

GAO

Report to the Chairman, Subcommittee
on Communications, Committee on
Commerce, Science, and Transportation,
U.S. Senate

November 2003

TELECOMMUNICATIONS

Uneven Implementation of Wireless Enhanced 911 Raises Prospect of Piecemeal Availability for Years to Come



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Highlights of [GAO-04-55](#), a report to the Chairman, Subcommittee on Communications, Committee on Commerce, Science, and Transportation, U.S. Senate

Why GAO Did This Study

When an emergency call is placed to 911, prompt response depends on knowing the location of the caller. Enhanced 911 (E911) service automatically provides this critical information. E911 is in place in most of the country for traditional wireline telephone service, where the telephone number is linked to a street address. Expanding E911 capabilities to mobile phones is inherently more challenging because of the need to determine the caller's geographic location at the moment the call is made. Concerns have been raised about the pace of wireless E911 implementation and whether this service will be available nationwide. GAO reviewed the progress being made in implementing wireless E911 service, the factors affecting this progress, and the role of the federal government in facilitating the nationwide deployment of wireless E911 service.

What GAO Recommends

In order to provide the Congress and federal and state officials with an accurate assessment of the progress being made toward full deployment of wireless E911, we are recommending that the Department of Transportation work with state officials and public safety groups to develop data identifying which PSAPs will need to have E911 equipment upgrades. In response, DOT stated that it generally agreed with our recommendation.

www.gao.gov/cgi-bin/getrpt?GAO-04-55.

To view the full product, including the scope and methodology, click on the link above. For more information, contact Mark Goldstein at (202) 512-6670 or goldsteinm@gao.gov.

TELECOMMUNICATIONS

Uneven Implementation of Wireless Enhanced 911 Raises Prospect of Piecemeal Availability for Years to Come

What GAO Found

Implementation of wireless E911 is several years away in many states, raising the prospect of piecemeal availability of this service across the country for an indefinite number of years to come. Successful implementation depends on coordinated efforts by wireless carriers, local telephone companies, and more than 6,000 public safety answering points (PSAPs)—the facilities that receive 911 calls and dispatch assistance. According to a database sponsored by the Department of Transportation (DOT), as of October 2003, nearly 65 percent of PSAPs had Phase I wireless E911 service, which provides the approximate location of the caller, while only 18 percent had Phase II, which provides a more precise location and is the ultimate goal of wireless E911 service. Though valuable, the database does not differentiate between PSAPs that will require equipment upgrades and those that will not, thereby limiting its usefulness in accurately assessing progress toward full implementation. Looking forward, 24 state 911 contacts said in response to a GAO survey that their state will have Phase II implemented by 2005 or sooner; however, all other state contacts estimated dates beyond 2005 or were unable to estimate a date.

Key factors hindering wireless E911 implementation involve funding and coordination. The wireless carriers, states, and localities must devise the means to fund more than \$8 billion in estimated deployment costs over the next 5 years. Some states and localities have established funding mechanisms (such as E911 surcharges on phone bills), but others have not done so or have used their E911 funds for unrelated purposes. In addition, there is also a lack of coordination in some cases among the wireless carriers, local telephone companies, and PSAPs that can lead to delays in wireless E911 implementation. States with knowledgeable and involved coordinators were best able to work through these coordination issues.

The Federal Communications Commission (FCC) and DOT are involved in promoting wireless E911, but their authority in overseeing its deployment is limited because PSAPs traditionally fall under state and local jurisdiction. FCC has set deadlines on the wireless carriers' E911 responsibilities and has taken actions to identify best practices and improve coordination among the parties. DOT is developing an action plan and clearinghouse for wireless E911 planning, implementation, and operations.

Call Taker Station at a Public Safety Answering Point



Source: photograph by Yasmin Fleming, Frederick County, Maryland, 911 Center.

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Abbreviations

DOT	Department of Transportation
E911	enhanced 911
FCC	Federal Communications Commission
GPS	Global Positioning System
LEC	local exchange carrier
NENA	National Emergency Number Association
PSAP	public safety answering point

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United States General Accounting Office
Washington, D.C. 20548

November 7, 2003

The Honorable Conrad Burns
Chairman
Subcommittee on Communications
Committee on Commerce, Science, and Transportation
United States Senate

Dear Mr. Chairman:

In 2001, Americans placed almost 57 million emergency calls to 911 using mobile phones. According to the Federal Communications Commission (FCC), around one-third of 911 calls are now made from mobile phones. With almost 150 million Americans now subscribing to a mobile phone service and new concerns about homeland security facing our nation, the ability to reach 911 from sidewalks, highways, and rural areas has become increasingly important. Knowing the precise location of a 911 caller facilitates the quick and accurate dispatch of emergency responders such as police, firefighters, and ambulance crews. However, in some cases, 911 callers cannot speak (e.g., a caller who is suffering a heart attack) or simply do not know their location (e.g., a caller reporting an accident along a highway).

For traditional wireline phones, most areas across the country now employ “enhanced 911” (E911) services, where the caller’s address automatically appears on-screen for the 911 call taker. The increasing use of mobile phones led to concerns by the Congress and others in the federal government and the public safety community that E911 location information is often not available for citizens dialing 911 from a mobile phone. However, implementing wireless E911 is inherently more challenging than wireline E911. Unlike wireline phones, where the phone number is linked to a specific street address, providing location information for a mobile phone involves technologies that must calculate the geographic coordinates of the caller at the time of the call and display those coordinates as a location the 911 call taker can understand. Moreover, a wireless 911 call is routed along the networks of both a wireless telephone company and a wireline telephone company before terminating at a facility where 911 calls are answered, known as a public safety answering point (PSAP). There are more than 6,000 of these answering points nationwide, often at a county or city level. All three of these entities—wireless carriers, wireline carriers, and public safety answering points—must be properly interconnected and have certain

equipment in place before wireless 911 calls can be correctly routed and E911 location information sent with the call.

At the federal level, FCC and the U.S. Department of Transportation (DOT) have taken steps to promote the deployment of E911 location technologies for mobile phones. Deployment usually proceeds in two phases: Phase I provides general location information by identifying the cell site¹ and cell sector² receiving the wireless call as well as the telephone number of the caller; Phase II provides a more precise location by determining the latitude and longitude of the caller, which can be electronically displayed on a map. Currently, the only federally mandated time frames for installation of wireless E911 technologies are those placed on wireless carriers by FCC. These time frames vary by wireless carrier and by the type of location technology the carrier has selected, and currently extend out to December 31, 2005. However, FCC has no authority to place time frames on the public safety answering points, which are under state and local jurisdiction. As a result, there is no ultimate nationwide deadline for full implementation of wireless E911 services. FCC has technical and educational initiatives under way to help the parties involved to share information on deployment practices, problems, and experiences. Also, DOT has recognized the relationship between wireless E911 services and highway safety and is working with a key nongovernmental organization, the National Emergency Number Association (NENA), to develop a PSAP database that tracks E911 implementation.³ DOT is also working to promote research, planning, and education related to wireless E911 services.

¹Wireless carriers deliver mobile phone service by subdividing large geographic areas into smaller sections called cells. Each cell has a base station equipped with one or more antennas to receive and transmit radio signals to the mobile phones within its coverage area. The distance covered by the base station can range from less than a mile to 20 miles. For more information on cell phones, see U.S. General Accounting Office, *Telecommunications: FCC Should Include Call Quality in Its Annual Report on Competition in Mobile Phone Services*, GAO-03-501 (Washington, D.C.: Apr. 28, 2003).

²The cell sector refers to the coverage area of a cellular antenna. Cell sites often contain three antennas, which define three unique coverage areas or sectors, helping to narrow the field of search for the wireless caller.

³NENA is a membership organization of emergency communications professionals in government and industry that fosters the technological advancement, availability, and the implementation of a universal emergency telephone number system. The database is accessible through <http://www.nena.org>.

The pace of wireless E911 deployment has been a key concern for the Congress. The Wireless Communications and Public Safety Act of 1999 designated 911 as the universal emergency telephone number within the United States and called on FCC to encourage and support efforts by the states to deploy wireless E911 services by working with state and local officials, the telecommunications industry, consumer groups, and those involved in public safety services.⁴ There is also a Congressional E911 Caucus that aims to educate lawmakers, constituents, and communities about the importance of 911 systems.⁵ You asked us to provide an overview of the deployment of wireless E911 services across the country. We agreed to provide information on (1) the progress made in deploying wireless E911 services throughout the country, (2) the factors that are affecting this progress, and (3) current federal government actions to promote the deployment of wireless E911 services.

⁴Pub. L. No. 106-81, 113 Stat. 1286 (1999). According to its purpose section, the act is meant to “encourage and facilitate the prompt deployment throughout the United States of a seamless, ubiquitous, and reliable end-to-end infrastructure for communications, including wireless communications, to meet the Nation’s public safety and other communications needs.”

⁵The establishment of the E911 Institute, a not-for-profit organization that will support the work of the Congressional E911 Caucus, was announced in July 2003. More information can be found at the organization’s Web site, www.e911institute.org.

