PRINCE GEORGE'S COUNTY
JACK B. JOHNSON
COUNTY EXECUTIVE

TTFCC

Telecommunications Transmission Facility Coordinating Committee

2008 Report to the County Executive and the County Council

COVER PHOTO

The cover photo shows a monopole located at 5621 Sargent Road in Chillum as it was first constructed. Originally, that structure was designed to minimize its visual impact by supporting just three flush-mounted antennas, as can be seen in the photo on the left below. As coverage needs expanded, however, other carriers attached antennas—and this slender, "stealth" monopole today appears much more like the typical monopole, with triangular antenna arrays that present a more noticeable structure on the horizon. Applications for additional antennas at this site have been reviewed and recommended by the TTFCC to meet the objective for co-location on existing structures, but the efforts to minimize the structure's appearance have been overcome by service needs.

The monopole shown on the left is as it was first constructed. The photo in the middle shows the monopole as it appears today, as seen from the rear of the building, and the photo on the right shows the current view from the front of the Save-A-Lot store.

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1. Introduction

Prince George's County created the Telecommunications Transmission Facility Coordinating Committee (TTFCC) in 2000 to encourage co-location of telecommunications facilities on existing structures and minimize the adverse impact of these structures on the community.

This TTFCC Annual Report is to inform the Prince George's County Executive, the County Council, and the general public of the TTFCC's activities during 2008. The report summarizes the nature of applications reviewed by the TTFCC, expected antenna siting activities in 2009, and recommendations for furthering the TTFCC's role in managing the deployment of wireless services in the County.

2. Executive Summary

Wireless carriers filed 237 TTFCC applications in 2008. Only 3 percent were to construct new support structures. Of the rest, 70 percent were for co-locating new antennas on existing structures and 30 percent were for making minor modifications to, adding to, or replacing existing antennas. Most of these applications (approximately 72 percent) were for placing antennas in residential and commercial zones. Looking at the data another way, 70 percent of the applications were filed to place antennas in areas outside the Beltway, averaging approximately 15 percent each in Council Districts 1, 4, 5, 6, and 9. Other districts had fewer applications. Applications for antenna sitings were filed primarily by two carriers, Cricket and Sprint/XOHM; they accounted for approximately 60 percent of all applications.

In 2008, the TTFCC continued, through the application review process, to encourage co-location of antennas on existing structures; verify the technical need for new towers; and minimize the visual impact of new towers, monopoles, and antennas in the community. It also suggested improvements to the TTFCC application review process itself.

Also in 2008, the County Council adopted changes recommended by the TTFCC in their 2007 Report, to amend the County code to establish a procedure for placement of temporary wireless towers in the community, and to establish new categories of fees for TTFCC applications. The changes increased the existing fee structure to cover a greater portion of the County's costs for review of proposals to site antenna facilities.

The TTFCC recommends the following additional actions to further improve the overall antenna siting review and coordination process:

1. Clarify the Zoning Ordinance limits on antenna heights above ground level.

2. Consider use of chimneys for antenna attachment.

3. Require developer participation in planning for placement of wireless facilities in community projects.

4. Actively encourage the use of County, M-NCPPC, WSSC and the Board of Education facilities for co-locations and new support structures

3. The TTFCC Membership

The County Code specifies that the TTFCC must consist of the following representatives:

- The Director of the Department of Environmental Resources, or the Director's designee
- The Maryland-National Capital Park and Planning Commission (M-NCPPC) Planning Director, or the Director's designee
- The Superintendent of Schools, or the Superintendent's designee
- The Director of the Information Technology Division, Office of Management (presently the Office of Information Technology and Communications), or the Director's designee
- A Telecommunications Transmission Facility Coordinator appointed by the County Executive.

The current TTFCC members are:

TTFCC Chair

- Stan Wildesen, Special Assistant, Department of Environmental Resources

TTFCC Vice-Chair

- Clarence Moseley, Permits Supervisor, Permits Information and Management Section, Department of Environmental Resources

TTFCC Members

- Nate Archey, Cable/I-Net Administrator, Office of Information Technology and Communications
- Debbie Gallagher, Supervisor, Permit Review Division, Development Review Division, Maryland-National Capital Park and Planning Commission
- Lawrence Fryer, Chief of Supporting Services, Office of the Superintendent of Schools
- Leslie Jackson-Jenkins, Associate Director, Office of Central Services
- Frank Porter, Committee Director, Prince George's County Council
- Paivi Spoon, Special Assistant to the Deputy Chief Administrative Officer, Office of the County Executive
- Brian Winterwerp, Supervisor, Office of Engineering, Department of Public Works and Transportation

Office of Law

- Edwin Raynor, Esq., Associate County Attorney

TTFCC Facility Coordinators

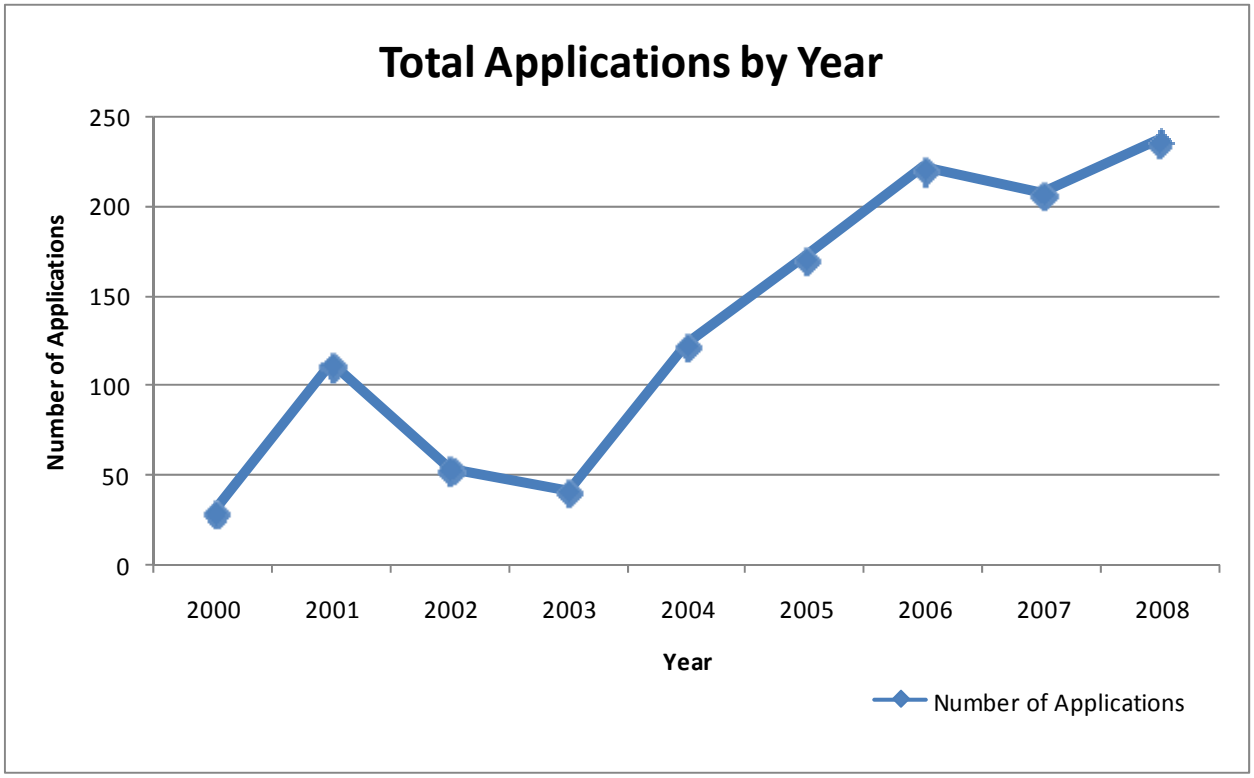
- Robert Hunnicutt, Principal Analyst, Columbia Telecommunications Corporation
- Shivani Gandhi, Senior Engineer, Columbia Telecommunications Corporation

4. Summary of 2008 TTFCC Activities

Application Activity Summary

Since its inception in 2000, the TTFCC has reviewed a total of 1,191 applications. The TTFCC reviewed 237 applications in 2008. As Chart 1 shows, the number of applications generally continues to increase. In 2009 we expect to see many applications from carriers that want to replace older antennas with new ones so they can deploy advanced services for their customers.

Chart 1: Number of Applications Received (by Year)



Co-location of New Antennas

The primary objective of the TTFCC as stated in the County Code is to "promote the appropriate and efficient location and co-location of telecommunications transmission facilities to minimize adverse impacts on other land uses in the County." The TTFCC encourages co-location on existing structures wherever possible in lieu of constructing new towers or monopoles in the County.

