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Before the
Federal Communications Commission
Washington, D.C. 20554

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In the Matter of)
)
Revision of the Commission's Rules)
To Ensure Compatibility with)
Enhanced 911 Emergency Calling Systems)
)

CC Docket No. 94-102 /

**UNITED STATES CELLULAR CORPORATION
PETITION FOR WAIVER OF SECTIONS 20.18(e) AND (g)
OF THE COMMISSION'S RULES**

UNITED STATES CELLULAR
CORPORATION

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September 10, 2001

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United States Cellular Corporation ("USCC"), by its undersigned counsel and pursuant to sections 1.3 and 1.925 of the Commission's rules, hereby petitions for a waiver of sections 20.18(e) and (g) of the Commission's rules regarding the October 1, 2001 implementation deadline for phase II E911 services. Specifically, USCC requests a waiver to permit it to deploy a handset-based solution across its CDMA network consistent with the commercial availability of phase II compliant handsets and Mobile-Assisted Network Location System ("MNLS") technology across its TDMA network. As demonstrated more fully below, USCC's waiver request satisfies the Commission's legal standards and is entirely consistent with the voluminous number of phase II E911 waivers already filed in this proceeding.

I. Introduction & Summary

USCC is committed to public safety and the nationwide roll-out of E911. USCC's goal is to provide ubiquitous availability of reliable, enhanced public safety to its customers. USCC is also committed to delivering E911 to its customers expeditiously, accurately and cost effectively. For these reasons, USCC contributed to and supported the original consensus agreement between the public safety and wireless industries in 1996, which

set out challenging, yet what was believed at the time to be achievable goals to meet the expectations of USCC's customers and their need for E911.

As a predominantly rural carrier, USCC covers 14.88 percent of the square miles of the country while reaching approximately 9.4 percent of the population. Approximately 67 percent of the population served by USCC utilizes a TDMA air interface, while 33 percent utilize a CDMA air interface.¹ USCC's mixed air interface results from its status as a rural carrier. In order to maximize roaming revenue on a spectrum efficient basis, USCC has consistently selected the same digital air interface as the carriers serving the nearby major metropolitan markets. This decision also ensures that USCC's customers enjoy so-called full-featured roaming in the nearby major markets.

USCC interacts with over 1000 PSAPs throughout 627 counties included in its service area.² Many of these PSAPs are small, unsophisticated entities that are far from capable of deploying phase II E911 service. In fact, as of August, 2001, only 218 of these PSAPs (less than 25 percent of the total PSAPs served) have implemented phase I.³ Only 10 PSAPs (less than 1 percent of the total PSAPs served) have submitted phase II requests to USCC, none of which have been validated. Thus, even if USCC were capable of meeting the October 1, 2001 deadline for deploying phase II compliant GPS handsets, very few of its customers would receive the location service due to lack of PSAP readiness.

USCC has been an active participant in the E911 proceeding. Throughout these proceedings, USCC has attempted to focus the Commission's attention on the particular difficulties of predominantly rural carriers in deploying 911. USCC has repeatedly urged the

¹ A map depicting USCC's territory is attached hereto as Exhibit A.

² Counties within the USCC service area are frequently served by several PSAPs.

Commission to move away from a one-size-fits-all approach in its rules governing the roll-out of E911. A witness from USCC testified at a House Subcommittee oversight hearing in July 2001 on the E911 roll-out to highlight the special circumstances facing rural carriers. USCC again urges the Commission to abandon the one-size-fits all approach as it addresses the multitude of phase II waiver requests currently pending.

Two rural carrier E911 issues are particularly relevant in considering the instant waiver request. First, as the Commission itself recognized in the *Third Report & Order*, rural wireless networks have not been designed to accommodate a network-based phase II solution.⁴ This is because in rural areas, cell sites cover extremely large land areas and are often aligned on a straight path along major interstates or through the populated areas—the so called “string of pearls” configuration.

