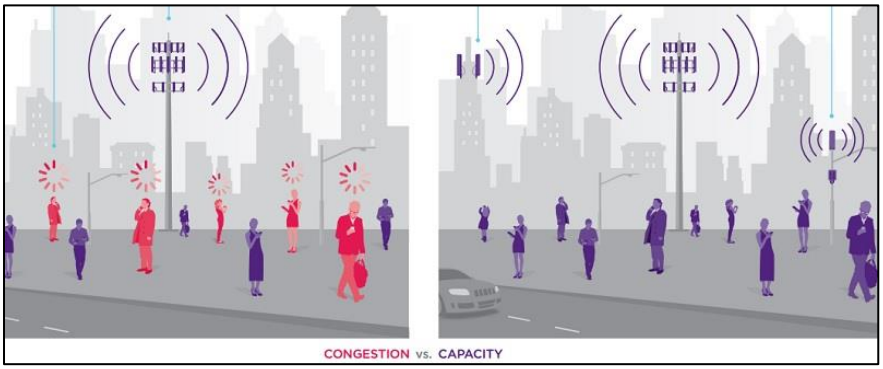
- Denver Public Works reviews applications for Small Cell equipment in the public right of way.
- Requests for Small Cell equipment on new freestanding poles are processed as Encroachment Permits. State law requires the City to process applications in batches (currently 10 poles or less per application), and in 90 days or less.
- Denver Public Works is working with each proposing carrier to standardize the physical and aesthetic appearance of equipment as much as possible.
- Denver Public Works is having success requesting that applicants limit the height of new freestanding poles to less than 35 feet, similar to existing street lighting in the public right of way.
- Denver Public Works is encouraging co-location of new equipment onto existing poles and infrastructure in the public right of way wherever possible.

Small Cell Infrastructure is coming to Denver

Here's the current state of Small Cell technology, as we understand it from the wireless carrier industry.

1. Why are we seeing a surge in interest to install wireless infrastructure?

Researchers say mobile data traffic in North America has grown significantly, and is projected to continue increasing at a rapid rate with the proliferation of mobile devices. In our City there has been a surge in population and economic growth, and wireless carrier companies are indicating that existing infrastructure is becoming congested and cannot continue to meet the demands of their customers.



Source: Crown Castle

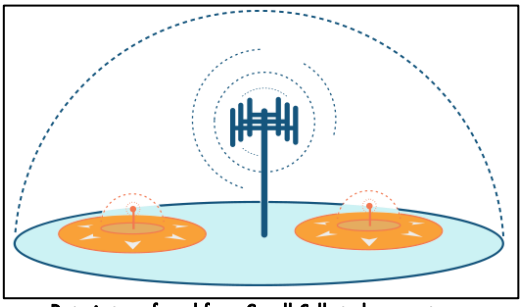
2. What type of infrastructure is proposed?

Wireless carrier companies have indicated that until recently, wireless phone service in general has been managed using large antennas mounted on towers located on both public and private property. Those antennas serve relatively large areas, or "cells" up to several miles away. Carriers have explained to the City that existing cell sites are already becoming congested and that installing more cell towers covering large areas will not keep up with projected demand for high speed wireless data that is growing rapidly.

Typical large cellular antenna.

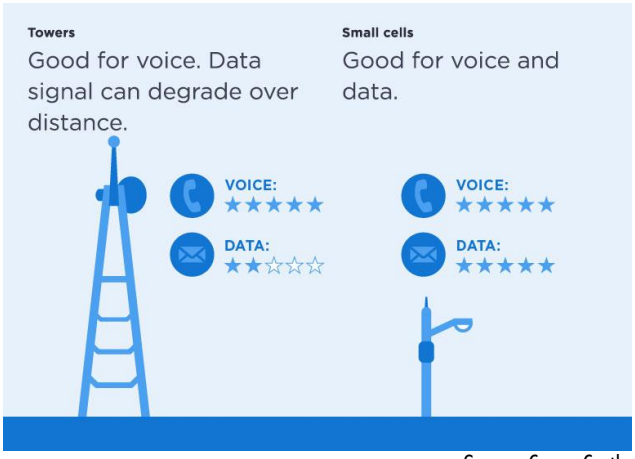
Credit: Joe Ravi via Wikimedia Commons

To meet demands for wireless data, carriers have begun using new lower-powered antenna technology to "offload" data traffic from the larger cell towers. Each of these smaller antennas serves a much smaller area (1-2 blocks) but with much higher data volumes. This type of wireless infrastructure is referred to as "Small Cell."