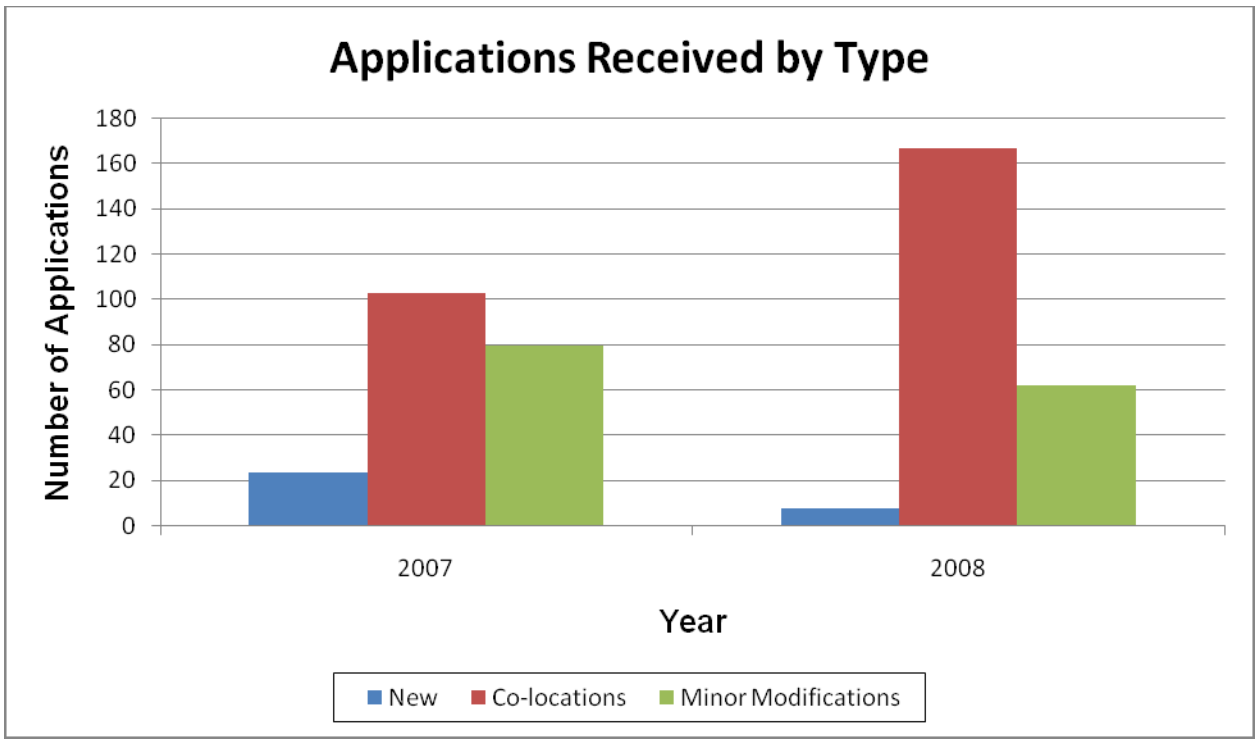
This is accomplished, in part, by a search of the TTFCC's database of locations where antennas are currently placed and a site visit to the area where a new monopole or tower is proposed. During this process, the Facility Coordinator identifies potential alternative existing structures—and applicants are asked to document why their antennas cannot be placed on those support structures in lieu of constructing a new monopole.

Applications to co-locate antennas on existing structures accounted for 70 percent of the applications received in 2008—a significant increase over the 52 percent of co-location

applications in 2007. Two main factors contributed to the increase in co-location antennas. First, a new wireless service provider in the County, Cricket, submitted 92 applications to co-locate their antennas on existing structures. Second, a new subsidiary of Sprint, XOHM, filed 59 co-location applications to add microwave dish antennas to existing Sprint antenna sites. The XOHM antennas were to provide additional capacity to handle the increased data traffic resulting from the new services available through the carrier's greater frequency bandwidths. Many of the other co-location applications were to upgrade existing sites to enable advanced high-speed data services such as Internet access and video.

Chart 2 illustrates the number of applications that were reviewed for co-location compared to applications to construct new towers. The number of applications for new towers appears to have been fairly constant over the past several years until calendar year 2008.

Chart 2: Applications Received by Type



Of the 237 applications reviewed by the TTFCC in 2008, recommendations for 27 applications were conditioned on the carrier addressing concerns expressed by the TTFCC. Conditions included:

- Requirements for the carrier to apply for modifications to a Special Exception shown for the property proposed for siting antennas (12 applications)
- Submission of a structural analysis to document that the antenna placement could be safely completed (eight applications)
- Requirements to bring a facility into compliance with the zoning ordinance for screening of the equipment area (seven applications)

Minimize Community Impact of New Facilities

The TTFCC is also required to "evaluate the aesthetic effects of locating multiple telecommunications transmission facilities in a single location or on a single structure" and "recommend alternative sites and techniques where appropriate to mitigate the visual impact of the proposed and alternative site."

In 2008 only six applications, or 3 percent, were for new towers or monopoles—ten percent of the new support structures in 2007, when there were 24 applications for new support structures. Four of those were proposed for construction on residentially zoned property, one on commercial land, and one in a comprehensive design zone. One of the new towers is a collapsible design that will be raised and lowered only for testing new antennas manufactured by ARA, a business in the county that designs and sells wireless antennas. Another of the new towers is a County-owned tower to be used for public safety communications. One of the applications for a new tower was withdrawn before the TTFCC reviewed it.

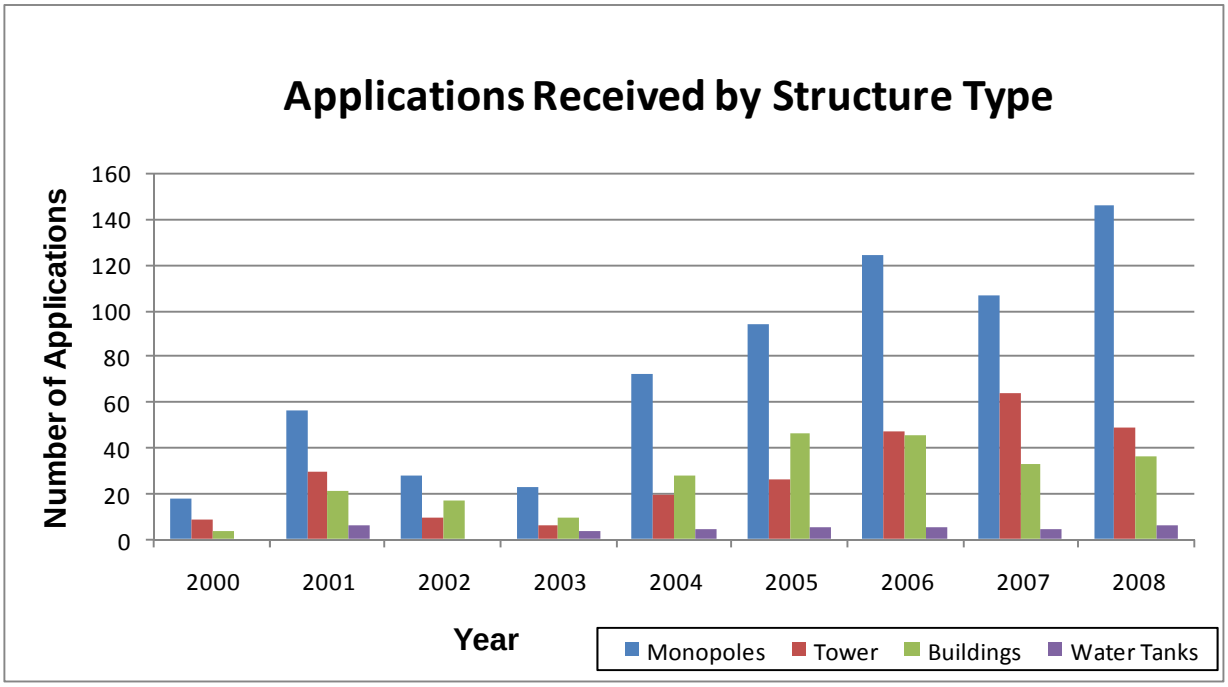
The TTFCC encourages concealment or disguise of antennas when possible. These so-called "stealth" antennas enable deployment of services with minimal visual impact to the community. The chimney in Photo 1 below is an example of a stealth antenna site; the enlarged extension atop the chimney encloses antennas at the Victoria Crossing apartment complex on New Hampshire Avenue in Langley Park.

Photo 1: Victoria Crossing

Support Structure Types

The TTFCC receives applications for new support structures (monopole or tower) and co-locations (e.g., adding a new antenna to an existing structure such as a monopole, tower, building, WSSC water tank, or BGE or PEPCO electric transmission line towers). Chart 3 shows the applications received each year by structure type.

Chart 3: Applications by Structure Type



At some locations, monopoles have reached their space limits or structural capacities for supporting additional antennas. In some instances, structural modifications were proposed to accommodate the weight and wind loading of additional antennas and related cabling. In other cases, additional space was created by pole-mounting antennas above an existing monopole. (This practice is permitted in the zoning ordinance as long as the new antennas are no more than 15 feet above the top of the monopole.)

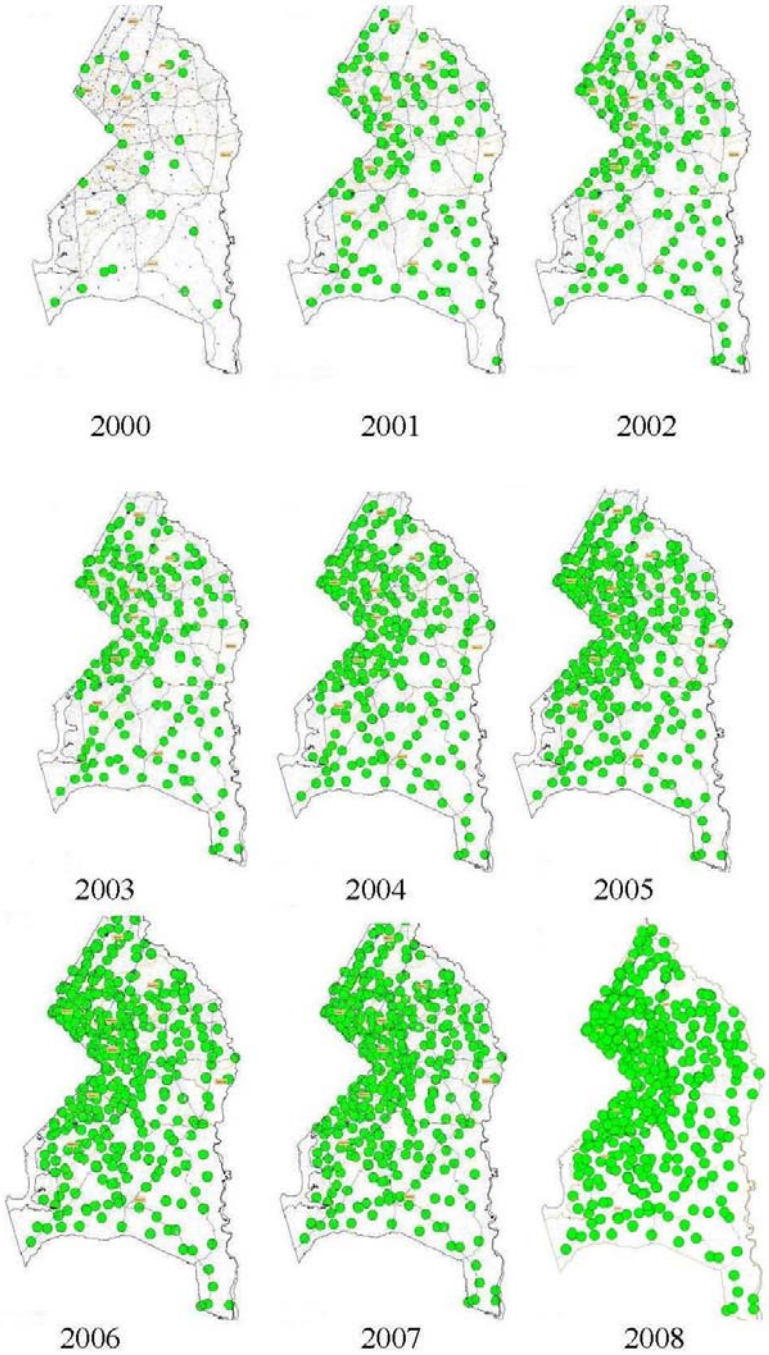
Table 1 below shows the number of applications that the TTFCC has reviewed since its inception to add antennas to a tower or monopole. Though we have not tracked this statistic in the past, we will use it as a baseline for future reports to highlight how existing towers are filling up—a situation that may contribute to the need for additional new structures to be constructed in areas where existing monopoles or towers cannot be used because of structural or physical space issues.