To address these issues, we interviewed representatives of the various parties involved in wireless E911 implementation. We selected nine states (California, Idaho, Indiana, Kentucky, Maryland, Missouri, South Carolina, Texas, and Virginia) and the District of Columbia as case studies.⁶ For each case study, we interviewed representatives of a public safety answering point in both an urban and rural area of the state.⁷ We also interviewed the state's 911 coordinator and representatives of one small wireless carrier⁸ serving the state.⁹ In addition to our case studies, we interviewed companies providing wireless telephone services nationwide, companies providing local wireline telephone services, and a manufacturer of mobile telephones. We interviewed federal, state, and local government officials involved in wireless E911 implementation and representatives from several public safety associations and wireless industry associations. Lastly, we conducted a telephone survey of the state 911 contacts in all 50 states and the District of Columbia (these individuals were designated by the governor of each state as the E911 point of contact and are listed on FCC's Web site) to obtain an overview of implementation efforts across the country. A more detailed discussion of our scope and methodology is found in appendix I.

Results in Brief

Implementation of wireless E911 is several years away in many states, raising the prospect of piecemeal availability of this service across the country for an indefinite number of years to come. According to a DOT-sponsored database, as of October 2003, nearly 65 percent of the more than 6,000 public safety answering points nationwide are receiving Phase I

⁶We selected states that were spread geographically across the United States and that appeared to be having various levels of success with wireless E911 implementation based on early research. In particular, we selected at least one rural state and at least one state known to have redirected funds collected for E911 implementation to other uses.

⁷There were exceptions to this in one state and the District of Columbia. California has no rural public safety answering points that take wireless calls, so we interviewed the California Highway Patrol, which handles most of the wireless 911 calls in California. The District of Columbia has only one public safety answering point.

⁸For purposes of our case studies, a small wireless carrier was considered any wireless carrier other than the six large nationwide wireless carriers (AT&T Wireless, Cingular, Nextel, Sprint, T-Mobile, and Verizon Wireless).

⁹Again, there were exceptions to this in one state and the District of Columbia. We were unable to schedule an interview with a small wireless carrier in Missouri, and the District of Columbia is not served by any small wireless carriers.

location information, but only about 18 percent are receiving Phase II location information. Although the DOT-sponsored database has greatly increased the amount of information available about E911 progress, the database does not differentiate between public safety answering points that will require equipment upgrades and those that will not. This limits its usefulness in accurately assessing progress toward full implementation. Looking forward, 24 state 911 contacts said in response to a GAO survey that their state will have Phase II implemented by 2005 or sooner; however, all other state contacts estimated dates beyond 2005 or were unable to estimate a date.

Lack of funding for equipment upgrades and a lack of coordination among the parties involved are factors slowing the pace of the rollout of wireless E911 technologies. Based on our interviews, lack of state or local funding is the largest factor affecting the progress of wireless E911. No federal funding was provided to the states and localities to cover the cost of E911 implementation, estimated to be at least \$8 billion over the next five years. Our survey of state contacts showed that 39 states and the District of Columbia have put in place a surcharge on wireless customers to pay for E911 upgrades to public safety answering points. Yet, some states have no funding mechanism in place and even those that do sometimes redirect the collected funds to uses unrelated to wireless E911 implementation. Another factor slowing wireless E911 rollouts is a lack of coordination among the parties involved. This problem has been avoided in some localities with early coordination meetings among all the parties, where personal contacts can be established and early concerns raised and addressed. We were told by many of those we interviewed that states with knowledgeable and involved state coordinators have had an easier time with coordination and with public safety answering point readiness. Technologically, the main hurdle of developing wireless location equipment for mobile phones has been solved, but the continuing emergence of new wireless devices and services has the potential to overburden the current 911 infrastructure.

The federal government has been involved in the promotion of wireless E911, but has limited authority over the entire process. FCC has concentrated its regulatory efforts toward the wireless carriers, where it has the most enforcement authority. FCC has established implementation schedules with each of the major wireless carriers and has recently taken enforcement actions against wireless carriers that failed to meet deadlines. According to FCC, the Commission does not have clear jurisdiction over wireline carriers with regard to wireless E911 implementation and looks to

the state public utility commissions, which have clear and sufficient authority, to take the lead. However, FCC has said it will monitor the wireline carriers' efforts to ensure that they are meeting their responsibilities with regard to E911 deployment. In April 2003, FCC held the first coordination initiative meeting to bring the parties involved in E911 together and has established a technical group to examine relevant E911 infrastructure issues. DOT is developing an action plan and clearinghouse for wireless E911 planning, implementation, and operations. FCC and DOT coordinate their wireless E911 activities to avoid duplication of effort. However, the agencies do not jointly staff or fund any wireless E911 projects.

To address the limitations in the DOT-sponsored database on public safety answering points' readiness for wireless E911 service, we are recommending that the department work with state officials and public safety groups to develop a more accurate assessment of the number and location of answering points that still need equipment upgrades. A draft of this report was provided to DOT and to FCC. In commenting on the draft of this report, DOT stated that it generally agreed with the report's recommendation, and FCC offered some technical comments that were incorporated where appropriate.

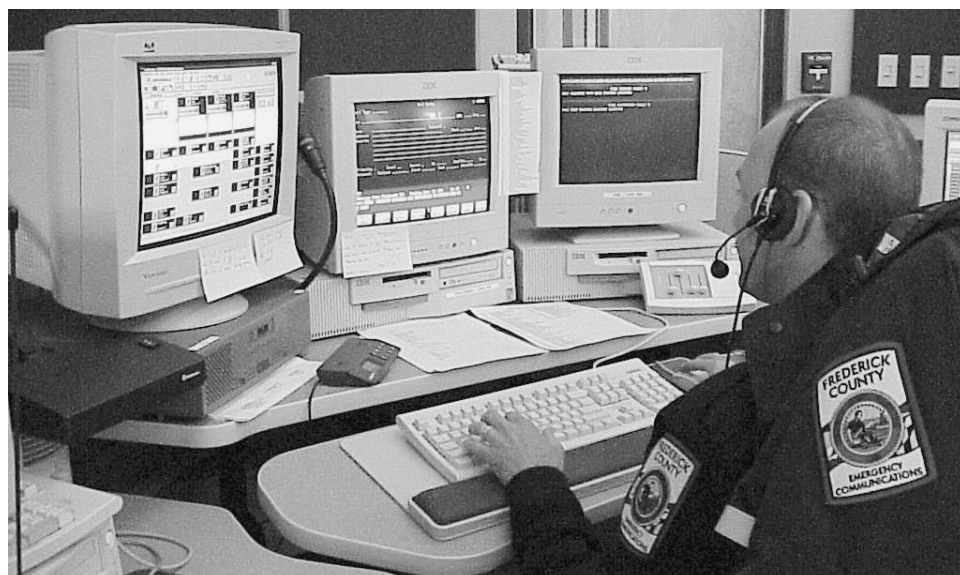
Background

Basic wireline 911 service provides an easily remembered universal number that connects the caller with an emergency response center, known as a public safety answering point (PSAP) (see fig. 1).¹⁰ The next step after basic wireline 911 service is "enhanced 911" (E911), which automatically routes the emergency call to the appropriate PSAP and transmits to the call taker the telephone number (the "callback number," should the call be disconnected) and street address of the caller. Nationwide implementation of E911 by local wireline telephone companies, known as "local exchange carriers" (LEC), began in the 1970s without a federal mandate or deadlines governing the rollout. By 1987, 50 percent of the United States' population could reach emergency services through wireline 911. Today, 99 percent of the population is covered by

¹⁰PSAPs vary in size and technical sophistication. Some large urban PSAPs have dozens of call takers and split the functions of call taking and dispatching the proper emergency responder. Smaller PSAPs are sometimes staffed by only two or three call takers who also handle dispatch. In some rural areas, the PSAP may be the sheriff's office.

wireline 911 service, and 93 percent of that coverage includes the delivery of a callback number and location information.

Figure 1: Call Taker Handling a 911 Call at a Public Safety Answering Point



Source: photograph by Yasmin Fleming, Frederick County, Maryland, 911 Center.

In the early 1990s, FCC took note of the rising number of mobile telephone subscribers and the resulting increase in 911 calls. In 1994, FCC requested comments on requiring wireless carriers to provide the same level of 911 service that was available from LECs. In 1996, with input from the industry and public safety community, FCC adopted rules for wireless E911 that established an approach consisting of two phases for implementation by the wireless carriers. FCC also set schedules for implementing both basic and enhanced wireless 911 services, determined accuracy requirements and deployment schedules for location technologies, and outlined the role of PSAPs. Specifically, the phases required the following:

- Phase I required that by April 1998, or within six months of a request from a PSAP, whichever was later, wireless carriers were to be prepared to provide the PSAP with the wireless phone number of the caller and the location of the cell site receiving the 911 call.