Data is transferred from Small Cells to large antenna

Source: Qualcomm Technology



Source: Crown Castle

Small Cell antenna equipment is typically the size of a suitcase and must be under 20 cubic feet in total volume according to State law. The types of equipment and method of deployment being proposed in Denver will vary widely and depend upon the network needs and technology requirements of the various wireless carriers. Typical antenna locations are expected to be:

- Mounted onto existing utility or street lighting poles.
- Placed onto new freestanding poles erected in the public right of way.
- Strung on wires between existing poles.
- Mounted onto existing buildings on public and private property.

Source: (1)

Source: (2)

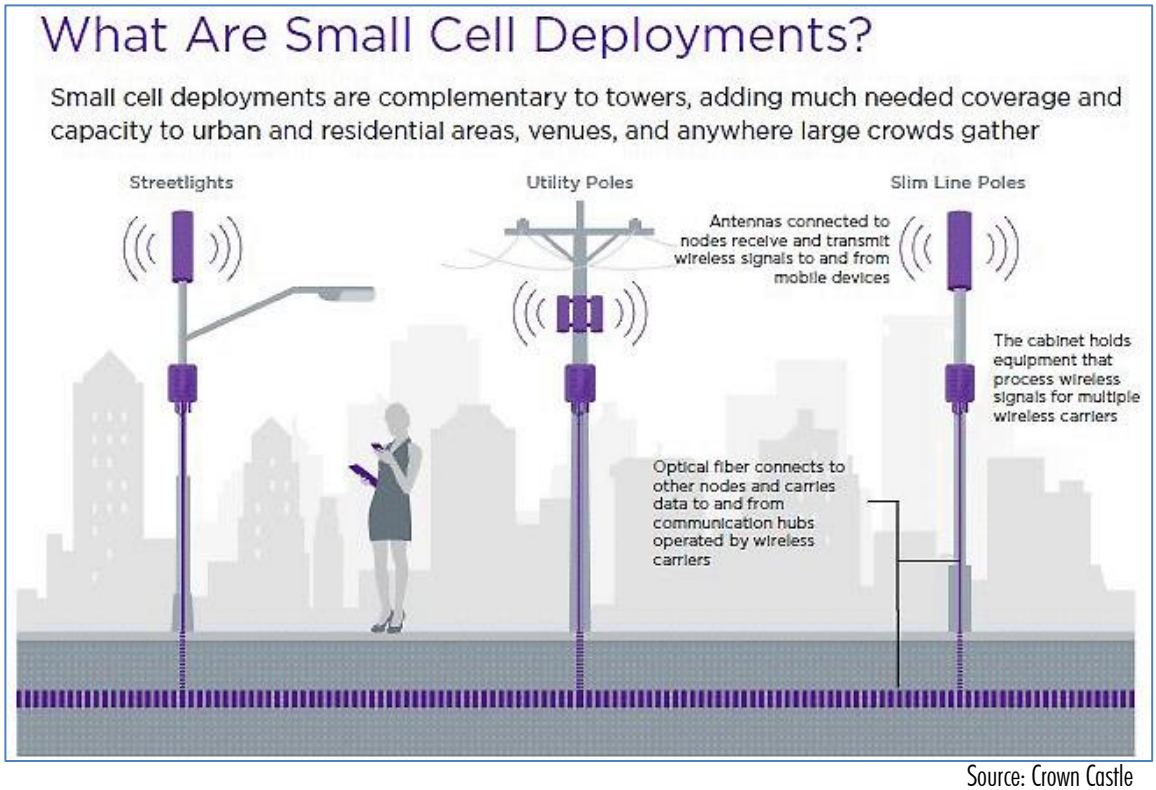
Source: (3)

There are an estimated 60,000 plus Small Cell units already operating nationwide. Requests for Small Cell antenna installations in the City of Denver are expected to rise in the coming months as wireless companies work to meet the increasing wireless data demands of their customers. We understand hundreds, if not thousands, of additional Small Cell antennas may be proposed in Denver by cellular carrier companies.