Table 1: Towers or Monopoles with Multiple Carriers Antennas

Number of Monopoles/Towers with Multiple Carriers Attached		
Number of Carriers	Monopoles	Towers
2	30	23
3	25	10
4	33	5
5	13	3
6	13	2
7	1	1

The illustrations below show the locations where the TTFCC has reviewed applications to place antennas. Most applications in earlier years were for locations inside the Beltway; as carriers met the coverage needs of more populated areas, sites in rural areas along main travel corridors began to expand.

Figure 1: Locations of Sites for Antennas Based on Applications Reviewed by the TTFCC (Cumulative by Year)



5. Public Participation

The TTFCC is charged with facilitating public participation in the telecommunications transmission facility siting process. As part of its review process, the TTFCC verifies that an applicant has properly met the requirements of providing notice of a proposed new tower or monopole to the nearby residential property owners. In 2007, the County Code was amended to expand carrier requirements for community notice to include sending letters to all community associations within one mile of the proposed location for a new support structure and a notice to the Council Member in whose district the structure would be constructed. The TTFCC holds applications for review until all public notice requirements have been met.

Additionally, an annual Master Plan of actual and proposed telecommunications facilities is prepared by the Facility Coordinator based on updated antenna locations planned for construction for the succeeding two years provided by each of the carriers annually. The plan is submitted to the County Council for their approval and adopted each October. Once the Plan is approved it is available for public review. The plan is a map showing target areas where new antennas may be sited in the community. Where there are no existing structures to which the carriers could potentially place new antennas, the carrier may seek approval for a new tower or monopole in the community. The Plan is intended to alert residents in those areas of the possibility of new antennas or a new support structure.

The Office of Information Technology and Communications maintains a TTFCC website (http://www.goprincegeorgescounty.com/Government/BoardsCommissions/ttfcc.asp) which provides information about the TTFCC and the application process, downloadable application forms, excerpts from related County Code and zoning regulations, the Telecommunications Master Plan, and contact information for interested parties who may have questions or comments.

TTFCC meetings are held on the third Wednesday of each month. Applications are due by the last Wednesday of the month in order to be considered for review at the next month's meeting. The meetings are held in Room 4085 of the County Administration Building in Upper Marlboro and are open to the public, pursuant to the Open Meetings Act.

Prior to action by the TTFCC, the Facility Coordinator makes recommendations based on a review of the technical and aesthetic aspects of the application and its level of compliance with the County zoning ordinance.

2008 Legislative Initiatives

In 2008 the TTFCC recommended changes to application fees and other amendments to the code to improve the overall review process. The recommendations resulted in CB-67-2008 which was enacted by the County Council on November 18, 2008 and signed by the County Executive on November 24, 2008. As a result of the bill, TTFCC application fees increased effective January 12, 2009. In addition, CB-67-2008 amended Subtitle 5A of the County Code to delete similar, now-obsolete provisions:

- Add or modify definitions to clarify the meanings of technical words used to define the operations of the TTFCC.

- Delete definitions and obsolete sections related to the Telecommunications Franchise Law.

- Clarify the responsibilities of the TTFCC, the Coordinator, and the Chair.

Application fees created by the bill are summarized below. The increased fees are expected to cover approximately $260,000 in annual expenditures anticipated for future TTFCC work.

The new fees are:

$2,500	TTFCC application for a new tower, monopole, or support structure
$1,500	TTFCC application for a co-location
$500	TTFCC application for a minor modification
$250	Modification or revision to a TTFCC application
$500	Annual Master Plan update

Prior to adoption of the new fees, applicants were charged $500 for a new tower or monopole request and $250 to co-locate antennas on existing structures. Because the review of a minor modification application usually does not take as much time as a full application review, a lower fee for those minor modification applications was created. Also, a new fee was established for review of corrected applications; in 2008, the number of applications that had to be re-reviewed because of incorrect or incomplete information increased significantly. Fees to recover costs for review and updating the TTFCC database and preparation of the Master Plan for approval by the County Council were implemented as well.

Other administrative changes that were part of the legislation include:

- Setting a date for submittal of the Annual Report to the County Executive and County Council (by May 1 of each year)
- Extending the period from 30 days to 60 days for the County Council to review and submit comments on the TTFCC Master Plan
- Establishing an expiration date of one (1) year for an approved TTFCC application, and requiring reapplication upon expiration
- Establishing a process for an expedited administrative review and approval of applications for minor modifications to existing facilities
- Providing a mechanism for carriers to place portable temporary cell towers when needed to maintain continuous coverage, as in the case of existing facility outages or for special coverage needs such as large public events. These temporary facilities are known as a Cell on Wheels, or “COW”
- Establish a position of TTFCC Vice-Chair to lead the TTFCC in the absence of the Chair

6. Administration of the Antenna Siting Review Process

6.1 Revenues

For the 2008 calendar year, the County received $60,250 in filing fees for applications to the TTFCC. Expenditures for Facility Coordinator work amounted to $232,899 for 2008. The new fees did not impact revenues in calendar year 2008.

6.2 The TTFCC Database

The Facility Coordinator maintains a database of all applications submitted for review by the TTFCC and a database of existing and proposed future sitings, as provided by the carriers in their annual plans. To protect the security of the specific facility location information, the application database is available by request from interested parties on an as-required basis with limits on the data provided. Updates of the database are provided to the Office of Information Technology and Communications for use by public safety agencies as part of the enhanced 911 services that locate cell phone callers in emergency situations.

6.3 The Application Process

The TTFCC, in cooperation with the applicants, made further improvements to the application process in 2008. These changes were provided via two advisory "Bulletins" issued to all known interested parties by the Chair of the TTFCC, and posted on the TTFCC website. The Bulletins explained improvements to the application forms and provided a copy of a radio frequency study prepared by the Facility Coordinator. Changes to the forms expanded the applications that may be submitted on a "Short Form" for expedited processing of minor changes to existing antenna sites. In 2008, the TTFCC received 59 applications (25% of the total) to replace existing antennas or add new or different models through the expedited process.

Based on the annual plans for existing and future sites provided by the carriers in 2008, there are plans to locate antennas at 141 additional antenna sites in the County over the course of 2008 and 2009—a 45% decrease over planned sites as provided in the 2007 annual plans. Current and changing market and economic conditions or increased competition may impact the deployment of services for new entrants to the local area marketplace.

6.4 Application Processing Time

On average, in 2008 the processing time for an application from the date it was initially received until the date it was acted upon by the TTFCC was 46 days, an increase of 24% over the average processing time in 2007—but well within the 60-day goal to act on a completed application. This increase is attributable to the high number of incomplete applications that had to be corrected and resubmitted before they could be reviewed by the TTFCC. Hopefully, the new fee for a resubmitted application will encourage applicants to more thoroughly review their applications before submitting them. For the four new tower applications that were acted upon by the TTFCC (of the six total, one was pending at the end of the year and another was ultimately withdrawn by the applicant), the average processing time was just 37 days.

6.5 Statistical Update

The following statistics are provided as an update to the information provided in last year's report.

The graph in Chart 4 shows the number of applications for each zoning category. The vast majority of new structures have been placed in residential zones as carriers seek to improve coverage to subscriber homes. In residential zones, the zoning ordinance permits new telecommunications structures up to 100 feet in height.