-
- Phase II required that by October 2001, or within 6 months of receiving a request from a PSAP, whichever was later, wireless carriers were to be prepared to provide the PSAP with Phase I information plus the latitude and longitude coordinates of the caller within certain standards of accuracy.

In 1996, when these rules were established, the technology to accurately locate a caller on a mobile telephone had not yet been perfected, but a “network based” solution was anticipated. With this type of solution, a caller is located through a triangulation process using the closest cell towers.¹¹ However, as location technology was being developed, a “handset based” solution (i.e., one using the wireless phone itself) was made available. The most common handset solution also relies on triangulation, but uses Global Positioning System (GPS) satellites and a GPS chip inside the handset.¹² In recognition of this second solution, FCC issued rules in October 1999¹³ for carriers that selected handset-based location technologies.¹⁴ In August 2000, FCC adopted modifications to its rules for handset-based solutions and said that even if a PSAP has not made a request for Phase II wireless E911 service, wireless carriers deploying a handset-based solution must ensure that by December 31, 2005, 95 percent of their customers have mobile phones capable of providing automatic location information.¹⁵

A typical wireless 911 call is routed along both wireless and wireline networks before terminating at the PSAP. See figure 2 below. While the voice call is taking place over the wireless and wireline networks, several

¹¹Triangulation is a method of locating the source of a radio signal, generally through the use of three receivers, or antennas.

¹²The most commonly used handset-based solution is “assisted GPS,” in which some of the processing is carried out in the network to improve system performance.

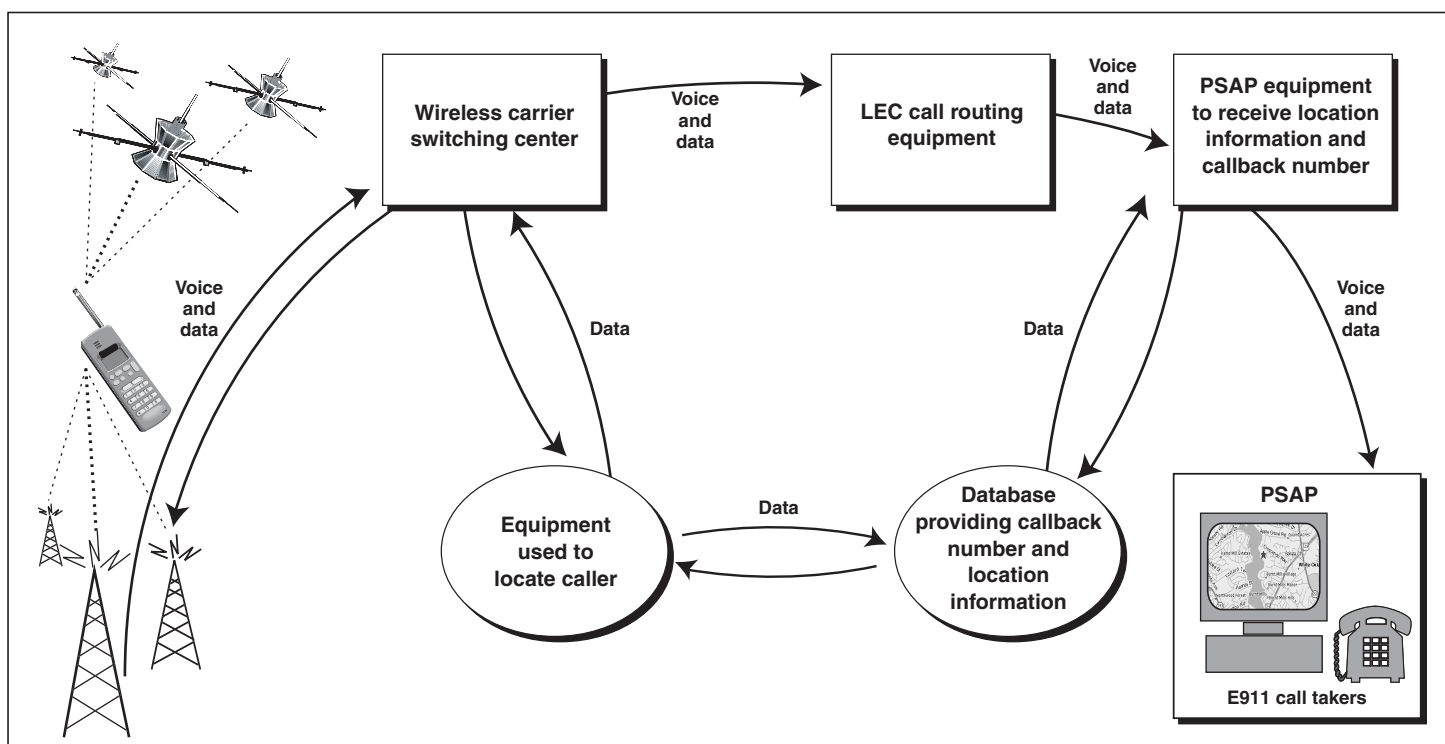
¹³*In the Matter of Revision of the Commission’s Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems*, CC Docket No. 94-102, *Third Report and Order*, FCC 99-245 (released Oct. 6, 1999).

¹⁴A third approach to caller location is known as “enhanced observed time difference of arrival,” which is regarded as a hybrid because the required measurements are distributed between the handset and the network.

¹⁵*In the Matter of Revision of the Commission’s Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems*, CC Docket No. 94-102, *Fourth Memorandum Opinion and Order*, FCC 00-326, (released Sept. 8, 2000).

data queries are simultaneously occurring to determine the caller's physical location and callback number. With wireless callers, the location information may need to be updated throughout the call to achieve greater accuracy or because the caller is moving during the call.

Figure 2: Simplified Wireless E911 Call to PSAP with Phase II Capability



Sources: GAO; and Nova Development (clipart).

Phase II wireless E911 service is more complex to implement than Phase I because of the need to install equipment to determine the geographic coordinates of the caller, transfer that information through the telephone networks, and have a mapping system in place at the PSAP that can display the latitude and longitude coordinates of the caller as a map location for dispatching assistance. When Phase II location data is unattainable (e.g., the handset does not have line of sight to enough GPS satellites to determine the caller's location), most wireless systems default to providing Phase I data, including the location of the cell tower and cell sector receiving the call.

The increased complexity of Phase II also makes it more costly than Phase I to implement. To date, the federal government has played no role in financing the rollout of wireless E911 services. Wireless carriers must finance the implementation of a caller location solution and test equipment to verify accuracy. LECs are generally responsible for ensuring that all the necessary connections between wireless carriers, PSAPs, and databases have been installed and are operating correctly. PSAPs purchase telephone services from the LECs. Because the typical underlying wireline E911 network is unable to carry the additional wireless E911 information, PSAPs often must purchase a separate data link and connection from the LEC. In order to translate the latitude and longitude location information into a street address, PSAPs usually purchase and install mapping software. PSAPs may also need to acquire new computers to receive and display this information.

In short, three parties—the wireless carriers, LECs, and PSAPs—must interconnect and install equipment in order for wireless E911 calls to be completed and the caller location information to be sent with the call. However, no single entity has regulatory authority and oversight over the entire implementation process. FCC has considerable regulatory authority over wireless carriers and has placed location accuracy standards and deployment deadlines on the wireless carriers. State public utility commissions have some authority over wireless carriers' terms and conditions of service. The state public utility commissions also have a great deal of authority over the LECs, including authority over intrastate service rates, while FCC retains some authority over LEC interconnection agreements with wireless carriers and other issues. PSAP readiness remains a state and local issue because PSAPs serve an emergency response function that has traditionally fallen under state or local jurisdiction. The manner in which the more than 6,000 PSAPs across the country are administered and funded—at a state, county, city, or other political subdivision level—varies from state to state. According to FCC, the Commission has no authority to set deadlines for PSAPs' deployment of the equipment they need in order to receive caller location information from the wireless carriers. Setting such deadlines on PSAPs would be a matter for states and localities.

Another federal agency with an interest in this issue is DOT. According to DOT, its involvement stems from the department's mandate to handle issues of traffic safety and from a directive from the Secretary of Transportation to become involved in wireless E911 issues. DOT officials noted that wireless phones have become crucial to reporting highway

accidents and getting ambulances or other assistance to the scene. As will be discussed below, DOT is involved in several initiatives to track the progress of E911 deployment and help promote wireless E911 services, especially at the state and local level.

As the original Phase II deadline of October 2001 approached, the six large national wireless carriers (which provide service to approximately 75 percent of wireless telephone subscribers) requested waivers because the location technology was not ready for implementation. In granting the waivers, FCC negotiated different deadlines with each of these carriers, based on the carrier-specific Phase II compliance plans. The FCC also required these carriers to file detailed quarterly reports regarding implementation. In July 2002, FCC also granted temporary relief from the Phase II deadlines to those non-nationwide midsize and small wireless carriers that had requested relief.¹⁶ Currently, all wireless carriers that have chosen to deploy a handset-based location solution remain under a deadline of having handsets containing location technologies in use by 95 percent of subscribers by December 31, 2005. Yet, despite this deadline, Phase II service is not assured in any area by any specific date. This is because all wireless carriers must respond within 6 months to a PSAP request for the delivery of wireless E911 location information.¹⁷ PSAPs, however, are under no federal deadlines to ever request wireless E911 services. Thus, the full rollout of wireless E911 services nationwide depends in great part on the implementation efforts of the more than 6,000 PSAPs.