It appears that most new infrastructure being proposed today is servicing current 4G ("4th Generation") cellular and data needs, also known as "LTE". However, wireless carriers are already preparing plans for imminent 5G ("5th Generation") wireless networks, expected to service even higher speed data from densely placed antennas.

3. Types of Applicants

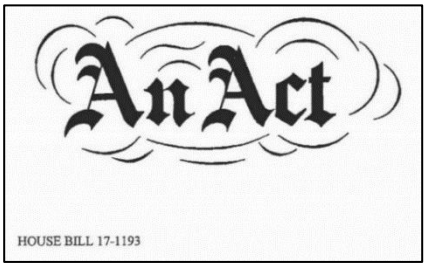
Denver has learned that the companies that intend to build Small Cell infrastructure follow different business models. Some companies will construct their own infrastructure to service wireless demand from their own customers (AT&T and Verizon Wireless, for example). Other companies will construct wireless infrastructure and then lease or sell service to wireless providers that do not wish to construct and own their own equipment (Crown Castle for T-Mobile, and Mobilitie for Sprint, for example).



Source: Crown Castle

Photo Sources: (1) scientists4wiredtech.com; (2) steelintheair.com; (3) wade4wireless.com

4. Federal and State Law on Small Cell Infrastructure



Wireless infrastructure is subject to the parameters of Federal Communications Commission (FCC) and State law. In addition to FCC requirements surrounding wireless radio placement and transmissions, the State of Colorado recently approved a new law in March of 2017 that establishes that wireless providers have the legal right to locate Small Cell equipment in the public rights of way of Colorado.

The new State law is specific that municipalities may not entirely deny or discriminate against Small Cell infrastructure, treating the equipment in the same way as other permitted users of the right of way. However, Denver still maintains the authority to regulate new Small Cell equipment based on public health, safety, and welfare, and deny or require change to proposals that conflict with other uses of the public right of way or are otherwise unlawful.

Immediately following the passage of the State House Bill, the City experienced interest from multiple companies (see last page of this handout) and has received numerous applications for Small Cell equipment in the public right of way.

5. Why can't Small Cell equipment just be placed on current poles?

Source: Verizon Wireless

Of note, the City and County of Denver does not own or maintain most existing street lighting, utility, or traffic signal poles in the public right of way. The majority of these current poles are owned and maintained by Xcel Energy or other utility companies.

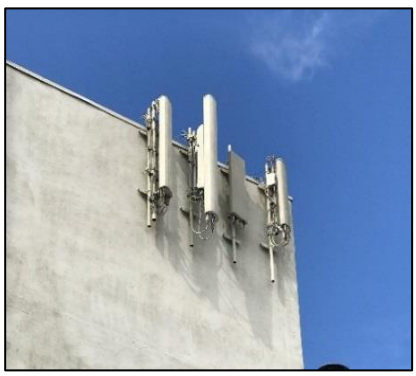
For years, Xcel and other utility companies have allowed the mounting of cellular equipment onto utility poles, and there are many existing examples throughout Denver. These locations are preferred for wireless networks as they are already standing, are of adequate height for antennas, and have electrical power nearby. However, space on utility poles is scarce, and becoming increasingly eliminated as poles are removed when unsightly overhead lines are relocated underground.

Just recently, Xcel Energy announced its intention to allow companies to attach (or "co-locate") Small Cell equipment onto existing street light poles in Denver. There are over 52,000 such poles throughout the City; however, it is unknown how many could possibly support additional equipment or be replaced with a pole/ light combination. The City understands that it each company must reach final agreement with Xcel Energy for co-locating, then work with Xcel to review and approve individual pole locations. Some street light locations that are not capable of accepting new equipment may be removed and replaced with a combination street light/ antenna pole.