Chart 4: New Structures by Zoning Category

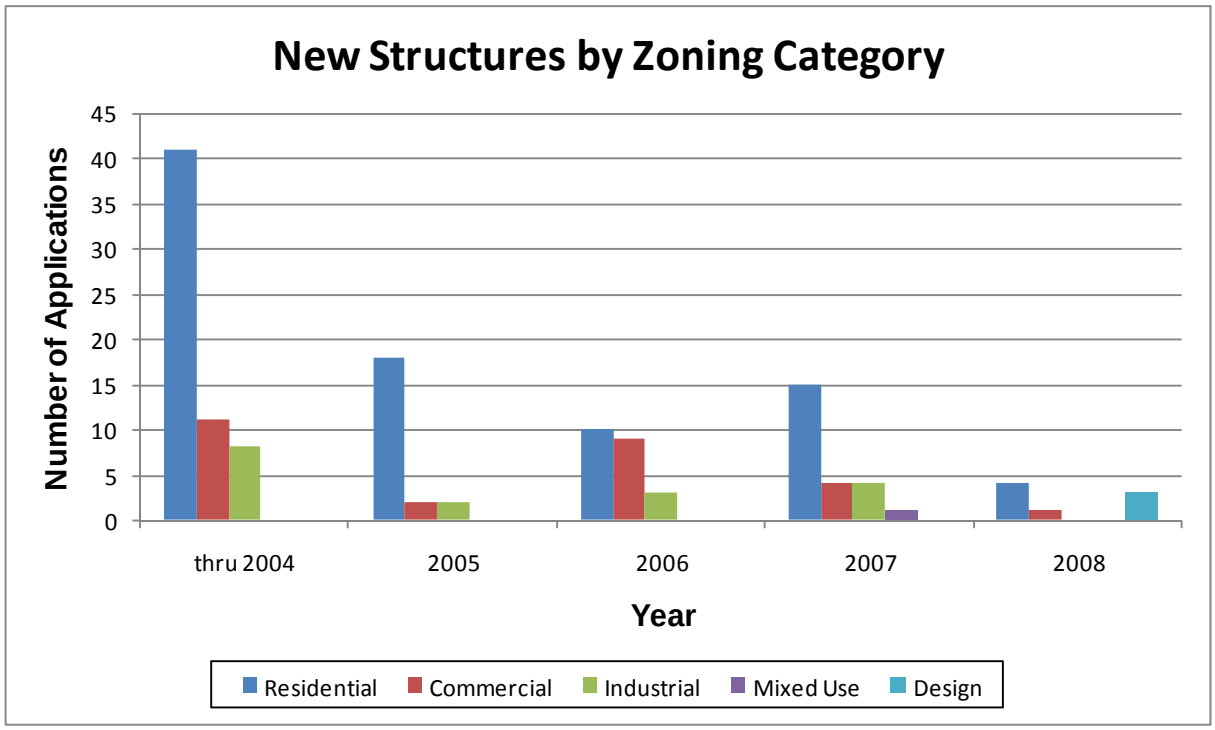


Table 2 provides information regarding new structures by Council District.

Table 2: New Structures by Council District

Council District	2008 Applications for New Structures	2000 to 2007 Applications for New Structures	Special Exceptions
1	2	8	1
2	0	7	0
3	1	9	0
4	1	20	0
5	1	24	1
6	0	15	0
7	1	8	0
8	0	11	0
9	0	30	2
Total	**6**	**132**	**4**

Table 3 reports the number of applications for facilities on public or institutionally owned property since the TTFCC's inception in 2000. Because there are some sites with multiple carriers at the same location, the total number of sites may be lower than the number shown for applications.

Table 3: Facilities Sited in the County

Number of Sites on Public Property	2008 Applications	Total Applications	2008 New Structures	Total New Structures	Total Sites
PEPCO	21	138	0	0	78
WSSC	5	42	0	5	17
Municipal	14	37	1	10	12
M-NCPPC	6	29	1	13	15
WMATA	1	3	0	1	1
BG&E	2	14	0	1	5
Prince George's County	3	24	1	7	14
P.G. Community College	1	9	0	1	1
University of Maryland	0	2	0	0	1
Volunteer Fire Dept.	8	27	0	4	10
Total Public Property Sites	**61**	**325**	**3**	**42**	**154**
Private Property	168	784	3	72	257
Church/Religious Org. Property	8	82	0	18	33
Total	**237**	**1,191**	**6**	**132**	**444**

The increasing number of cell phone users and competition for customers, along with the need for additional antennas at sites, has resulted in antennas from multiple carriers at some sites. Table 4 illustrates the increase in 2007 of the number of sites with antennas from multiple carriers.

Table 4: Number of Sites with Multiple Attachments

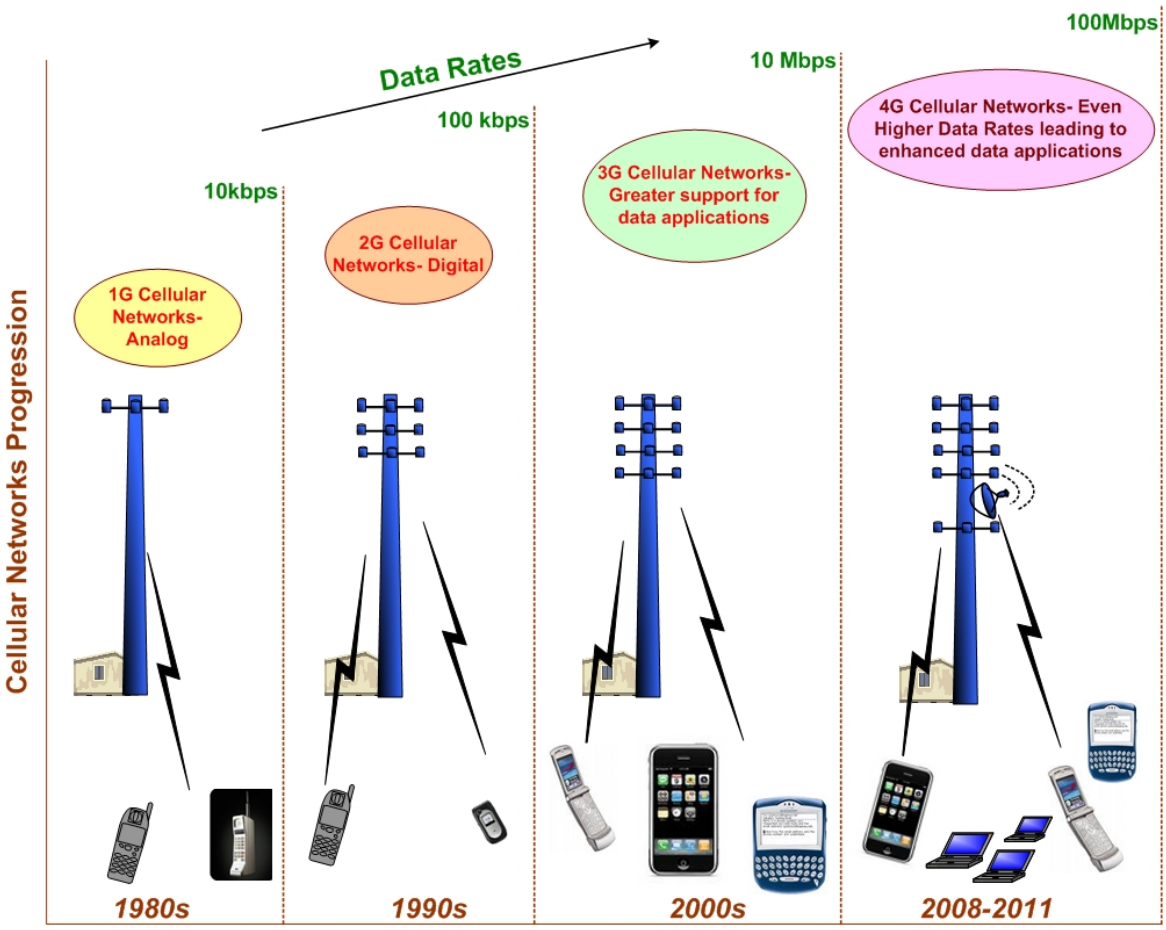
Number of Carriers with Antennas at the Site	2004	2005	2006	2007	2008
2	37	64	70	71	74
3	17	35	40	48	49
4	1	8	38	37	47
5	0	2	12	12	20
6	-	-	2	1	36
7	-	-	-	-	2

7. Recent Industry Activity and Its Impact on the TTFCC

As discussed above, changes in the wireless industry last year have resulted in changes to the types of applications being submitted to the TTFCC. This is largely due to the fact that the nature of the services supported by cellular carriers is no longer restricted to voice communications alone. Today, a cell phone is viewed as a device that can also provide access to the Internet, e-mail, photos, music, wireless television channels, and even movies. The demand for these services necessitates greater transmission speeds to quickly transfer the large amounts of data associated with them—to ensure that, for example, e-mail is downloaded in seconds as opposed to minutes. To meet that demand, data transmission speeds have grown over the past decade from kilobits per second (kbps) to megabits per second (Mbps).

Figure 2 illustrates the advances in wireless performance as each successive generation of technology enables reliably high speeds for games, e-mail, Internet access, television channels, and movies—all accessible from a mobile phone, BlackBerry, or other wireless device.

Figure 2: Advances in Wireless Performance



Applications in 2009/2010 for New or Modified Tower Facilities

Based on the annual plans filed by each carrier for the upcoming 12-month period, we can expect that there may be 200 or more applications filed in 2009, depending on the state of the economy

and the carriers' business plans for the market in our area. If additional service providers enter the market, that number could double. Potential new providers include MediaFLO, a wireless video programmer; TerreStar, an integrated satellite and terrestrial communications network; and Clearwire, a new venture that will use additional frequency bands recently issued by the FCC for wireless services. Because these new market entrants do not currently occupy space on existing towers, and because, as noted above, many of the existing support facilities are at or are reaching their capacity, the new carriers may need to construct new monopoles or towers.

Additionally, current carriers such as AT&T, Verizon, and T-Mobile—which have occupied the PCS and/or Cellular frequency bands for many years—have now acquired additional spectrum in the 700 MHz and AWS bands and may seek to either place new antennas on their existing towers or replace their current antennas with "dual band" antennas, which are capable of operating on both the old and new frequencies. As these carriers begin to deploy their new spectrum holdings in the County, they will have to file applications for new and/or modified antenna facilities.

Attached in Appendix A is a technology report explaining the changes in the wireless industry and wireless service in the County since the 1980s. It includes specific, in-depth information about frequency bands, the FCC's auctions, carrier activity, and advances in technology.

8. Recommendations to Improve the Wireless Antenna Siting Process in the County

In the spirit of the County Executive's Livable Communities Initiative, the TTFCC proposes the following changes to the zoning ordinance to further minimize the adverse impact of antennas and support structures in residential communities and on scenic roadways in the County.

1. Clarify the Zoning Ordinance Limits on Antenna Heights Above Ground Level.

The present zoning ordinance permits mounting antennas up to 15 feet above the height of a support structure, but limits monopole heights to a maximum height. Periodically, the TTFCC has reviewed applications for new monopoles to be constructed with antennas that extend above the maximum height limit for a monopole. In our opinion, this practice circumvents the height limit for the monopole imposed by the Code and increases the impact of the facility in the community. In the view of the TTFCC, an attachment 15 feet above the structure height has the same impact as increasing the overall height of the structure. The TTFCC members believe that the two Code sections regarding height limits should be read together so that extensions on existing support structures may be permitted, but only to the extent that the overall height of the facility does not exceed the height limits of a telecommunications tower for the zone. We believe it is in the County's interest to make the Code language clear on that point. Because the vast majority of the monopoles in the County are on residentially zoned property (see Chart 4 in previous section of this report) as presently permitted in the Code, establishing such a limit will minimize any further impact of an existing monopole or tower.