This configuration, which is optimal to maximize voice traffic coverage cost effectively, makes it impossible to triangulate a signal to determine the location of the handset because only one cell site typically receives a signal from the handset. Thus, in order to employ a network-based solution, rural carriers must build additional location-only cell sites throughout their networks. Western Wireless recently estimated that it would need to construct an additional 1,000 cell sites to effectuate a network-based solution in its predominantly rural wireless networks.⁵ USCC has approximately 2,500 cell sites in its network and would be required to

³ A current list of USCC PSAPs currently providing phase I together with the date that service was initiated is attached hereto as Exhibit B.

⁴ See *Revision of the Commission's Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems*, Third Report and Order, 14 FCC Rcd. 17388 (1999) (“*Third Report & Order*”).

⁵ See Petition for Waiver of Section 20.18(g) of Western Wireless Corporation at 8-9 & n.7 (“Western Wireless Waiver”).

build a comparable number of sites to implement a network solution. At an estimated cost of \$500,000 per site, the costs of implementing such a solution are clearly prohibitive.

Second, predominantly rural carriers like USCC do not have the business volume to induce outside vendors to develop software or new products that comply with the Commission's E911 mandate. Simply put, rural carriers individually account for only a tiny fraction of the dollar volume generated by the large, nationwide carriers in the United States. As a result, USCC, like other rural carriers, was and is largely dependent on the nationwide wireless carriers to push the handset and equipment vendors to develop E911 compliant products in a timely manner.

When USCC filed its Phase II Implementation Report in November 2000, it reported its selection of a handset solution for phase II but noted that it would require assistance from several outside vendors in order to deploy the solution in a timely fashion.⁶ This is still true today. USCC is heartened by the recent decisions of several nationwide carriers to implement a handset-based phase II solution for their CDMA networks because these decisions will inevitably create the market dynamics needed to drive outside vendors to create and make available phase II compliant handsets and supporting network hardware and software.

II. USCC's Efforts to Comply with the Phase II E911 Deadline

USCC has been actively engaged in efforts to comply with the Commission's E911 mandates since the inception of the E911 proceeding at the Commission in 1996. USCC was one of the first carriers to roll-out phase I E911 service in Texas. Since the release of the

⁶ See United States Cellular Corporation's Implementation Report, November 9, 2000, at 7.

First Report & Order in this proceeding,⁷ USCC has been actively engaged in researching all methods of location technology that could possibly be deployed in order to meet the Commission's E911 mandate and provide increased safety for its customers.⁸

A. Handset-based solutions

A handset-based solution to phase II location technology was recognized by the Commission as a viable and even preferable alternative location solution for rural carriers in the *Third Report & Order*.⁹ This solution requires handset vendors to manufacture and distribute GPS equipped handsets. It also requires USCC's switch vendors to develop and deliver software that complies with J-STD-036 and the installation by USCC of equipment on its network to process the GPS information. The solution also requires PSAPs to upgrade their equipment and software to utilize the more detailed location information to be provided by USCC's network.

USCC began evaluating handset options in 1998. In November, 1998, USCC was approached by Tendler Cellular to test a wireless phone equipped with an external GPS receiver. USCC tested the unit at that time and received skewed results due to defects in the Tendler product. Tendler subsequently provided USCC with another prototype which was tested in December, 1998. Test results using the Tendler product demonstrated the primary benefit of GPS – namely, the ability to obtain the precise location of the handset.¹⁰

In 1998, USCC also investigated a solution manufactured by SnapTrack. This solution requires elements in both the phone and the network. However, at the time of USCC's

⁷ See *Revision of the Commission's Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems*, Report and Order and Further Notice of Proposed Rulemaking, 11 FCC Rcd. 18676 (1996) ("*First Report & Order*").

⁸ See Declaration of James P. Quinlan (attached hereto as Exhibit C).

⁹ See *Third Report & Order*, ¶ 24.

¹⁰ An internal USCC memorandum summarizing these test results is attached hereto as Exhibit D.

inquiry, SnapTrack's solution had not been bought by any other handset manufacturers. More importantly, the solution was designed to work only in CDMA markets.

USCC also investigated in 1998 a solution marketed by Harris Corporation, which had developed a chip for inclusion in a handset battery pack. However, Harris Corporation could provide no accuracy measurements or assurances that their product would meet FCC-mandated accuracy standards and no guarantee as to the quantity of these chips it planned to manufacture.