Source: rcwireless.com

Xcel Energy also owns and maintains most of the traffic signal poles in Denver (typically located at street intersections). The City of Denver has an exclusive agreement with Xcel Energy to locate signal, emergency response, and other municipal equipment (cameras, etc.) on traffic signal poles. The City is carefully evaluating whether it will be possible to allow additional wireless infrastructure on these poles without conflicting with current traffic or safety equipment.

6. Why can't cellular infrastructure be located on private property?



A quick glance around most parts of Denver will reveal many cellular antennas already located on private property. However, because of the complexities and length of time to create agreements with individual property owners, many companies have disclosed to the City that it is not feasible to deploy Small Cell equipment in this manner and still meet current data demands.

If and when a company identifies a good location for mounting Small Cell equipment on private property, it will be regulated by the City's Community Planning and Development Division using requirements of the current Denver Zoning Code. The Zoning Code includes parameters for height, size, placement, etc. on private property to preserve the intent and character of the zoning district. Zoning Code requirements do not apply in public right of way.

7. Why can't cellular infrastructure be combined onto one pole?

For now, the City understands that the siting of Small Cell antennas is dictated by the wireless provider and its customer's needs, terrain, and radio frequency modeling results. Each wireless provider has different objectives and may not need the same locations. Each carrier, who owns rights to a spectrum of operating frequency, states that some separation with competing antennas is necessary to avoid signal interference.

With that said, the City understands that Small Cell technology is evolving rapidly towards the ability to share antennas or even poles between multiple carriers. The City is exploring all options and is encouraging pilot programs that demonstrate how the equipment for multiple carriers can be combined into a single pole, with the long-term goal of minimizing the amount of new infrastructure placed in the public right of way.

8. How is the City handling Small Cell infrastructure proposed in the public right of way?

The City is currently reviewing all new pole applications in conjunction with Federal and State law, as well as Denver Rules and Ordinances. Denver Public Works is the responsible entity for permitting any infrastructure, object, or construction in the public right of way of Denver.

Public Works currently performs careful consultation with top executive and program management staff from each wireless provider about proposed infrastructure programs before the provider is allowed to submit any applications for approval. This ensures that each provider approaches the City in a consistent manner, and that the City's current policies and permitting procedures are well known at the outset.

Per State law, the City must allow each company to propose their infrastructure in the public right of way. Additionally, the City must offer permitting procedures that can process "bulk" Small Cell programs in batches, in 90 days or less, rather than requiring individual permits for each pole or antenna.

In response to these requirements, Public Works has established a plan review and permitting program that combines existing Utility Plan Review and Encroachment Permitting into one contiguous process. Each applicant may submit batches of 10 or fewer unique poles or pieces of ground-mounted equipment per application. Each application will result in a revocable Encroachment Permit.

This batch permitting system ensures that each Small Cell application follows the same procedures and standards as any other user of the public right of way, while minimizing City processing and administration labor.

Each Encroachment Permit requires a complete and public-facing plan review process. The City Public Works Department logs each application for review by internal and external stakeholders (such as utility companies, etc.), special Districts, and known neighborhood groups using an electronic plan review website. The City has created procedures that will also ensure the applicant has notified adjacent property owners at each proposed pole location during this process.

Any comments received from the plan review process are accepted and must be addressed by the applicant. Comments that are deemed to have technical merit (identifying unlawful or conflicting proposed infrastructure) are required to be fully resolved by the applicant.

If an Encroachment Permit is issued, the associated batch of new poles is approved to proceed to Right of Way Construction Permitting.