Proposed action: The TTFCC will draft legislation to clarify the limits on antenna heights above ground level.

2. Consider Use of Chimneys for Antenna Attachment.

The TTFCC has reviewed applications to attach antennas to an existing stand-alone chimney at an apartment complex. The present zoning ordinance does not permit attachment to chimneys unless the chimney is attached to a building. We believe that the use of chimneys that are structurally capable of supporting a number of antennas should be permitted, as long as the antennas are designed to be flush mounted and painted to match the surface of the structure to which they are attached, and the equipment area is screened to meet existing Code requirements. This option may add many new locations for siting antennas with minimal impact to the community.

Proposed Action: The TTFCC will draft legislation to allow the use of stand-alone chimneys for antenna attachments.

3. Require Developer Participation in Planning for Placement of Wireless Facilities in Community Projects.

We suggest that it may also be prudent for developers of large residential projects to be required to submit for County approval a plan that addresses how the developer proposes to facilitate the deployment of wireless services in and around its development. Set-aside areas for screened or disguised equipment compounds, underground conduit for distributed antenna system cabling, and structures within which antennas may be concealed (such as street lights or a clock tower at a proposed community center) could eliminate the need for a more visually intrusive facility to provide needed wireless services.

Although this is important for residentially zoned areas, it could also be useful for commercial and industrial projects where there will undoubtedly be a need for future wireless services. A planned approach to providing antenna supports may preclude the need for additional towers visible from County shopping areas, roadways, and adjacent residential areas, which will aid in making for a more "livable community."

Proposed Action: The TTFCC will draft legislation to require developer participation in the planning for placement of wireless facilities in and around proposed developments.

4. Actively Encourage the use of County, M-NCPPC, WSSC and the Board of Education Facilities for Co-locations and New Support Structures

As noted in the report, the successful deployment of wireless services in the County means that there is a continuing and growing demand for antennas near residential areas, because carriers need to improve signal levels inside dwellings. Additionally, more—and sometimes larger—antennas are being added to existing antenna arrays to deploy advanced 3G and 4G services. And there are new carriers seeking to provide services in this market.

Existing structures are filling up. In some cases, additional antennas would exceed a monopole's structural capacity unless the monopole receives structural modifications.

Building new towers to meet this demand, however, may have a potentially negative effect on the County's residential neighborhoods. So in the interest of continuing to provide new services to the community and a more competitive market for consumers, the TTFCC strives to

encourage the carriers to be creative in antenna and support structure design to diminish the impact of new towers in the community. Toward that end, the TTFCC also encourages all the agencies to consider allowing wireless facilities to be attached the agencies' buildings or allow the construction of new support structures in areas with minimum visual impact.

The TTFCC also encourages the Board of Education to consider allowing wireless facilities to be attached to existing or replacement stadium light structures at high school athletic stadiums—all of which are in or near residential neighborhoods. Using stadium light structures for antenna deployment would offer potential benefits to the community and the schools. Because adding antennas to the high-mast lighting may require only minimal modifications, nearby residents may not notice any difference in appearance—and the new antennas would, in theory, provide expanded service to their homes. Additionally, the use of school facilities for private wireless services may offer new sources of revenue to help offset the County's recent budget shortfalls.

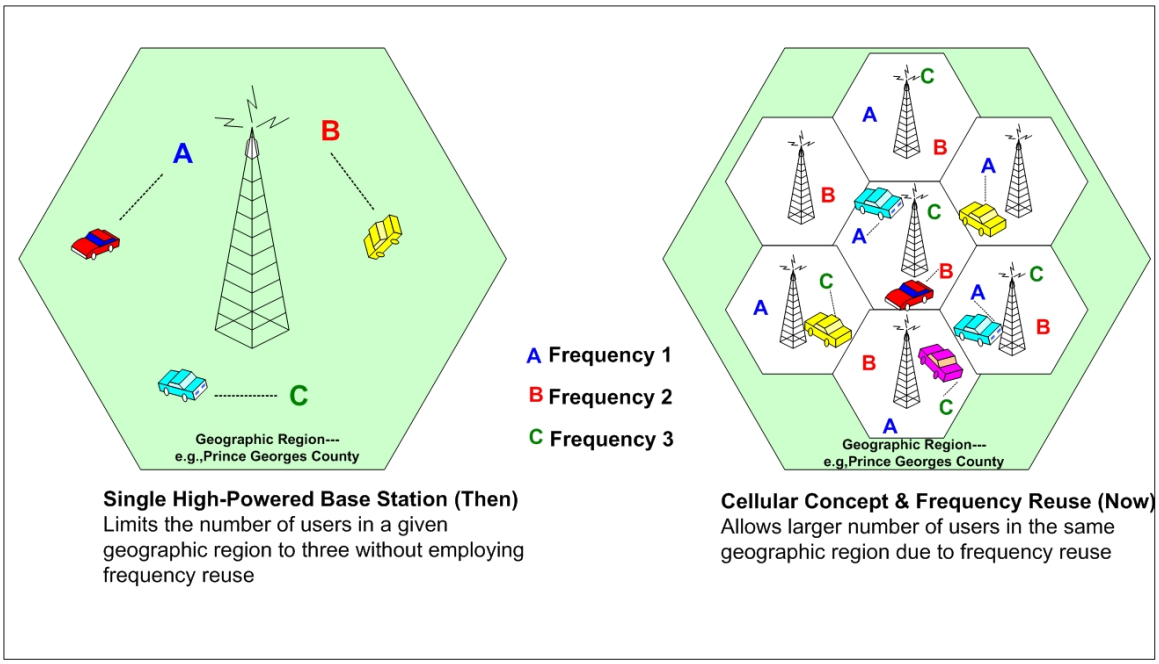
Proposed Action: The TTFCC proposes to work and agency representatives to craft a draft policy for presentation to their Boards and/or Directors.

APPENDIX A

Wireless Technologies, Then and Now

In the 1980s the Federal Communications Commission (FCC) established the Cellular Radiotelephone Service in the 800 megahertz (MHz) frequency band. The service was configured to operate using many low-powered base stations, with each station designed to provide coverage to a small service area a few miles in diameter. When placing a call within the service area, or "cell," a mobile phone user was assigned a frequency by the base station. When the user left the cell, that frequency was freed up for the next caller to use, and the original user moved to another frequency in a neighboring cell. This operating scheme, which is illustrated in Figure 1, was a much more efficient way of utilizing radio frequency spectrum than the systems used by other mobile radio services at the time, such as the dispatch radio systems used by taxicab companies, delivery services, etc. Such systems employed a single, high-powered radio station to cover a very large area; once a frequency was assigned to a particular user, it could not be used by anyone else for hundreds of square miles. The cellular concept was quite different, and it revolutionized the world of radio communications.

Figure 1: Concept of a Cellular Network



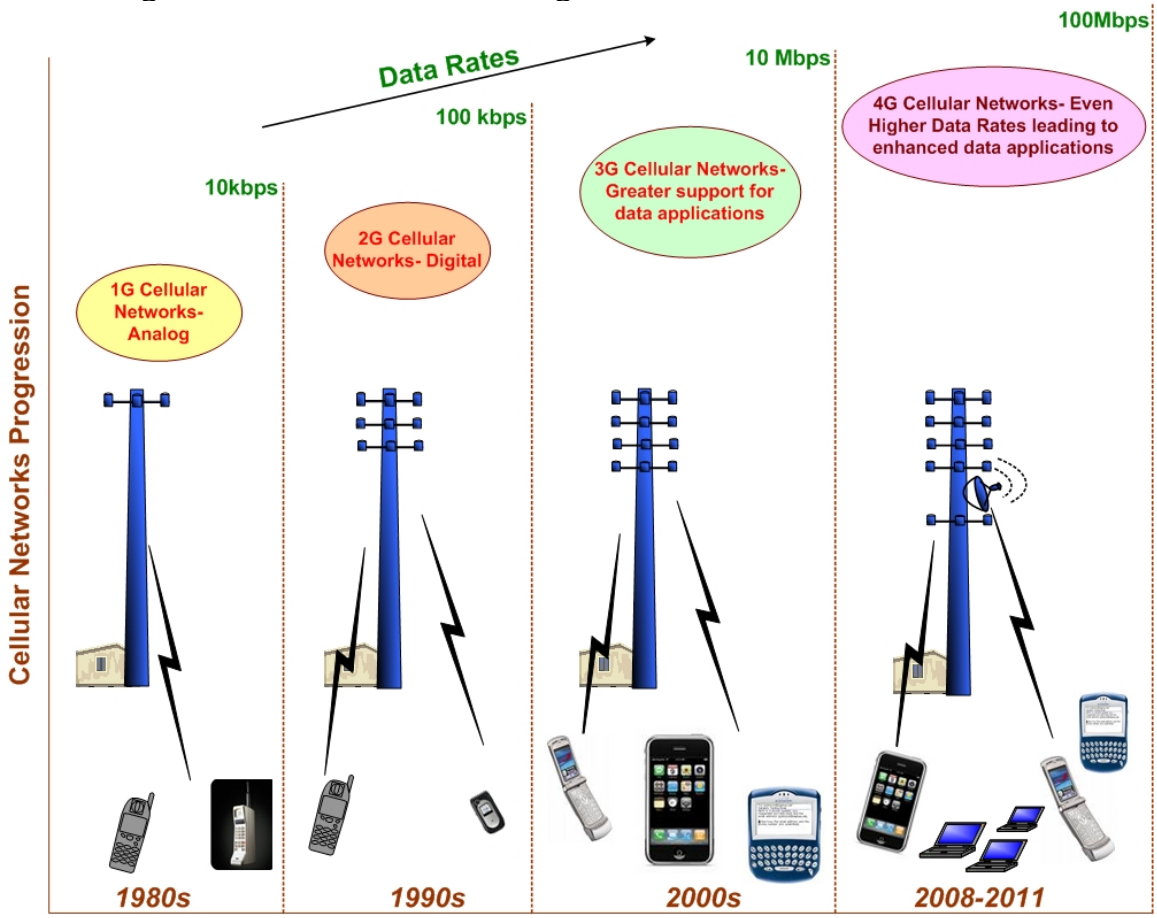
In the mid-1990s the FCC allocated additional spectrum to provide greater capacity for the rapidly expanding cell phone market. Specifically, it allocated frequencies in the 1800 and 1900 megahertz (MHz) bands for what it called Personal Communications Service, or "PCS." While this was happening, a new "digital" technology was being developed to use these frequency bands more efficiently. The first digital technology enabled three conversations to be placed on a single radio channel, rather than the one conversation per channel allowed by analog FM. These

early digital technologies came to be known as the second generation of cellular service, or "2G" as it is commonly referred to today.[1]

Over time, as demand for cellular radio outgrew the limited amount of spectrum available for this service, engineers developed more advanced digital technologies to use spectrum more efficiently and provide for greater data transmission speeds on a channel. With each of these advancements more users could share channels, and could use them not only for voice communications, but to send and receive pictures, e-mail, and even video broadcast transmissions.