Most recently, USCC examined Airbiquity's proposed handset solution earlier this year. This solution is an add-on to the handset battery that has GPS capability built into it. This product is currently available only for the Nokia product line and will increase the cost of the battery for those phones. USCC did not choose this approach as its long term phase II solution for several reasons. First, USCC believes that the consumer, when faced with the need for a new battery, will opt for the less-expensive, non-GPS battery and forego the location capability. Second, Airbiquity's solution utilizes exposed contacts on the bottom of the Nokia phone. Should Nokia ever alter the design of their product and encase these contacts, as other manufacturers do, the Airbiquity solution would cease to work. Third, the Airbiquity solution would require PSAPs to install special equipment to decipher the latitude and longitude information relayed by the mobile unit. Thus, this solution would significantly limit the availability of location services to USCC's customers while roaming outside of USCC's market.

USCC has also been in continuous contact with handset and equipment manufacturers regarding the availability of GPS-compliant phones and the network hardware and software required to implement that solution. To that end, in June, 2001, USCC began the preliminary work of identifying the network elements required to support the handset solution. SnapTrack was one of the first vendors USCC invited in its efforts to seek further information

about the network elements required to support an AGPS system. Since that time, USCC has received information from Lucent Technologies (and has in fact obtained a price quotation) and from Nortel. As discussed in more detail below, USCC plans to have its network upgraded at the time phase II compliant GPS handsets become available.

B. Network-based solutions

Currently, there are two predominant network solutions – Time Difference of Arrival (“TDOA”) and Angle of Arrival (“AOA”). TDOA utilizes a unique algorithm to pinpoint the location of the mobile phone by triangulating the time of arrival of the signal as seen by at least two cell sites. Generally, TDOA only approaches the FCC’s accuracy requirements when three or more cell sites are used. AOA locates the mobile phone by measuring the angle of the signal from two or more different cell sites. AOA requires specialized antennas to achieve accurate location measurements. Both of these methods would require specialized equipment at each cell site and dedicated back haul to a centralized location. Neither of these location solutions are ideal for rural environments, where cell sites tend to be taller and further apart, and calls are frequently handled by only one cell site.

Beginning in 1998 and continuing for over three years, USCC investigated network-based solutions offered by a number of potential vendors. True Position initially planned to employ TDOA technology. Subsequently, True Position acquired a company called KSI, which utilized AOA technology. True Position combined TDOA and AOA into a hybrid solution to increase location accuracy. A USCC senior RF engineer was dispatched to witness True Position’s TDOA solution in a controlled environment when an appropriate number of cell sites can be seen. However, the difficulties in rural markets remain – namely, a wireless caller still had to be seen by multiple cell sites in order for the caller to be accurately located.

The same engineer that observed True Position's system witnessed a test of Grayson's combined TDOA/AOA network-based solution. Again, in this controlled environment given the appropriate number of cell sites, the system worked. However, USCC has not observed a network-based solution that would work in a rural environment with low cell site density.

Cell Loc proposed a service bureau approach to E911 solution. Under this approach, when a carrier signs up with Cell Loc, Cell Loc comes into that carrier's market and deploys E911 location technology using a high resolution software of enhanced TDOA. At the time of USCC's interaction with Cell Loc, however, Cell Loc provided very little information about its service and expressed interest only in entering large, urban markets.

USCC also investigated US Wireless' multipath, radio camera approach. Under this approach, a camera takes pictures of the multipath environment surrounding a handset and matches it to a database of previously taken RF pictures. USCC attended a demonstration of US Wireless' system in Washington. After reviewing the demonstration, USCC determined that it is highly unlikely that the multipath environment would remain stable enough to produce accurate results. While the RF "snapshot" would be accurate when taken, the frequent changes in the RF environment would make the database picture quickly outdated.

USCC issued a Request for Quote ("RFQ") on April 25, 2001 for the provision of network-based location solution technology.¹¹ It did so for two primary reasons. First, it became increasingly clear that handset manufacturers were not going to have phase II compliant handsets by the October 1, 2001 deadline, and that the manufacturers were likely not going to

¹¹ A copy of USCC's RFQ is attached hereto as Exhibit E.

make chipsets for TDMA markets at all. Second, a number of carriers elected network-based phase II solutions in their November 2000 phase II implementation reports.