¹⁶On October 10, 2003, the FCC issued a six-month stay of applicable provisions of E911 rules, or until it decides on the merits, whichever is shorter, with regard to all pending petitions of small wireless carriers seeking relief. *In the Matter of Revision of the Commission's Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems*, CC Docket No. 94-102, *Order to Stay*, FCC 03-241 (Oct. 10, 2003).

¹⁷Under FCC rules, however, a wireless carrier and a PSAP can mutually agree to a time frame other than a 6-month response. 47 C.F.R. §20.18(j)(5).

Nationwide Phase I Deployment Is More Than Halfway Complete, but Full Phase II Deployment May Be Years Away

Based on the best data that is available, nearly 65 percent of PSAPs across the nation have implemented Phase I and 18 percent have implemented Phase II with at least one wireless carrier providing location information. However, there is still a lack of information regarding how many of the more than 6,000 PSAPs will need to upgrade their equipment, making it difficult to accurately measure the progress of wireless E911 implementation. Looking forward, our survey of state 911 contacts found that less than half of them believe that wireless E911 services will be fully in place in their state by 2005. This raises the prospect that E911 implementation will be piecemeal both within states and across the nation for an indefinite number of years to come.

Eighteen Percent of PSAPs Have Implemented Phase II, but Measuring Progress toward Full Deployment Is Hampered by Data Problems

Currently, the single best information source for tracking the progress being made in deploying wireless E911 service at the local level comes from DOT and the National Emergency Number Association (NENA). DOT contracted with NENA to create a database of counties and the PSAPs within the counties to provide information about implementation of wireless E911. This database is updated every quarter using wireless carrier information filed with the FCC, and supplemented by data gathered directly from PSAPs. Prior to the creation of this database, the only national data available about PSAPs that existed comprised information about NENA's membership, and that information did not include all PSAPs or track E911 deployments. Thus, the DOT/NENA initiative has provided a key instrument for measuring wireless E911 implementation.

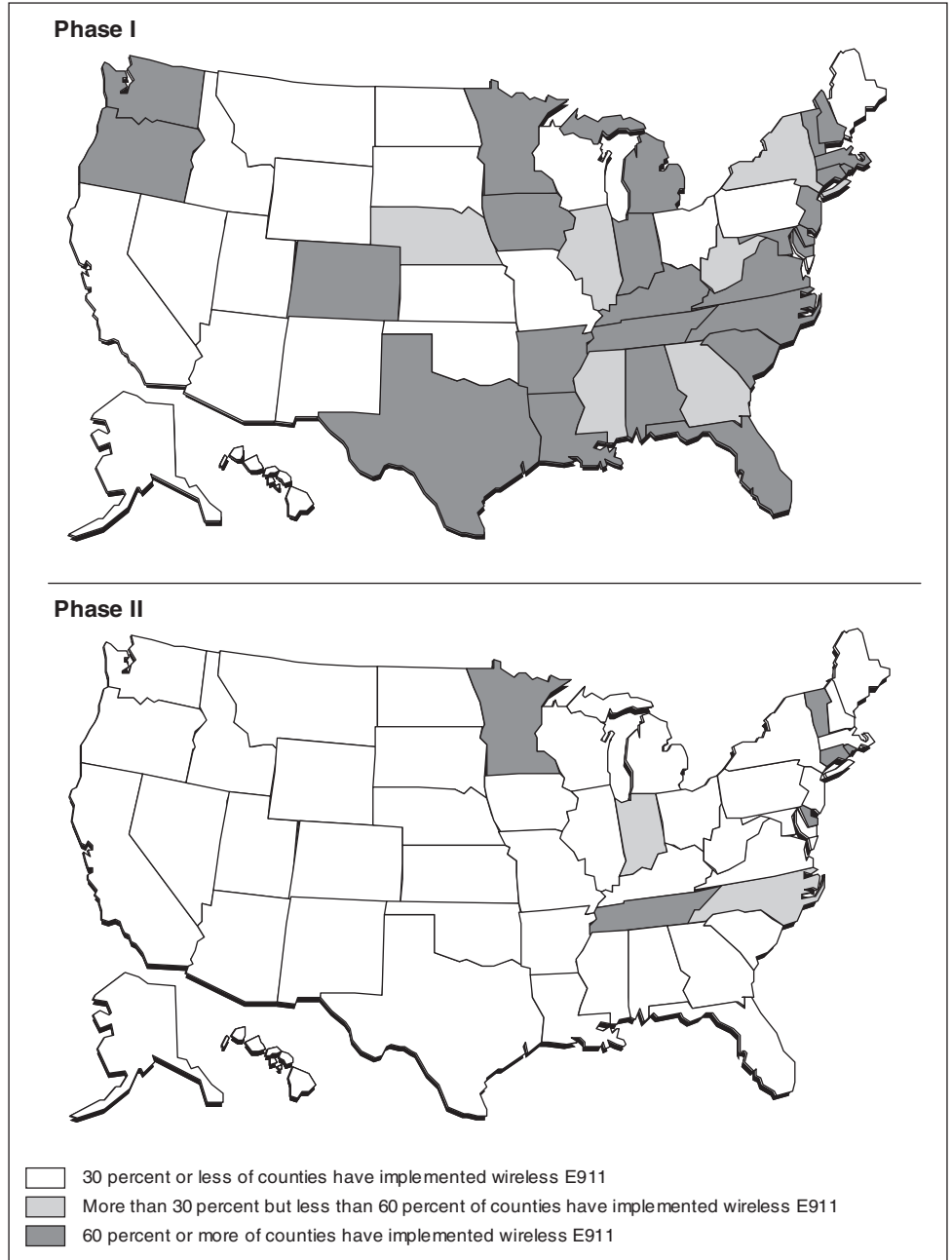
According to NENA, as of October 2003, nearly 65 percent of PSAPs nationwide had implemented Phase I wireless E911 services, which provides the call taker with the callback number and the location of the cell tower and cell sector receiving the 911 call. Phase II, which locates the caller with more precise geographic coordinates, has been implemented with at least one wireless carrier in 18 percent of PSAPs. As part of our survey of state 911 contacts, we asked respondents about their states' progress on Phase I and Phase II deployments. The responses to our survey were not complete because some state contacts were uncertain about their

state's current status.¹⁸ However, for the 33 states and the District of Columbia from which we did receive responses, we found that percentages for Phase I and Phase II implementation were consistent with NENA's data.

The percentages of counties that have implemented wireless Phase I and Phase II E911 service are illustrated, by state, in figure 3. The percentages are based on GAO's analysis of NENA data as of October 2003.

¹⁸The state contacts were taken from a list provided on FCC's Web site. The names were provided to FCC by the governor of each state. However, not all state contacts were actively involved in E911 issues, and some could provide only limited responses to our questions. We did speak with others suggested by the state contacts in some of our surveys. See appendix I for more information about our survey.

Figure 3: Percentage of Counties, by State, That Have Implemented Wireless E911 Phase I and Phase II as of October 2003



Source: GAO analysis of NENA data.

Note: As of October 2003, the District of Columbia had not implemented Phase I or Phase II.

Measuring the progress of wireless E911 implementation against the goal of full nationwide Phase II deployment depends on being able to compare the number of PSAPs that are receiving wireless Phase II location data with the universe of PSAPs that need to be upgraded. We found, however, that there is a lack of accurate information on the total number of PSAPs that need to be upgraded. NENA has determined that there are 6,143 PSAPs nationwide. However, this number includes both “primary” and “secondary” PSAPs. A primary PSAP is defined by NENA as a PSAP to which 911 calls are directly routed; a secondary PSAP only receives calls that have been transferred, or passed along, from a primary PSAP. Generally, primary and secondary PSAPs have been included in the total number of PSAPs that need to be capable of receiving wireless E911 information.

However, our survey results of state 911 contacts, along with our case study interviews, indicate that some states do not plan to upgrade their secondary PSAPs. For example, in North Carolina, state statute only permits primary PSAPs to be funded for wireless E911; in Kentucky, Virginia, and Washington, state funds to help finance wireless E911 upgrades are only available to primary PSAPs; in Maryland, the issue is currently under discussion, although consolidating secondary PSAPs with primary ones has been considered. In addition, some secondary PSAPs are so small that they may never need wireless E911 equipment. Currently, the DOT/NENA database does not differentiate between PSAPs that will need to be upgraded and those that will not, which limits usefulness of the database in accurately assessing progress toward full wireless E911 implementation.