Technology advancements have enabled transmission speeds to grow from kilobits per second (Kbps) in the 1990s to megabits per second (Mbps) today. These increasingly faster speeds were the result of the advancement from 2G technology to third-generation, or 3G, and now fourth-generation, or 4G, digital radio technology. The following figure illustrates how these advances in cellular networks have enabled more users to receive newer, and different, wireless services.

Figure 2: Cellular Networks Progression—Evolution from 1G to 4G



[1] Analog FM was the first generation of cellular radio technology.

New Wireless Spectrum Bands

But even with these technology advancements, which enabled wireless carriers to use spectrum more efficiently, the enormous growth in mobile phone use in the country in recent years means the carriers require more and more spectrum for their operations. In response, the FCC made available large amounts of new commercial spectrum through auctions of three new frequency bands: the 700 MHz band; the 1700/2100 MHz bands for the Advanced Wireless Service (AWS); and the 2.5 GHz band for the Broadband Radio Service (BRS)/Educational Broadcast Service (EBS).

There are currently four nationwide carriers providing wireless service in Prince George's County—AT&T Wireless, Verizon Wireless, Sprint Nextel, and T-Mobile. All four have upgraded their 2G networks in the County to 3G—and with each of these advancements, the carriers have been able to provide increasingly higher quality "broadband" services to more and more customers in the County.[2]

Verizon and Sprint, which employ the wireless access technology known as Code Division Multiple Access (CDMA), have implemented the CDMA-based 3G data technology called Evolution-Data Optimized (EV-DO) throughout the County. AT&T and T-Mobile are replacing their 2G technologies—General Packet Radio Service (GPRS) and Enhanced Data Rates for GSM Evolution (EDGE) —in the County with the 3G technology called Wideband CDMA (WCDMA).[3]

If the carriers have not already done so, they will, in the near future, likely upgrade their systems in the County further to the most recent technology.[4] For the CDMA carriers, this will mean replacing their EV-DO Revision 0 (Rev. 0) systems with the higher-speed data technologies EV-DO Rev. A or Rev. B. For AT&T and T-Mobile, it will mean adding High Speed Packet Access (HSPA) data technologies to their existing WCDMA networks.

Eventually, carriers will implement 4G technologies, which are expected to provide even higher data rates.[5] Sprint, for example, has indicated its intention to deploy a 4G technology called

[2] Broadband is a term commonly used today to refer to the various services and features that can be provided through high speed data networks. These services include, among other things, the ability to search the Web, receive live video transmissions, or talk to someone over the Internet (using a technology called Voice over Internet Protocol (VoIP)). As data speeds increase, the speed of Internet downloads increases and the quality of voice and video transmissions improves.

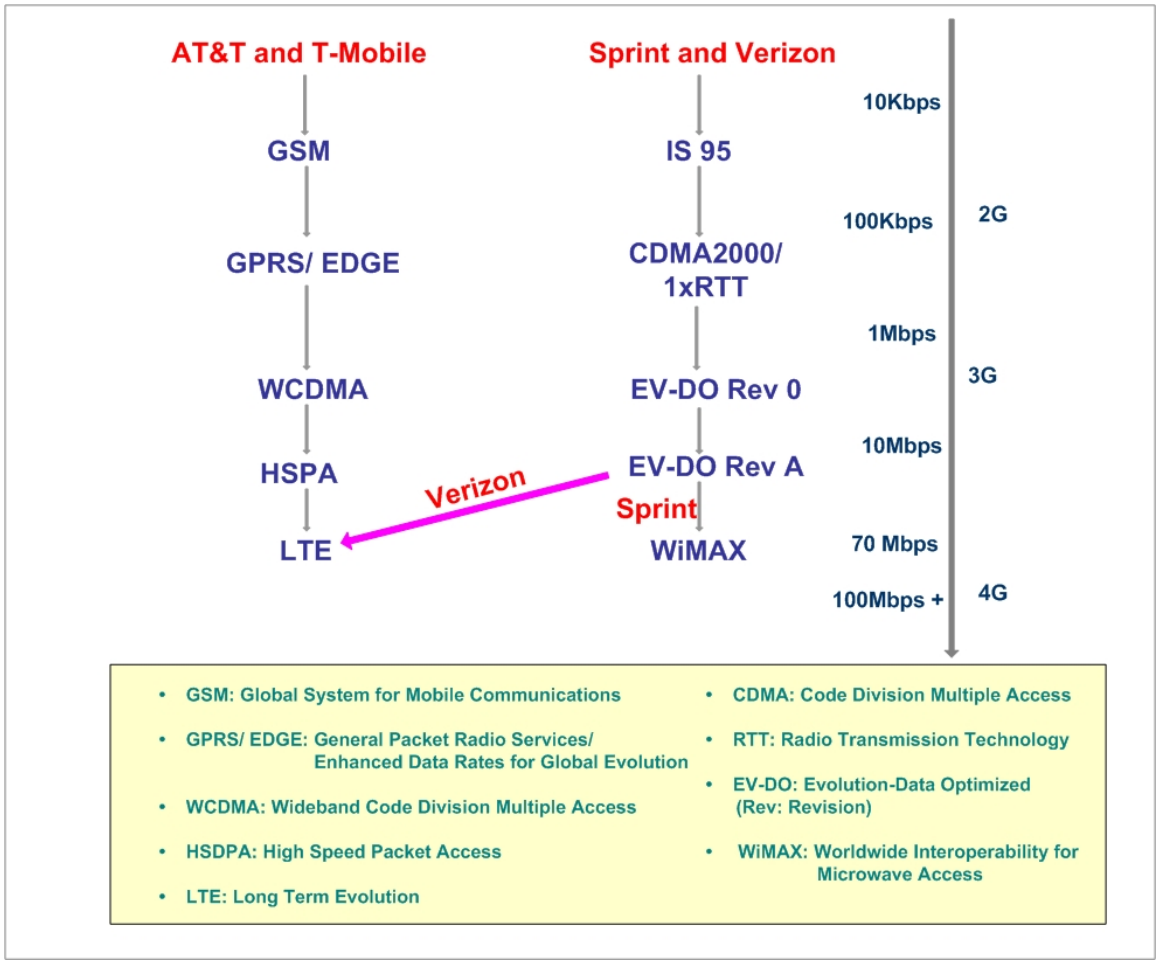
[3] AT&T has implemented WCDMA technology in all but the southernmost portions of the County, while T-Mobile has deployed WCDMA inside the Beltway and along the I-95 corridor.

[4] It is not always possible to determine, from carriers' websites, exactly what technologies they are employing in different areas of the country. However, the major carriers are clearly in the process of upgrading their 3G systems to 3.5G.

[5] It should be noted that more advanced technologies provide for only *theoretically* higher data rates. In the real world the quality and reliability of service a subscriber might receive will depend on a variety of factors, including the strength of the signals the subscriber receives from the carrier's base stations, how much spectrum the carrier has dedicated for use in the area where the subscriber is operating, and how many other subscribers are sharing that

Worldwide Interoperability for Microwave Access (WiMAX) and AT&T and Verizon have announced their plans to begin implementing the 4G technology known as Long Term Evolution (LTE) in 2010. As carriers deploy these new technologies in the Washington area, broadband services will continue to improve[6]—and through the increased capacity provided by these technologies, high-quality broadband service will become available to more and more residents in the County.

Figure 3: Evolution Paths for Major Carriers



spectrum at the time the subscriber is operating. So, while advancements to higher and higher data rate technologies are encouraging, it is not the case that 4G systems will necessarily produce better or higher-quality service than 3G or systems. In fact, a well-designed 3G network could easily outperform a poorly designed or overloaded 4G network.