USCC received responses from Sigma One, US Wireless, True Position, Grayson, and Cell Loc. USCC analyzed the information it received from these companies in May, 2001, and realized that very little had changed since its first investigation of network solutions in 1999 and 2000. None of these network solution providers had solved the problems of locating a handset in a rural market that is typically seen by only one cell site. USCC's conclusions from its November 2000 phase II implementation report remained valid. These conclusions have largely been vindicated in the latest round of phase II waiver filings as several carriers have now switched from implementing a network-based to a handset-based phase II solution.

III. Waiver Standard

The Commission has the authority to waive its rules for good cause shown.¹² Under the Commission's rules and case law, a waiver will generally be granted if the underlying purpose of the rule would not be served by strict enforcement of that rule and a grant of the waiver is consistent with the public interest.¹³ A waiver is also appropriate when, in consideration of the individualized facts of a case, enforcement of the rule would be inequitable or unduly burdensome.¹⁴

Indeed, within the context of the E911 proceeding, the Commission itself recognized that there may be situations where a waiver of the E911 rules may be appropriate. The Commission stated that there may be instances where it is impossible for carriers to meet the

¹² See 47 C.F.R. § 1.3 (2000).

¹³ See *Northeast Cellular Telephone Company v. FCC*, 897 F.2d 1164, 1166 (D.C. Cir. 1990).

¹⁴ See 47 C.F.R. § 1.925 (b)(2000).

phase II deadline due to technology-related impediments or other exceptional circumstances.¹⁵ In those circumstances, the Commission indicated that it would accept applications for waivers that were specific, focused and limited in scope, and that demonstrated a clear path toward full compliance.¹⁶ As demonstrated more fully below, USCC's waiver request meets these criteria and should be granted.

In particular, the underlying purpose of the rule will not be frustrated by a grant of the requested waiver. As noted above, less than 25 percent of the PSAPs within USCC's service area have deployed phase I and only 10 PSAPs (far less than 1 percent) have even requested phase II service. Thus, the Commission's objectives underlying the rule will not be frustrated because phase II service could not be provided to any USCC customers even if USCC were fully ready to deploy that service according to the Commission's timetable.

IV. GPS Handset Solution for CDMA Territories

For its CDMA territories, USCC plans to deploy a GPS-equipped handset-based solution to phase II requirements for E911. USCC's schedule for deploying the handset solution to phase II location technology in its CDMA markets is dependent upon the progress made by its vendors in the manufacture and distribution of the necessary equipment, including both handsets and network elements. As noted above, USCC believes that the recent commitments by several nationwide carriers to adopt a handset-based solution will provide the necessary incentive for the development and deployment of a variety of compliant handsets in relatively short order.

Handset vendors are currently representing that handsets equipped with GPS location capability

¹⁵ See *Revision of the Commission's Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems*, Fourth Memorandum Opinion and Order, 15 FCC Rcd. 17442, 17457 (2000) ("*Fourth Memorandum Opinion & Order*").

¹⁶ See *id.* at 17458.

will be available to carriers for testing beginning in first quarter 2002, with the first phones available for commercial sale in second quarter 2002. In order to reserve production capacity with handset manufacturers and provide a good faith demonstration of commitment, USCC will enter into advance purchase orders for GPS enabled handsets no later than December 31, 2001.¹⁷

Based on those discussions, USCC proposes the following deployment schedule:

- Handsets sales commence Third quarter 2002
- 50 percent new handset sales are GPS capable mobiles Second quarter 2003
- 100 percent new handset sales are GPS capable mobiles Second quarter 2004
100 percent conversions and upgrades to GPS capable mobiles
- Full penetration of GPS capable mobiles December 31, 2005¹⁸

Similar to Western Wireless' situation, USCC receives handset models after the larger carriers, with an average lag time of 90 days.¹⁹ Thus, if handset vendors have phones initially available to carriers in April, 2002, USCC expects to be able to initiate sales of such handsets by July, 2002. USCC has not provided a 25 percent benchmark because USCC is uncertain when a variety of phones will be available in the market. Nonetheless, USCC believes that a 50 percent penetration benchmark by second quarter 2003 is feasible because by that time, USCC expects that there will be widespread availability of a full suite of GPS compatible CDMA phones from several handset manufacturers, thus giving its customers the selection they demand. USCC believes, as do other carriers, that the only way to ensure compliance with

¹⁷ USCC will provide copies of these advance purchase orders to the Commission upon request.

