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June 10, 1999

Via Federal Express

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FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

Magalie Roman Salas
Secretary
Federal Communications Commission
445 12th Street, TW-A325, SW
Washington, DC 20554

Re: CC Docket No. 94-102 – Comments of Integrated Data Communications, Inc.

Dear Ms. Salas:

Per Public Notice DA 99-1049, dated June 1, 1999, enclosed for filing in the above-referenced docket is an original and five copies of *Comments of Integrated Data Communications, Inc.*

If you have any questions, please feel free to call me at 206.623.4711. Thank you.

Very truly yours,

ATER WYNNE LLP

Angela Wu, Esq.

enclosures

cc: Mindy Littell
International Transcription Service, Inc.
Dan Allen, President
Dan Preston, CTO/Co-Founder

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Federal Communications Commission
Office of Secretary

INTEGRATED DATA COMMUNICATIONS

COMMENTS

June 10, 1999

In the Matter of Requests for Comments on Wireless E911 Phase II Automatic Location Identification Requirements

Section 20.18(e) of the Commission's Rules for E911
CC Docket No. 94-102

INTEGRATED DATA COMMUNICATIONS COMMENTS

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ATTACHMENTS

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B. Penetration Estimates for Location-Enabled Handsets

C. WOW-COM | Wireless 9-1-1 and Distress Calls

D. M.Davis, King County E-911 Program Office Letter

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JUN 1 4 1999

Federal Communications Commission
Office of Secretary

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C.

In the Matter of	)	
	)	
Requests for Comment on	)	CC Docket No. 94-102
Wireless E911 Phase II	)	
Automatic Location Identification	)	
Requirements	)	
	)	DA 99-1049
Section 20.18(e) of the	)	
Commission's Rules for E911	)	

COMMENTS OF INTEGRATED DATA COMMUNICATIONS, INC.

Pursuant to the Public Notice issued by the Wireless Telecommunications Bureau on June 1, 1999 ("Public Notice"), Integrated Data Communications, Inc. ("IDC"), submits these comments in response to the Bureau's request for additional information on wireless E911 Phase II automatic location identification ("ALI") requirements, and whether the Commission should make any changes to its Phase II rules in light of the availability and increased benefits offered by handset-based technologies.

INTRODUCTION AND SUMMARY

IDC is a provider of a signaling protocol technology that uses MF in-band signaling to transmit location data simultaneously with voice on the voice channel. The location information is obtained from global positioning satellites (GPS).

GPS consists of 24 satellites that orbit the earth twice a day at an elevation of about 11,000 miles above the earth. These satellites transmit the precise time and position information necessary to produce latitude, longitude, and altitude anywhere on the Earth,

24-hours a day. This 10 billion dollar GPS satellite system was developed by the Department of Defense in the 1970s. It provides continuous worldwide positioning and navigation to U.S. military forces around the world, but it also serves broader civilian and commercial applications. For example, the Internet, mobile cell sites, mobile switches and high capacity circuits rely upon GPS.[1] In fact, the Federal Aviation Administration ("FAA") recently began implementation plans to transition to GPS technology.[2]

Together with IDC's signaling protocol, and the technological advancements and miniaturization of chip technology, a GPS chip in a wireless handset (or in a battery retrofit), can transmit longitude, latitude, altitude, time, direction, and speed to a Public Safety Answering Point (PSAP). The transmission of location data in the voice channel adds no time to the 911 call. IDC's special feature, selective routing, which allows a PSAP to transfer location data with the 911 call to another location, adds only 1.6 seconds to the 911 call.

In addition, because location data can be transmitted simultaneously with voice in the call-path, IDC's technology enables wireless carriers to provide ALI within the Commission's Phase II requirements with little impact or modification to existing wireless, wireline, or PSAP networks. This is because IDC's technology works with existing carrier and PSAP equipment, as explained in its field test report for the King County E-911 Program Office (Report).[3]

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[1] GPS signals are free-of-charge to users.

[2] The Federal Aviation Administration (FAA) has embarked on an aggressive program to make satellite-based navigation technology available for use throughout the National Airspace System (NAS). The FAA is working with the aviation industry to augment the Global Positioning System (GPS), developed by the Department of Defense (DOD), to provide navigation services adequate for all phases of flight.