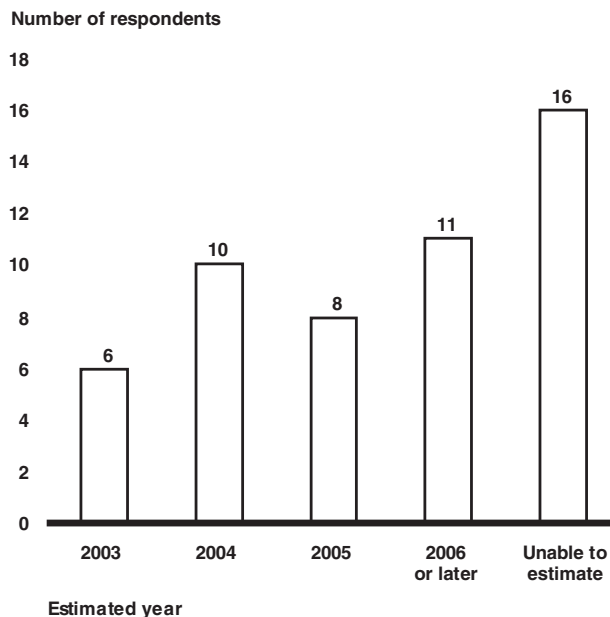
For its part, FCC requires large and midsize wireless carriers that have filed for relief from deployment deadlines to provide information quarterly on their progress in implementing Phase I and Phase II. Until recently, the data submitted by the carriers and available from FCC were organized by carrier, not by state or county, and were not easily sorted to provide information concerning the status of wireless E911 deployment. However, as of August 1, 2003, FCC also began requiring the large and midsize wireless carriers to submit data in an electronic spreadsheet format regarding deployment of Phase I and Phase II by PSAP. Because this spreadsheet has several fields, including the state, researchers can search by field and have numerous options for organizing the data. In addition, small wireless carriers, which had also requested relief, also were required to file one interim report with FCC about their E911 progress on August 1, 2003. Based on the August filings, FCC told us that most of the large and

midsize carriers appear to be making good progress toward readying their networks to respond to PSAP requests for E911 services.

State 911 Contacts Offered a Wide Range of Estimated Phase II Completion Dates

In our survey of state 911 contacts (which included the District of Columbia), we asked respondents to provide us with an estimate of when they believed their state would have wireless Phase II E911 fully in place for at least one wireless carrier per PSAP. Twenty-four of 51 respondents said they thought Phase II would be fully in place in their state by 2005, the last year for which there is any specific FCC deadline on wireless carriers. Six of those 24 respondents said they would be ready by 2003. Contacts in other states were either unwilling to commit to any specific year, given their current level of implementation, or estimated a date in 2006 or beyond. See figure 4.

Figure 4: Estimates by State 911 Contacts of Year Their State Would Have Phase II Wireless E911 Fully Implemented (Includes the District of Columbia)



Source: GAO state survey (June to September 2003).

As the estimates from state contacts indicate, no clear picture is emerging on when Phase II will be fully deployed nationwide, raising the prospect of piecemeal availability of this service across the country for an indefinite number of years to come.

Funding and Coordination Are Key Factors Affecting Current Wireless E911 Deployment, with New Wireless Services Posing Future Challenges

As of October 2003, NENA estimates that over the next 5 years the nationwide cost to deploy Phase II will be between \$8 billion and \$9 billion, including capital and incremental operating expenses. Funding for PSAP equipment upgrades remains a major issue for many states and localities and continues to hamper nationwide deployment. Not all states have implemented a funding mechanism for wireless E911, and of those that have, some have redirected E911 funds to unrelated uses. In addition, poor coordination among the parties is a factor affecting wireless E911 deployment, although some states and localities have eased this problem with active and knowledgeable state 911 coordinators who help oversee the process and work with all the parties. Technologically, the main hurdle of developing wireless location equipment for mobile phones has been solved, but the continuing emergence of new wireless devices and services has the potential to overburden the current 911 infrastructure.

Ongoing Problems with State and Local Funding of Equipment Upgrades Are Hampering the Deployment of Wireless E911

It is costly to implement wireless E911 services. PSAPs need money to upgrade their systems and equipment and to purchase new software to receive and display caller location information. Wireless carriers incur costs associated with handset and network upgrades, engineering design, upgrading hardware and software, and maintaining the system. The LECs also incur costs, but generally these are paid for by the PSAPs as they purchase 911 services and upgrades from the LECs. Currently, funding must come from sources other than the federal government, which has not provided funding to PSAPs or wireless carriers for wireless E911 or established guidelines on how wireless E911 should be funded.

At present, it is up to state and local governments to determine how to pay for PSAP wireless E911 upgrades. To cover the costs associated with implementing wireless E911, responses to our survey showed that the majority of states (39 states plus the District of Columbia) require wireless carriers to collect funds from their subscribers through a surcharge included on subscribers' monthly wireless phone bills.¹⁹ The amount of the surcharge is usually determined by the state; responses to our survey showed the surcharges ranged from 5 cents to \$1.50 per month. Generally, the wireless carriers submit the funds to the states, and the states have the discretion to determine how the funds will be managed. For example, some states have established E911 boards that oversee the funds, while other states allow the funds to be managed at the county or PSAP level. Methods of disbursement also varied. Some states allocated wireless E911 funds to PSAPs based on their jurisdictional population, while some based it on the number of wireless subscribers in the jurisdiction. Other states evenly divided the funds among counties or PSAPs.

Although the majority of states have established some type of funding mechanism, problems with funding PSAP equipment upgrades persist. For example, NENA maintains that many communities are not in a position to implement wireless E911 service because funds collected for E911 deployment are not being allocated for that purpose. Our survey of state E911 contacts found that 13 states and the District of Columbia had used wireless E911 funds for expenditures unrelated to wireless E911 implementation, and 9 other states had attempted to do so. For example, in one state, more than \$40 million was taken from the E911 fund for unrelated purposes, and an additional \$25 million is expected to be taken in 2004. The state contact said that if the redirection of funds continues, it would bring E911 upgrades to a halt. Another state E911 contact told us that the use of some E911 funds for other purposes had hindered the ability of PSAPs to purchase necessary computer upgrades and mapping software. In another state, funds had not been redirected to other purposes, but the E911 funds were "frozen" by the state's legislature and could not be used by the PSAPs to implement Phase II. The state E911 coordinator told us that the state's E911 fund had sufficient monies to implement Phase II statewide, but many PSAPs could not move forward until the state's

¹⁹Three other states had a wireless E911 funding mechanism in place, but did not impose surcharges on wireless subscribers. To pay for wireless E911 implementation, one state used funds from general revenue, one used funds from the state's Universal Service Fund, and one state used funds collected for wireline 911.

legislature allocated funds for E911 initiatives, and it was unclear when or if that would occur.²⁰

In addition to the redirection of E911 funds, our survey of state contacts found that eight states have never instituted a statewide system for collecting funds for wireless E911 purposes. In one state, for example, any fee or tax proposed to be placed on the public must be approved by the state's voters, and legislation creating an E911 funding mechanism did not receive voter approval. The state's E911 contact told us that the proposed legislation would have generated sufficient funds for deploying wireless E911 statewide, but without the funding, most counties in the state will not have Phase II implemented by 2005. Some of the other eight states have experienced opposition to E911 funding because it is perceived as a tax; another state has not addressed the issue of wireless E911 implementation at all.

Another funding issue raised by survey respondents and by others we interviewed was that rural PSAPs in particular face funding problems for E911. For example, some states allocate funds to the PSAPs based on their jurisdictional population, which may cause PSAPs serving small or rural communities in those states to receive insufficient funds to implement E911. While many of the costs involved in purchasing upgraded equipment and mapping software are similar for PSAPs serving large and small communities, PSAPs that receive fewer E911 funds because of their smaller population base may not have adequate funds to purchase the necessary equipment and software. Two wireless carriers told us that numerous PSAPs they serve had either withdrawn or suspended their request to wireless carriers for Phase II service because of funding constraints.

Wireless carriers also incur various costs to implement E911. For example, two wireless carriers told us they had spent about \$50 million each to date to deploy E911, and three others said their costs would exceed \$100 million each. Several of the small wireless carriers we interviewed in our case studies said that funding E911 technologies is particularly difficult for them

²⁰Legislation introduced in the U.S. Senate and House of Representatives would provide annual grants to states and localities to improve emergency communications (see S.1250, 108th Cong., 1st Sess. (2003); H.R. 2898, 108th Cong., 1st Sess. (2003)). Both bills would require states and localities to match the grants provided by the federal government and would prohibit federal grant monies from being awarded to states that redirect funds collected specifically for E911 initiatives to nonemergency communication uses.

because of their limited revenues and that raising their rates would risk their competitiveness in the market. While FCC requires wireless carriers to implement E911, the Commission has not mandated as a prerequisite to implementation that the carriers be reimbursed for their E911 expenses.²¹ Although responses to our survey showed that 32 states and the District of Columbia allow wireless carriers to recover their E911 costs from the state funding mechanism, state E911 contacts sometimes reported that it might be difficult for the carriers to recoup all of their E911 costs.²² For example, some states only allow the wireless carriers to be reimbursed if funds were appropriated for that purpose, and other states told us that only certain wireless carrier expenditures could be reimbursed. The wireless carriers we contacted said it was unlikely that all of their costs would be fully recovered, especially since cost recovery mechanisms are not available in all states. One wireless carrier told us that in some states, the E911 surcharges imposed on customers do not generate sufficient revenue to pay for both PSAP and carrier costs incurred in E911 deployment. Another wireless carrier said that some states make it so difficult for the wireless carrier to recover its costs that the carrier will not even attempt to get funds from those states. Since it is unlikely that all E911 implementation costs can be recovered through the states, several of the wireless carriers we contacted have chosen to charge their subscribers an additional monthly fee to help pay for E911 costs.