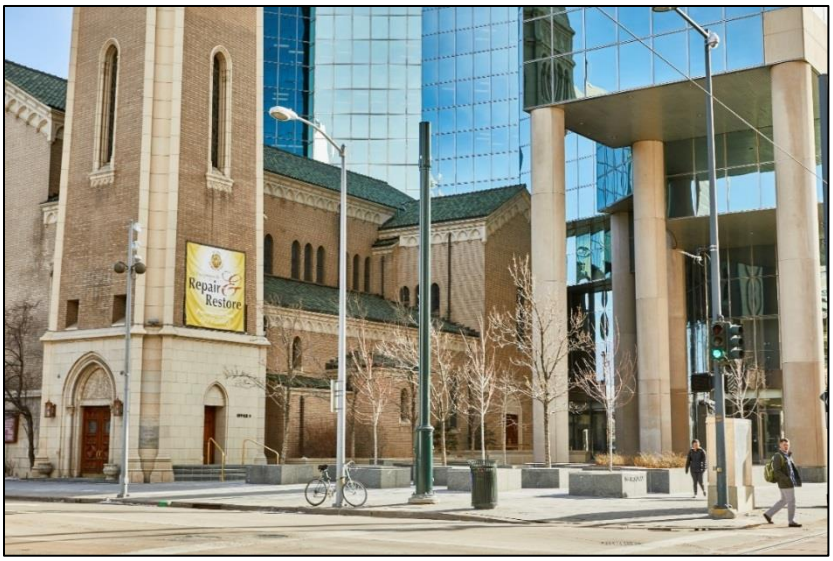
Of note, the very first Encroachment Permit for ground-mounted Small Cell equipment by any Company requires approval by City Council. Additionally, each pole or piece of ground-mounted equipment approved by an Encroachment Permit requires a $200 annual fee, and every Permit is revocable by the City under specified circumstances.

9. Can the City limit or standardize Small Cell infrastructure?

As mentioned above, the City is currently exploring its policies and ordinances for Small Cell infrastructure within the parameters of Federal and State law. Under current law, it is not clear how the City can restrict height, design, or location (unless conflicting) of Small Cell infrastructure. However, as the City as a whole considers new polices and rulemaking, the City Public Works Department is having success in coordinating expectations and recommendations through enhanced communication efforts at the outset of each company's program. So far each applicant has been receptive to:

- Considering standardizing pole design elements, color, location, etc. to meet intent and character of existing infrastructure in the public right of way.
- Limiting pole heights to match existing street lighting and other poles in the public right of way.
- Generally avoiding placing poles adjacent to parks and historical places.
- Encouraging pole and equipment designs that enclose as much equipment as possible to minimize visual impact.
- Co-locating equipment onto existing infrastructure wherever feasible.
- Installing consistent infrastructure that does not discriminate based on neighborhood type, demographic, or character.
- Exploring new concepts in combining equipment from multiple companies into single poles.

Public Works has placed top priortiy in coodinating design elements for proposed Small Cell infrastructure, and how companies should maximize aesthetics while minimizing congestion of the public right of way. Below are several examples of new Small Cell equipment recently constructed in Denver.



10. Who can I contact?

The City and County of Denver strongly encourages direct communication with the specific wireless provider or company who is installing specific equipment. City and County of Denver staff is also available to discuss processing and policy related questions. The following list of contacts that have approached the City so far is provided for your convenience:

NAME	EMAIL ADDRESS	AFFILIATION
Denver Public Works Regulatory: Jon Reynolds Denver Public Works Communications & Marketing:	denver.pwera@denvergov.org pw.comms@denvergov.org	DENVER PUBLIC WORKS
Verizon Wireless Debbie Essert	Debbie.Essert@verizonwireless.com	verizon
Mobilitie (currently servicing Sprint): Jennifer Johnson	Jennifer.Johnson@mobilitie.com	mobilitie telecommunications infrastructure Sprint
Crown Castle (currently servicing T-Mobile): Scott Harry	Scott.Harry@crowncastle.com	CROWN CASTLE T-Mobile
Zayo Group: Alec Geist	Alec.Geist@zayo.com	zayo GROUP
AT&T Wireless: Liz Walker	Liz.Walker@wirelesspolicy.com	at&t
Xcel Energy Facility Attachments: Tom Breuckman	Tom.Breuckman@xcelenergy.com	Xcel Energy