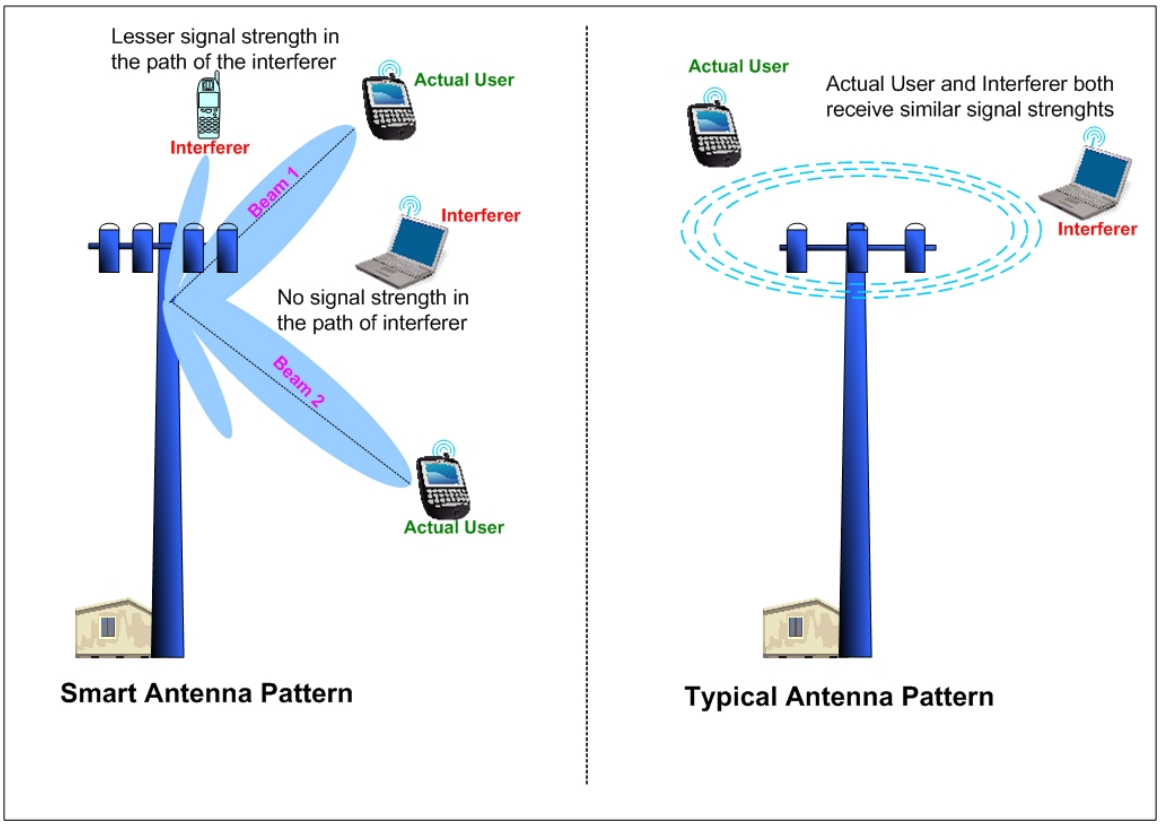
[6] The increased data rates of 4G technologies will, among other things, enable faster downloads from the Internet and higher-quality video transmissions.

Advanced Antenna Technologies

Regardless of which wireless access technology the carriers use, they may choose to employ what are referred to as advanced or "smart" antenna technologies to enhance the capabilities of their networks. The most basic type of advanced antenna technology adds a second receive antenna to a base station, which allows the station to select from the stronger of the two signals received by the two antennas. A much more advanced form of smart antenna technology is called Multiple-Input Multiple-Output (MIMO) technology. This technology requires additional receive *and* transmit antennas at the base station and employs sophisticated software and signal processing to enable the strongest and most reliable signal to be transmitted and received by the station. Using MIMO, an even more advanced antenna technology—called beamforming—can be implemented. This technology allows a base station to maximize the signals of its users, while minimizing the interfering signals from other nearby devices, by orienting its antenna beam toward its users as they move around the station.

Significantly, MIMO technologies are expected to be incorporated into the design of the 4G WiMAX and LTE systems to further enhance those systems' capabilities.

Figure 4: Smart Antennas Technique—Beamforming



New Wireless Spectrum Bands

The Use of New Spectrum Bands for Broadband Services in the County

A number of large and mid-sized carriers have acquired spectrum in the 700MHz and AWS bands in the Washington area in recent FCC auctions. Each of these carriers, of course, has different business plans with regard to how and when they will use their spectrum in the County, but with the Washington metropolitan area being a strong market for wireless services, it is likely that they will be using their newly acquired spectrum in the area in the near future.

Among the existing carriers in the County, AT&T acquired spectrum in the 700 MHz band, T-Mobile obtained spectrum in the AWS band, and Verizon obtained spectrum in both bands. All three of these carriers can be expected to use their new spectrum holdings to increase the quantity and variety of wireless services they currently offer to County residents.

But the new spectrum bands will also bring new carriers to the County. One such company is Cricket Communications, which acquired the rights to operate on AWS spectrum in the Washington area. Cricket has filed nearly 100 applications for antenna installations in the County during the past year, so it appears that the company could be planning to move aggressively to become the area's fifth commercial wireless provider.

Another possible new entrant to the Washington market is Clearwire, which controls most of the 2.5 GHz band spectrum in the U.S. through its recent arrangement with Sprint.[7] Clearwire has announced plans to offer WiMAX service, which it will call "Clear." This service is currently available in only a few cities in the country,[8] but there are indications in the trade press that Clearwire could begin providing the service in the Washington area as early as the second half of 2009.[9] If this occurs, Clearwire could become a major wireless provider in the County and give County residents yet another option for wireless broadband services.[10]

Finally, there are two additional companies that have obtained authorization to operate in the County through the recent AWS and 700 MHz auctions. They are SpectrumCo, which acquired AWS spectrum, and Frontier Wireless, which obtained 700 MHz spectrum. At this writing, there

[7] In this arrangement, Sprint turned over its 2.5 GHz band holdings to Clearwire in exchange for a 51 percent stake in the company.

[8] Clearwire is providing WiMAX service in certain major markets on the West Coast. Sprint is currently providing this service in the Baltimore area.

[9] According to the website http://www.informationweek.com/news/mobility/wifiwimax/showArticle.jhtml?articleID=212700856, Clearwire plans to provide its service to the "Baltimore-Washington corridor" during the second half of 2009. If this prediction is correct, the company will soon be providing service, at a minimum, to the northwestern part of the County.

[10] In 2008 Sprint filed more than 50 applications to provide "backhaul" service for its networks in the County. Backhaul is the term used to describe the data that is transmitted between base stations in a cellular network. It is possible that the backhaul network that Sprint is developing will be used to support Clearwire's 2.5 GHz band cellular network in the County.

is no information available about what kinds of services these companies intend to provide or when they plan to begin operations, but it's likely that either or both of them will offer some type of wireless service in the County in the future. Figure 5 and Figure 6 below show the spectrum acquired by various carriers in both the 700MHz and AWS bands.

Figure 5: Revised 700 MHz Band Plan

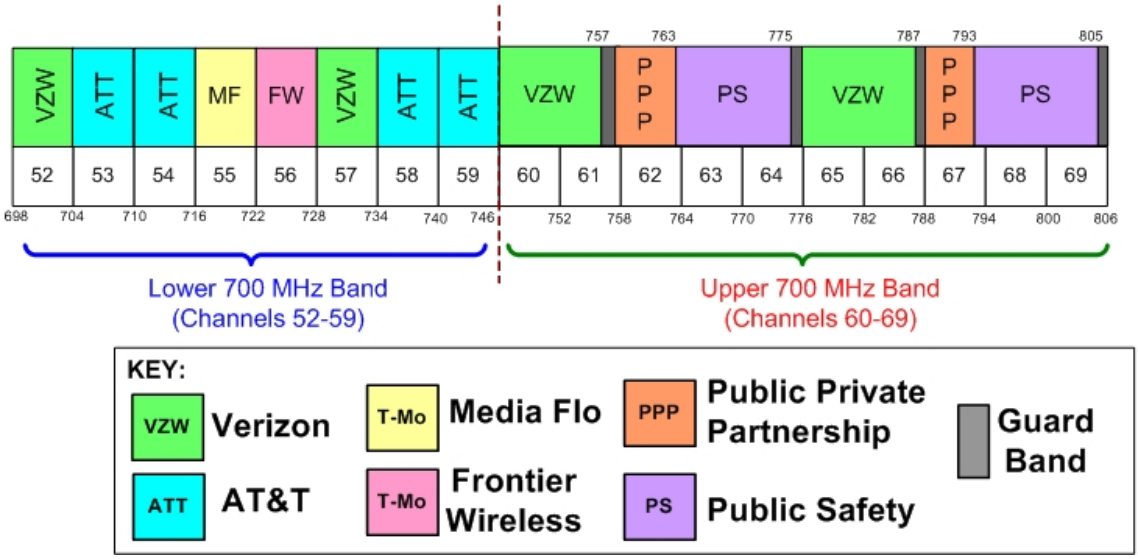
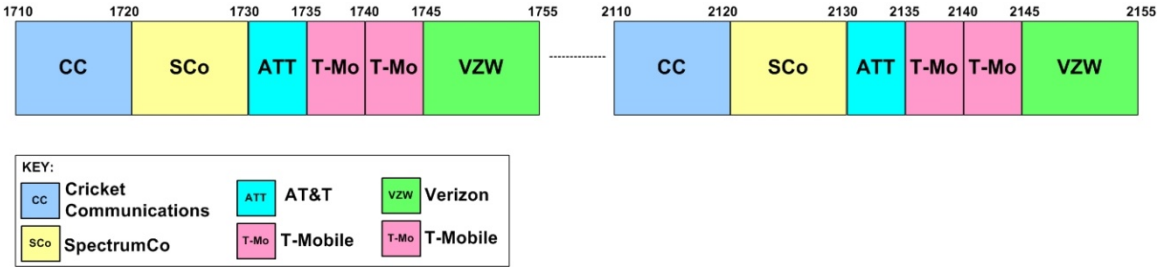


Figure 6: AWS Band Plan



What the Licensing of New Spectrum Bands Could Mean for the County

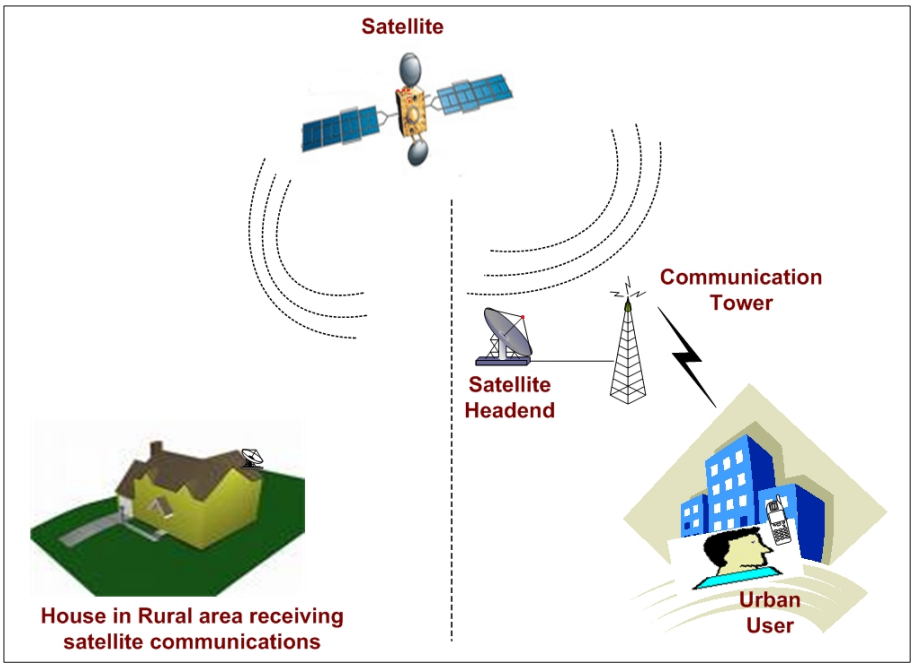
The licensing of these various new spectrum bands will benefit wireless users in the County in different ways. First, it will mean that existing carriers will be able to provide higher-quality service to their customers (i.e., the availability of additional spectrum will mean less congestion on carriers' existing circuits, which will result in fewer dropped calls, higher data transmission speeds, etc.). Another potential benefit for County residents is that carriers may dedicate some, or all, of their new spectrum to 4G service. And finally, the licensing of new spectrum bands could mean new wireless carriers in the County, which, through increased competition, could result in lower wireless costs to County residents.