Problems with Coordination Continue to Slow Wireless E911 Deployment

As noted earlier, the deployment of wireless E911 systems requires wireless carriers, LECs, and PSAPs to work together in distinct yet interdependent roles. However, according to some contacts we interviewed, delays sometimes occur because the various parties have difficulty coordinating their activities or working together. There was no consistency across the interviews as to which party (or parties)—wireless carriers, LECs, or PSAPs—was most hindering wireless E911 deployment.

The difficulties in coordination between the parties at times caused frustration, according to some contacts we interviewed. For example, representatives from two of the PSAPs we contacted noted that just

²¹Initially, FCC said wireless carriers were not required to provide E911 service unless a cost recovery mechanism was in place, but FCC reversed this decision in November 1999.

²²A representative from one PSAP told us that some wireless carriers might not seek to recoup costs incurred with deploying E911 if they plan to use the location technologies for commercial purposes.

determining the number of wireless carriers providing service in their PSAP's jurisdiction can be difficult. One PSAP administrator told us that in order to get a complete list of providers before sending out his request letters for Phase I, a PSAP employee drove around the county to identify the cell tower owners and contacted them to obtain the names of the wireless carriers leasing space on the towers.²³ The PSAP administrator noted as well that tracking down the right contact person at the wireless carrier was difficult.

In another example, representatives from several wireless carriers said that some PSAPs had requested E911 service from the wireless carriers even though the PSAPs' call centers were not yet ready to receive caller location information because the proper equipment had not yet been installed. This might occur because some PSAPs fail to understand what is required of them technologically and what tasks they need to complete prior to requesting E911 service. Traditionally, PSAP administrators have focused on public safety and emergency response, not telecommunications. The complexity of implementing wireless E911, however, has forced PSAP administrators to become telecommunications project managers and to learn about the technology involved.

We also were told that LECs have contributed to implementation delays. One PSAP representative told us that difficulties encountered with the LEC were a major obstacle to implementing wireless E911 and that the LEC delayed installing lines necessary for wireless E911 for 4 months, which greatly slowed the process. Because of continuing problems with the LEC in this location, the PSAP purchased its own call routing equipment. Similarly, another PSAP representative told us the main obstacle they faced in implementing E911 was working with the LEC. The PSAP representative noted that no one contemplated the role the LEC would play in the implementation of E911 and that this has led to problems and delays. A number of stakeholders we interviewed believed that FCC needs to be more involved with the LECs to ensure they are an active player in wireless E911 implementation. For example, an official representing a public safety association stated that FCC should closely monitor the role that the LECs play in wireless E911 implementation and should employ its oversight role

²³According to FCC, PSAPs can find wireless carrier licenses that serve their area from FCC's Universal Licensing System database. However, FCC stated that it might be difficult to link the name of the licensee to the name under which the actual operating carrier does business. The FCC database is available via its Web site at <http://wireless.FCC.gov/uls/>.

to facilitate corrective action to expedite wireless E911 compliance. Several of those we interviewed in our case studies suggested that FCC take on greater enforcement of the LEC role in E911 implementation, and perhaps consider placing deadlines on LECs to respond to PSAP requests for E911 upgrades. According to FCC, the Commission does not have clear jurisdiction over wireline carriers with regard to wireless E911 implementation, and the Commission looks to the state public utility commissions, which have clear and sufficient authority to take the lead. However, FCC has indicated that it is committed to monitoring the LECs' implementation role to ensure that they are meeting their responsibilities with regard to E911 deployment.²⁴

In response to these problems with coordination, many industry representatives and affected parties we contacted noted that a strong, knowledgeable state E911 coordinator was the key to helping to coordinate the parties and successfully implement wireless E911 services within the state. Many believed that those states with strong state E911 coordinators had made the most progress with wireless E911 implementation. These state coordinators perform tasks such as

- educating PSAPs about their wireless E911 responsibilities,
- providing technical assistance to PSAPs,
- bringing all parties together early on to discuss implementation issues and providing a single point of contact for all the parties, and
- lobbying for E911 funding and protecting the funding from being used for purposes unrelated to wireless E911 implementation.

Besides voicing support for effective state coordinators, those we interviewed provided several illustrations of actions their states were taking to facilitate wireless E911 implementation:²⁵

²⁴*In the Matter of Revision of the Commission's Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems, Petition of City of Richardson, Texas*, CC Docket 94-102, Order on Reconsideration, FCC 02-318 (released Nov. 26, 2002).

²⁵In addition to efforts by state officials to improve coordination, several public safety and industry associations have worked to provide information and assistance with wireless E911 implementation.

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- Several parties we spoke with mentioned that they had had a conference call or meeting early on between the wireless carrier, LEC, and PSAP to talk through the process and try to identify problems.
 - Kentucky requires all PSAPs to go through a certification process with the state board to ensure preparedness for both wireline and wireless E911 implementation. This certification process was created to establish an overall uniformity for the state's PSAPs. By using a checklist for upgrades and an inspection process, Kentucky expects all of its PSAPs that go through the certification process will be Phase II operational by January 2005.²⁶
 - California purchases equipment at the state level to create advantages in negotiating contracts with vendors and to create economies of scale in equipment purchases.
 - Indiana has an elected official in charge of funding, which provides for greater visibility of the E911 issue in the state and helps protect against redirection of E911 funds to other uses.
 - Virginia contracts with several technical consulting firms for wireless E911 implementation. The PSAPs are allowed to use contractors from this pool and can use the wireless E911 funding they receive from the state to pay for contractors' services. This arrangement provides needed technical assistance for PSAPs while allowing greater oversight of the contractors.

Early Problems with Location Technology Appear Resolved, but Technical Challenges Remain Regarding New Wireless Devices and Services

During our interviews, we were told that the basic technology for accurately determining the location of a wireless caller and systematically providing that data to PSAPs has now been developed. Some noted that although occasional problems still arise due to a particular wireless carrier/LEC/PSAP equipment configuration, these problems are lessening as the parties gain experience with E911 implementation. A representative of one LEC noted that the "challenging years" of coordinating interconnection between the LEC and the wireless carrier seem to be behind them and that implementation now generally tends to proceed more smoothly.

²⁶However, 25 counties in Kentucky still do not have wireline E911.

We asked the officials we interviewed what they saw as the remaining technical issues affecting wireless E911 implementation. Several parties mentioned a variety of technical problems that might slow wireless E911 implementation or affect the quality of 911 services in general. Problems that were mentioned include the following:

- Because the United States never adopted a single standard for mobile phone transmissions, the different systems used by wireless carriers are not always compatible with one another, which can affect the ability of a particular subscriber to reach 911 in the first place if they do not have a phone that can be used with multiple systems.
- While GPS can provide more accurate location data, concerns exist over the time it takes for location data to be calculated and delivered to the PSAP. In the context of an emergency call, even a wait of 10 or 20 seconds for the location data to be processed is considered a loss of valuable time.
- For rural wireless carriers that have selected a network-based solution, cell towers often are placed in a straight line and spaced widely apart along highways or other roads. This can make the determination of location difficult because the towers cannot accurately triangulate the location of the caller. Additionally, the handset-based solution may not be immediately available due to equipment issues.