¹⁸ Full penetration of GPS-capable handsets is defined in the *Fourth Memorandum Opinion & Order* as 95 percent penetration. See *Fourth Memorandum Opinion & Order*, ¶ 37.

¹⁹ See Western Wireless Waiver at 12-13.

penetration benchmarks is to provide its customers with a full range of handsets from multiple manufacturers at various price points. While this penetration level could be achieved sooner, USCC is not in control of the manufacturing and deployment schedules for the handset manufacturers, nor does USCC directly control the purchasing decisions of its customers.

Even if GPS handsets were available today, the handset-based phase II solution would not work until switch upgrades are in place and working. Currently, USCC utilizes network elements provided by Nortel and Lucent. Nortel has indicated that its standards-compliant switch software which will be included in MTX10 is scheduled for release during fourth quarter 2001.²⁰ Once the software is released, with testing and coordination of scheduling the roll-out with Nortel, at least an additional twelve months is required to complete roll-out of the software throughout USCC's network.

Since software releases often change the billing format, upon initial release of the software, USCC must request sample billing data from Nortel and validate that these changes have not diminished USCC's capacity to produce an accurate bill. Frequently, USCC must modify its internal billing software in order to accommodate changes made by Nortel to the billing format in the new software load. This requires a minimum of ninety days. Only then can USCC begin upgrades to its switching network, beginning with one switch. In full production, USCC can accommodate upgrades to two switches per week. Hardware upgrades are usually required with each software upgrade, and Nortel requires a 28 day "soak" period from the time of hardware installation before the software upgrade can be run. In addition, CDMA systems are more complex given that software and hardware upgrades are required for two network elements, both the Mobile Switching Center (MSC) and the Base Station Controller (BSC). By way of

example, USCC anticipates completion of the MTX09 upgrade, which began in February, 2001, by the end of October, 2001. This upgrade was considered a “light load,” as it did not require significant hardware upgrades.

In USCC’s experience, the above procedure is not unique to Nortel but is relatively standard throughout the industry. While USCC has not yet undergone an upgrade for its Lucent platform, USCC expects the same timetable to be applicable.²¹ USCC has obtained a quotation from Lucent Technologies for the MPC/PDE, and is currently evaluating all options available to it before making a purchase decision. USCC expects to place a purchase order with its vendor of choice by the end of first quarter 2002. This will allow for an appropriate amount of time to install and test the network elements prior to the receipt of the first GPS equipped handset.

V. TDMA Territories

As the phase II waiver filings of Cingular and AT&T made abundantly clear, a near term phase II compliant solution for USCC’s TDMA systems is practically impossible. Both Cingular and AT&T demonstrated that the TDMA air interface will soon be phased out of the marketplace. As a result, USCC’s phase II solution of choice, a GPS-assisted handset solution, will never be commercially available for its TDMA systems because no handset manufacturer is willing to invest the considerable resources needed to develop a compliant handset for a soon-to-be abandoned air-interface. In addition, as noted above, full network-based solutions are not economically feasible in USCC’s rural service area.

²⁰ See Letter to Jay Quinlan, USCC, from Randy Tornes, Nortel Networks, July 25, 2001 (attached hereto as Exhibit F).

²¹ See Letter from Lucent Technologies, August 10, 2001 (attached hereto as Exhibit G).