New Wireless Services on the New Spectrum Bands

New spectrum bands are also bringing new types of wireless services to the County. One such service enables live television broadcasts to be transmitted to wireless subscribers. It was implemented by Qualcomm (under the name MediaFLO) using spectrum that the company obtained in the 700 MHz band. MediaFLO has entered into separate agreements with AT&T and Verizon to allow those carriers' customers to receive MediaFLO's broadcast transmissions on their mobile phones. (Verizon markets its video service under the name "V CAST.") At the moment, this video service appears to be available to AT&T and Verizon customers operating inside the Beltway and in the eastern and northern parts of the County, but not to customers operating in certain areas south and southeast of the Beltway.

There is also the possibility that a different type of wireless service, called mobile satellite service (MSS), could be introduced in the County in the near future. MSS is designed to transmit satellite signals to individuals and businesses operating in rural and remote areas of the country, where cellular and PCS signals are not readily available. MSS carriers, however, were recently given the authority to use their spectrum to operate terrestrial base stations to reach customers in urban areas, where satellite signals can sometimes be blocked from view. And although no MSS licensee is yet providing terrestrial service, one company, TerreStar, which plans to launch its satellite in 2009, has announced that it has entered into a roaming agreement with AT&T. Once TerreStar's satellite is successfully launched, customers of AT&T will be able to operate on MSS frequencies in rural/remote areas of the country (where strong AT&T signals may not be present) and customers of TerreStar will be able to receive service through AT&T's network when operating in urban areas. If this unique, hybrid satellite/terrestrial service is introduced in the Washington area in the near future, it could give County residents, especially those in rural parts of the County, an additional option for obtaining wireless broadband service.

Figure 7: Satellite Communication for Rural and Urban Users



The County has been served for several years by two satellite radio providers, XM and Sirius, both of which acquired spectrum in the 2.3 GHz band. Sirius (which merged with XM last year) employs satellite signals as its primary transmission source, but uses terrestrial stations to provide coverage in areas of the country where its satellite signal may be weak or blocked entirely (e.g., indoors, or outdoors in urban areas). Sirius currently provides this terrestrial "back-up" coverage to about 75 percent of the County.[11]

Possible Unique Wireless Services on the Horizon

In addition to the array of wireless broadband options currently available in the County, there are a number of new, intriguing wireless services that might be coming along in the near future.

One such service is based on a proposal by a company called M2Z. M2Z petitioned the FCC to set aside 20 megahertz of spectrum in the 2.1 GHz band, which would be used to provide free broadband service to subscribers. M2Z's proposal is currently under FCC consideration, and it is anticipated that the agency will address the proposal in 2009.

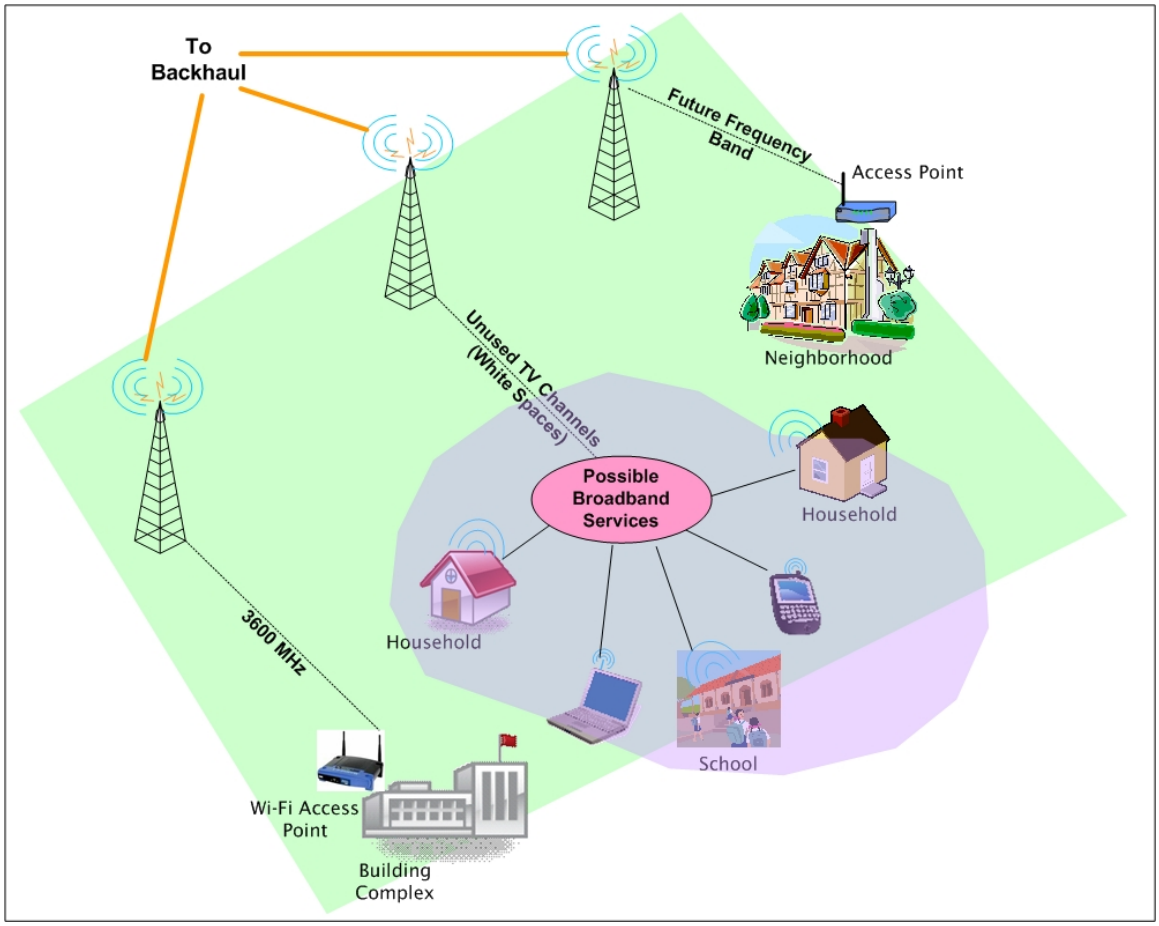
Another interesting service that might become available to County residents in the coming years is one that would use locally vacant FCC TV channels for short-range (i.e., non-vehicular and non-cellular) broadband transmissions. This service would operate on frequencies that are set aside for local television station broadcast but that are not being used in the Washington area; it could become a relatively low-cost option for providing broadband service to homes and neighborhoods in the County. The FCC recently granted equipment manufacturers the authority to begin producing and marketing devices that will be capable of operating on this spectrum. If manufacturers are able to satisfy the agency's rigorous technical requirements for these devices, it is possible that we could see this new broadband service in the County within the next year or two.

The FCC recently authorized a spectrum band for another unique type of broadband service. In the 3650-3700 MHz band, it adopted rules that will enable licensees to offer a high-powered, Wi-Fi-type service. Wi-Fi, of course, can be found in coffee shops, restaurants, stores, libraries, and other locations around the County. But due to limits placed on its power levels, Wi-Fi transmissions are confined to relatively small areas. Much higher power levels, however, will be permitted in the 3650-3700 MHz band, which will allow its transmissions to travel much farther, perhaps even miles from base stations. But the truly unique characteristic of the 3650-3700 MHz band is that its spectrum was not auctioned by the FCC to the highest bidder. Rather, it was—and still is—available to any and all entities who might seek to use it to provide broadband service. As equipment manufacturers begin producing 3650-3700 MHz band equipment, we could possibly see the band be put to use by commercial entities selling low-cost broadband service to

[11] Sirius does not provide information on its website regarding its terrestrial coverage. However, there is a website that purports to have this information: http://www.dogstarradio.com/sirius_map.php. The estimated 75 percent figure for Sirius' terrestrial coverage in the County is based on coverage maps shown on that website. Interestingly, the maps indicate that Sirius is not providing terrestrial coverage to some of the County's more populated areas, including Laurel, College Park, Hyattsville, and Upper Marlboro.

County residents or perhaps by County agencies seeking to provide broadband service to different buildings on their campuses.[12]

Figure 8: Potential Use of Unused TV Channels and Other Frequency Bands



[12] A company called Towerstream recently began providing commercial broadband service in the 3650-3700 MHz band to businesses in downtown Chicago, using 806.16e (mobile WiMAX) technology (http://www.towerstream.com/index.asp?ref=press_release_info&press_release_id=150). Also, in late 2008 the IEEE adopted 802.11y—its standard for Wi-Fi service in the 3650-3700 MHz band. With that standard in place, a number of manufacturers could soon begin producing 3650-3700 MHz equipment.