Another problem was raised by some of those we interviewed: the antiquated wireline 911 infrastructure that conveys many E911 calls from the wireless carrier to the PSAP. This issue was also raised by Dale Hatfield, former chief of FCC's Office of Engineering and Technology. In 2001, FCC asked Mr. Hatfield to conduct an inquiry into the technical and operational issues associated with wireless E911 deployment. His October 2002 report to FCC noted that the wireline 911 network is fundamentally unchanged since its inception in the 1970s and that the existing 911 infrastructure "is in no condition to accommodate the pervasive use of wireless technologies, the Internet, or the many other product offerings that invite or demand access to 9-1-1 services."²⁷ Those offerings include

²⁷Dale N. Hatfield, *A Report on Technical and Operational Issues Impacting the Provision of Wireless Enhanced 911 Services*, prepared for the FCC (Oct. 15, 2002), Docket No. 02-46, pp. 13-14, quoting SCC Communications Corp., *9-1-1 Networks in the 21st Century—The Case for Competition* (Feb. 20, 2001), p. 2.

new wireless technologies that could send E911 calls (e.g., automatic crash notification systems on cars that would also be able to send information to the 911 call taker about whether air bags have deployed or whether the car has flipped over), and the 911 services may need to be expanded to encompass such technologies. Many of those with whom we spoke believed that such new technologies should be considered now, rather than later. Some were critical of the LECs' failures to upgrade to modern digital technologies that would facilitate the rollout of wireless E911 technologies and improve 911 services. FCC released a notice of proposed rulemaking to reevaluate the scope of communications services that should provide access to 911 and has received comments and reply comments from interested parties.²⁸ NENA is also trying to address the issue of new technologies and of a "future path plan" for the 911 network.²⁹

The Recent Actions of FCC and DOT Are Focused on Enforcing Deadlines on Wireless Carriers and Improving Deployment Coordination

FCC and DOT have been involved in the implementation of wireless E911, but federal authority in overseeing the deployment is limited because of the traditional state and local jurisdiction over emergency response services. The primary federal agency involved in wireless E911 deployment is FCC. One of FCC's goals is to ensure the wireless carriers comply with their current implementation schedules. As noted earlier, FCC in the past had granted waivers to many of the wireless carriers in order to give them more time to resolve technical issues associated with developing wireless location technologies. Because many of these hurdles have now been overcome, FCC has stated that it will not hesitate to use its enforcement power when the wireless carriers fail to meet their current deployment timetables. For example, FCC officials noted that three wireless carriers agreed to pay nearly \$4 million to the U.S. Treasury for failure to comply with intermediate deadlines in their E911 deployment timetables.

²⁸See *In the Matter of Revision of the Commission's Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems*, CC Docket 94-102, *Further Notice of Proposed Rulemaking*, FCC 02-326 (released Dec. 20, 2002).

²⁹NENA is working to develop a plan for aggressively managing the technical evolution of the overall 911 system and emergency communications process in ways that serve local and national emergency needs. This technical plan will seek to provide a long-term direction for 911 to support new call sources (such as text messaging devices) and needs.

Beyond enforcing deadlines on wireless carriers, FCC has taken actions to identify both roadblocks and best practices in wireless E911 implementation. For example, the Hatfield report made a number of findings regarding obstacles to wireless E911 implementation. Those findings involve wireless carrier implementation issues, cost recovery and PSAP funding issues, and the lack of comprehensive stakeholder coordination. Public comment was sought on the report in late 2002 and, according to FCC, the Commission is currently considering both the recommendations contained in the report and the comments received.³⁰ FCC also conducted its first Enhanced 911 Coordination Initiative meeting in April 2003. The meeting brought together representatives from the federal government, the public safety community, wireless carriers, LECs, and other interested stakeholders to share experiences and devise strategies for expediting wireless E911 deployment. According to FCC, lessons learned from the initiative include the following:

- Strong leadership and vision are essential to ensure swift wireless E911 deployment.
- State or regional points of contact are critical for prompt wireless carrier deployment.
- Wireless E911 in rural areas may pose additional challenges such as financial hurdles and accuracy concerns.³¹

³⁰In his report to the FCC, Mr. Hatfield recommended that a national 911 program office be established within the Department of Homeland Security. He also recommended that FCC (1) maintain or even increase its oversight of the rollout of wireless E911 services; (2) establish an advisory committee to address the development and evolution of E911 systems and services; (3) continue to urge the creation of organizations at the state, regional, and local levels to coordinate the rollout of wireless E911; (4) encourage the creation of a national clearinghouse to collect, store, and disseminate wireless E911 information; (5) actively coordinate with and support DOT's Wireless E911 initiative and other efforts; (6) continue to support the efforts of the Emergency Services Interconnection Forum to address the issues of PSAP readiness; (7) work closely with individual state and regulatory commissions and their association, the National Association of Regulatory Utility Commissioners, in resolving issues relating to LEC cost recovery and pricing; and (8) urge stakeholders to develop industrywide procedures for testing and certification of wireless E911 to ensure that they meet the accuracy requirements in FCC rules. Mr. Hatfield also made several other recommendations relating to technical, regulatory, and consumer issues.

³¹Near the end of our review, FCC announced that they would be conducting another Wireless E911 Coordination Initiative to be held October 29-30, 2003.

Additionally, in August 2003, FCC announced the establishment of a wireless E911 technical group to focus on network architecture and technical standards issues. The group will be a subcommittee of the Commission's Network Reliability and Interoperability Council. Also in August 2003, FCC announced a wireless E911 public awareness campaign emphasizing coordination, outreach, and education. One of the first outcomes of the campaign was an FCC advisory published for consumers providing information on what people need to know about calling 911 from a mobile phone. A copy of this consumer advisory is found in appendix II of this report.

DOT also has efforts under way to promote wireless E911 implementation, focusing on implementation issues at the state and local level. DOT partnered with NENA to develop a Wireless Implementation Plan. One major aspect of this plan is the creation of a clearinghouse of wireless E911 planning, implementation, and operations resources. The clearinghouse is an attempt to gather and organize the best examples of information from various states, work groups, and ongoing development efforts. The clearinghouse also includes various forms used by parties across the nation in implementing E911 agreements. As discussed earlier, another major component of DOT's efforts is the sponsorship of a PSAP database (under contract with NENA) that tracks the current status of wireless E911 implementation across the country.³²

DOT also convened a Wireless E911 Steering Council³³ to develop a Priority Action Plan, released in May 2003, that outlines six priorities for wireless E911 implementation:

1. Establish support for statewide coordination of wireless E911 technology, and identify points of contact within each state for each of the stakeholders.
2. Help to convene stakeholders in appropriate 911 regions in order to facilitate more comprehensive, coordinated implementation of wireless location technologies.

³²Links to the clearinghouse and the database are available on DOT's Web site. See <http://www.itspublicsafety.net/wireless.htm>.

³³The Wireless E911 Steering Council includes leaders of the telecommunications, public safety, and highway safety communities.

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3. Examine cost recovery and funding issues at the state level.
 4. Initiate a knowledge transfer and outreach program to educate PSAPs, wireless carriers, and the public about wireless location issues.
 5. Develop a coordinated deployment strategy encompassing both rural and urban areas.
 6. Implement a “model location program” to identify and isolate potential barriers to wireless E911 deployment.

Work on implementing this plan was in its early stages at the time we concluded our review. However, DOT had subdivided each priority into a number of action items, identified lead agencies or associations for each action item, and established a time frame for completion of each action item.

FCC and DOT staff told us that the agencies coordinate their wireless E911 activities to avoid duplication of effort. An FCC representative attends DOT meetings and events on wireless E911 to stay current with the department’s activities; similarly, a DOT representative attends FCC meetings and initiatives on wireless E911. DOT officials noted that their efforts have been concentrated on providing assistance at the PSAP level since FCC has authority over the wireless carriers and LECs. While the agencies do not currently jointly staff or fund any wireless E911 projects, FCC officials noted that more formalized coordination is possible in the future.

Conclusions

Without the readiness of all parties—wireless carriers, LECs, and PSAPs—there can be no wireless E911 service. Efforts by FCC to monitor the progress of the wireless carriers in meeting their timetables and take enforcement actions, as warranted, will continue to be an important part of the implementation process. Still, given current E911 funding and coordination problems related to upgrading PSAPs at state and local levels, the pace of wireless E911 deployment could be similar to what happened with wireline E911, which took many years to implement nationwide. If this holds true, consumers and emergency management officials will be faced with a geographic patchwork of wireless E911 areas: Some will have service; some will not. As Americans travel across the country, they will be uncertain as to whether their 911 calls will convey their location. However, successful wireless E911 deployment is possible, as illustrated in some areas of the country. States and localities can benefit from the experiences

and best practices of others and adapt them to their own situations. Continued efforts by the FCC, DOT, and the public safety community to identify and publicize these successes will be a valuable means of facilitating the deployment.

During this transition period, it is important to accurately measure progress in wireless E911 deployment so that federal, state, and local officials can assess whether problems are arising in parts of the country that may require additional actions. This information would also help build public awareness of where this service is available and may stimulate action at the state and local level. Measuring the progress of wireless E911 implementation against the goal of full nationwide Phase II deployment depends on being able to compare the number of PSAPs that are receiving wireless Phase II location data with the total number of PSAPs that need to be upgraded. We found, however, that there is a lack of information on the total number of PSAPs that need to be upgraded. While FCC and DOT have taken important actions to track wireless E911 deployment, additional work is needed to create reliable data on how many of the more than 6,000 PSAPs will need to be upgraded.

Recommendation for Executive Action

In order to provide the Congress and federal and state officials with an accurate assessment of the progress being made toward the goal of full deployment of wireless E911, we recommend that the Department of Transportation work with state-level E911 officials, the National Emergency Number Association, and other public safety groups to determine which public safety answering points will need to have their equipment upgraded. This information should then be reflected in the PSAP database managed by NENA under contract with DOT. This will provide the baseline needed to measure progress toward the goal of full nationwide deployment of wireless E911 service.