USCC is finalizing its plans to replace its own TDMA systems with a system that will be fully phase II compliant from the outset.²² In the interim, USCC proposes to deploy MNLS, a switch-based phase II E911 solution. MNLS uses a function called Mobile Assisted Hand-off (MAHO). As stated in AT&T's waiver request, MAHO uses signal strength measurements inherent in TDMA IS-136 and IS-54B. MNLS uses these measurements to calculate the location of the mobile. Like any network-based solution, accuracy is increased as more base stations are included in the calculation, i.e. receive a signal from the mobile. USCC's proposed solution is critically dependent on the willingness of Nortel, the manufacturer of USCC's 50 TDMA switches, to license or develop the necessary MNLS proprietary software to support this solution. As indicated in the attached letter, Nortel has not yet decided whether it will support a MNLS solution.²³ Should it elect to support a solution, Nortel expects it to be available by the middle of 2002.²⁴

MNLS offers many advantages for USCC's TDMA customers over any alternative network-based solution. The MNLS solution works with all digital handsets in the existing network. Therefore, once the switch software is upgraded, existing subscribers are not required to upgrade or replace handsets before receiving the location determination functionality. In addition, MNLS automatically supports all roaming TDMA phones as well as noninitialized phones (i.e., phones used only to call 911). The system is also highly reliable because it uses functionality already in the network and, as documented in the AT&T waiver request, MNLS promises enhanced accuracy results as the location software/algorithm is improved.

²² In its next generation RFQ, USCC included a requirement that any solution proposed be fully phase II compliant. A copy of this RFQ will be provided to the Commission upon request.

²³ See Letter to Jay Quinlan, USCC, from Bruce Tiff, Nortel Networks, September 5, 2001 (attached hereto as Exhibit H).

MNLS suffers from some of the same defects as other non-GPS solutions in rural areas. Most importantly, at this time, MNLS will not satisfy the Commission's accuracy standards for network-based solutions. Although the MNLS solution does not yet meet the FCC's phase II accuracy requirements, it provides a dramatic improvement over phase I location information. Given this improvement and the relative ease with which this solution can be deployed, USCC's request to implement MNLS on its TDMA systems is in the public interest and should be approved.

VI. Conclusion

Based on the foregoing, USCC respectfully submits that its waiver request is in the public interest and should be granted. USCC is willing to provide interim reports to the Commission describing its progress in implementing phase II E911.

In addition, USCC urges the Commission to focus on the other half of the E911 deployment puzzle – the PSAPs. USCC urges the Commission to establish firm PSAP reporting dates to update the record on the status of phase I and phase II deployment. These reports, which should be updated periodically, should include information to allow both the FCC and the public to determine the geographic areas served by upgraded PSAPs. As evidenced at the recent House subcommittee hearing on the E911 roll-out, the FCC has remarkably little information about the state of PSAP readiness across the country.

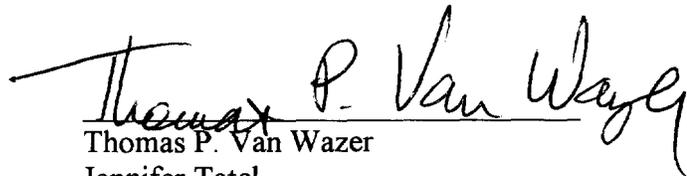
Finally, USCC urges the Commission to take action to protect wireless customers and carriers from the inevitable backlash that will occur if GPS-compliant phones are sold in areas served by non-updated PSAPs. Given the overall lack of PSAP readiness across the country, such a result is inevitable absent action by the Commission. To address this problem, at

²⁴ See Letter to Jay Quinlan, USCC, from Randy Tornes, Nortel Networks, July 5, 2001 (attached hereto as Exhibit I).

least in part, USCC urges the FCC to tie the deployment date for offering phase II compliant phones to the readiness of the PSAP serving a particular area. This is already the rule applicable for network-based solutions. The Commission should also seek comment on the proper way to notify wireless customers residing in areas not served by upgraded PSAPs. Such actions would more closely match the promise of phase II service with the actual date that service can be deployed to customers and would help to avoid frustrated customer expectations that could become a serious problem for PSAPs, the FCC and the wireless industry.

Respectfully submitted,

UNITED STATES CELLULAR
CORPORATION

A handwritten signature in black ink that reads "Thomas P. Van Wazer". The signature is written in a cursive style with a long horizontal line extending to the left.

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September 10, 2001