Agency Comments

We provided a draft of this report to DOT and FCC for review and comment. DOT stated that it generally agreed with our recommendation, and FCC offered some technical comments that we incorporated into the report where appropriate.

As agreed with your office, unless you publicly announce its contents earlier, we plan no further distribution of this report until 14 days after the

date of this letter. At that time, we will send copies to interested congressional committees; the Chairman, FCC; the Secretary, Department of Transportation; and other interested parties. We also will make copies available to others upon request. In addition, this report will be available at no cost on the GAO Web site at <http://www.gao.gov>. If you have any questions about this report, please contact me at (202) 512-6670 or goldsteinm@gao.gov. Key contacts and major contributors to this report are listed in appendix III.

Sincerely yours,

A handwritten signature in black ink, appearing to read 'M. Goldstein', with a long horizontal flourish extending to the right.

Mark L. Goldstein
Director, Physical Infrastructure Issues

Scope and Methodology

To provide information on the progress made in deploying wireless E911 services throughout the country, we conducted a telephone survey of the state E911 contacts. We completed surveys for 50 states and the District of Columbia. We pretested the questions with five state contacts from states we had spoken with earlier in our research. We revised the survey as appropriate based on responses during pretesting. For each state and the District of Columbia, we began by contacting the person named on the FCC's Web site at <http://www.fcc.gov/911/stateplans/contacts.html> as the point of contact for that state.¹ In 25 states, the person named on FCC's Web site did complete the survey. In the remainder of our surveys, we were directed to another person. The survey contained 17 questions about the state's progress in implementing Phase I and Phase II, problems encountered, funding mechanisms in place, and the role of the state coordinator or any state offices involved in wireless E911 implementation. The questions were open-ended and were read to the respondents. Surveys were completed between June 11 and September 12, 2003. In addition to our survey results, we used data from the National Emergency Number Association (NENA) to illustrate the progress of wireless E911 implementation as of October 2003. To assess the reliability of NENA's data regarding information on total costs to upgrade PSAPs to Phase II readiness and the number of PSAPs receiving Phase II data as of the August 1, 2003, FCC quarterly filings, we interviewed knowledgeable officials from NENA about their data collection methods and reviewed any existing documentation relating to the data sources. We determined that the data were reliable enough for the purposes of this report.

To provide information on the factors affecting wireless E911 rollouts across the country, we selected nine states (California, Idaho, Indiana, Kentucky, Maryland, Missouri, South Carolina, Texas, and Virginia) and the District of Columbia for case studies. We selected states that were spread geographically across the U.S. and that appeared to be having various levels of success with wireless E911 implementation based on early research. In particular, we selected at least one rural state and at least one state known to have redirected funds collected for E911 implementation to other uses. For each case study, we interviewed (in person or by telephone)

¹These names were provided to FCC by the governor of each state in response to a request from FCC's Chairman. FCC did not list a contact person for the states of Wisconsin and Oklahoma, so we obtained a contact name from NENA for these two states. We also did not receive a response from the contact for New York and completed the New York survey with a person suggested by NENA.

the state coordinator, a small wireless carrier serving that state,² and one urban PSAP and one rural PSAP within the state.³ In addition to our case studies, we interviewed representatives from four public safety associations and two wireless industry associations. We interviewed representatives from five large national wireless carriers and received written responses to our questions from a sixth large national wireless carrier. We also interviewed representatives from six local exchange carriers and one manufacturer of mobile phones.

To provide information on current federal government actions to promote the deployment of wireless E911 services, we spoke with officials at FCC and DOT about their involvement in wireless E911 implementation. We reviewed relevant orders, filings, and other materials from FCC docket number 94-102 on E911 implementation. We researched relevant materials from both FCC and DOT, such as DOT's Priority Action Plan. We attended FCC's daylong Enhanced 911 Coordination Initiative in April 2003.

Statistics presented in the first paragraph of the report are from the Cellular Telecommunication & Internet Association, unless otherwise noted. Statistics presented in the first paragraph of the background section are from NENA. All of these statistics are presented for background purposes and were not verified by GAO.

We conducted our review from January 2003 through October 2003 in accordance with generally accepted government auditing standards.

²For purposes of our case studies, a small wireless carrier was considered any wireless carrier other than the six large nationwide wireless carriers (AT&T Wireless, Cingular, Nextel, Sprint, T-Mobile, and Verizon Wireless).

³There were some exceptions to our case study formula. The District of Columbia has only one PSAP and has no small wireless carriers. California has no rural PSAPs that take wireless calls. Instead, we interviewed the California Highway Patrol, which handles most of the wireless 911 calls in California. Lastly, we were unable to schedule an interview with a small wireless carrier serving the state of Missouri.

FCC Consumer Advisory about Calling 911 from Your Wireless Phone

Among other responsibilities, FCC's Consumer & Governmental Affairs Bureau educates and informs consumers about telecommunications services. To this end, the Bureau has produced a number of consumer alerts and fact sheets. Among these is a new consumer advisory entitled "What You Need to Know about Calling 911 from Your Wireless Phone." This consumer advisory is reprinted on the following pages and can be accessed at FCC's Web site at www.fcc.gov/cgb/consumerfacts/e911.html.

Federal Communications Commission Consumer Advisory

What You Need To Know About Calling 911 From Your Wireless Phone

The FCC thinks it is important for consumers to know more about calling 911 from a wireless phone. In some areas, 911 operators automatically receive the phone number or location of a wireless call, but in many areas, that is not yet the case. Technology that will provide that information— Enhanced 911 or “E911” — is currently being implemented, but is not yet available in many wireless phones or most parts of the country. Though a great deal of progress has been made over the past year, some wireless carriers and some state and local governments have invested more than others in bringing this life-saving technology to consumers.

Find out whether E911 has been deployed where you live and work so you will know how much information you need to be prepared to give a 911 operator. If E911 is not yet available in your area, make sure to tell the emergency dispatchers your phone number and where you are. Inform yourself about the current capabilities of your wireless service.

Ask your wireless carrier –

Have you received a request from local public safety officials to deploy E911 in my area?

What is the status of your E911 deployment in my area?

Does my phone work for E911? What other models work for E911?

Ask your state legislators and public safety officials –

Is my local 911 call center ready for E911?

If not, what is the plan for making the necessary upgrades?

Is the E911 surcharge on my bill being used for E911?



Federal Communications Commission • Consumer & Governmental Affairs Bureau • 445 12th St., SW • Washington, DC 20554
1-888-CALL-FCC (1-888-225-5322) • TTY: 1-888-TELL-FCC (1-888-835-5322) • Fax: 1-866-418-0232 • www.fcc.gov/cgb

**Appendix II
FCC Consumer Advisory about Calling 911
from Your Wireless Phone**

-2-

Implementing E911 Technologies

The deployment of E911 is complicated and requires expensive upgrades to local 911 call centers ("Public Safety Answering Points" or "PSAPs") and coordination among wireless carriers, equipment vendors and manufacturers, and state and local public safety agencies. The FCC's E911 rules require the wireless carriers to implement in two phases. "**Phase I**" enables emergency personnel to know the wireless phone number of the caller and which communications tower is transmitting the call, which greatly narrows the potential area of search. "**Phase II**" provides more specific location information on the whereabouts of the caller.

Carriers may satisfy the Commission's requirements by choosing either a "**handset**" solution or a "**network**" solution, and you should know which solution your carrier has chosen.

A **handset** solution involves enhanced GPS capability in the phone itself. Under FCC rules, carriers using handset-based solutions need to pinpoint wireless 911 callers to 50 meters for 67% of their calls and to 150 meters for 95% of their calls. Of the major wireless carriers, Verizon Wireless, Sprint PCS, Nextel, and ALLTEL have chosen a handset solution. ***If you subscribe to one of these carriers, find out whether your phone has E911 location capabilities.***

A **network** solution involves base stations -- towers and antennae -- in the carrier's network to measure the timing of signals emitted from the phone, and the location capability is located primarily in the network, not in the phone. Under FCC rules, carriers using network-based solutions need to pinpoint wireless 911 callers to 100 meters for 67% of their calls and to 300 meters for 95% of their calls. Of the major wireless carriers, AT&T Wireless, Cingular, and T-Mobile have chosen a network solution. ***If you subscribe to one of these carriers, it is not necessary to have a particular model of phone for E911 to work.***

In either case, your wireless carrier and your phone are only half the equation. Your state and local government also must devote the resources to upgrade your state's 911 call centers. Consumers need to be fully informed about both halves of the E911 equation.

For additional information on Wireless Enhanced 911 (E911), contact the FCC's Consumer Call Center toll free at: 1-888-CALL-FCC (1-888-225-5322) voice, 1-888-TELL-FCC (1-888-835-5322) TTY or visit our Web site at www.fcc.gov/911enhanced.

For this or any other consumer publication in an accessible format (electronic ASCII text, Braille, large print, or audio) please write or call us at the address or phone number below, or send an e-mail to FCC504@fcc.gov.

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This document is for consumer education purposes only and is not intended to affect any proceeding or cases involving this subject matter or related issues.

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