[3] IDC Report, filed in the E911 Docket No. 94-102 on May 28, 1999. A summary of the highlights of the report are included the ex parte filed on May 28 and June 3, 1999 (*see Attachment A*).

- ***Technologically and Competitively Neutral***

In the E911 Reconsideration Order, the Commission addressed a concern that the effect of Section 20.18(e) might not be technologically or competitively neutral.[4] This concern was based upon the fact "that parties...assumed that ALI technology would be based in the network, not in the handset."[5] Thus the network solution was perceived by the wireless industry and PSAPs to be the only real choice for wireless carriers to meet their obligation to provide ALI.

In an attempt to correct this perception, the Commission stated that its "rules and their application are intended to be technologically and competitively neutral...that the [Commission] does not intend that the implementation deadline, the accuracy standard, or other rules should hamper the development and deployment of the best and most efficient ALI technologies and systems."[6]

There is interest by wireless carriers and public safety organizations in the increased benefits offered by the handset solution, but there is also concern by wireless carriers that if they choose a handset solution, they will not be able to meet the Commission's Phase II requirements as currently written. This suggests that the rules for Phase II, are unreasonably hampering the deployment of effective ALI solutions that can provide increased improvements in ALI capabilities, as originally desired by the Commission in its E911 Order.

Throughout the E911 proceeding, the Commission sought to advance the quality of E911 service to the public, through state-of-the-art location technology as it becomes

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[4] E911 Reconsideration Order, 12 FCC Rcd 22665, at 22725 (Para. 123), December 30, 1997.

[5] E911 Report & Order, and Further Notice of Proposed Rulemaking, 11 FCC Rcd 18676, at 18732 (Para. 111), July 26, 1996.

[6] E911 Recon Order, 12 FCC Rcd at 22725 (Para. 124).

available. When new technology is reportedly available, the Commission stated that it could require that the new technology be deployed if the benefit exceeds the cost.[7] In this case, GPS technology is not more expensive than the network solution. In fact, the opposite is true (*see Section II.B., Paragraphs 3-5 on Cost of IDC's Technology*).

- ***Specific Interest***

IDC is not a wireless carrier seeking a handset waiver. IDC is a vendor with a technology that can provide wireless carriers with the capability to transmit location data with voice with increased accuracy and reliability. IDC simply seeks clarification as to how the Commission will allow the handset solution to be an additional option to providing ALI for Phase II, and clarification on the conditions wireless carriers must meet, should they choose a handset-based approach. The conditions on wireless carriers will in turn provide guidance to equipment manufacturers on lead times and volume production.

In the interest of providing support for the handset-based approach, IDC is participating in this proceeding because it can provide factual evidence that GPS technology works, and that it works extremely well for public safety concerns. IDC submits its comments in response to the three specific subject areas of interest to the Commission: (1) whether to adopt different standards for handset-based solutions; (2) how the Commission should address, as a policy matter, the issue of roaming where both network and handset-based approaches are simultaneously implemented in the same area by different wireless carriers, and whether the rate of handset turnover is sufficient to justify a phase-in approach; and (3) whether RMS, CEP, or another standard is the appropriate measure of ALI accuracy.

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[7] E911 R&O, Further NPRM, 11 FCC Rcd 18676, at 18744-18745 (Paras. 141-143).

I. STANDARDS FOR HANDSET-BASED SOLUTION

IDC agrees with both the SnapTrack and APCO proposals that wireless carriers that choose to deploy a handset-based solution should be required to start providing ALI for wireless 911 calls before the Phase II October 1, 2001 deadline.

A. SnapTrack's Proposal

SnapTrack is a handset-based and network-assisted technology. Its solution requires processing support by the wireless carrier and use of the control channel (out-of-band). SnapTrack suggests that the Commission should automatically deem wireless carriers to be in compliance with Phase II if they provide ALI to subscribers before the October 1, 2001 deadline, and if they:

- Begin to deploy location-enabled handsets by January 1, 2001;
- Deploy only location-enabled handsets after December 31, 2001; and
- Achieve location accuracy of 90 meters using circular error probability (CEP) methodology.

B. APCO's Proposal

In its February 22, 1999 comments on the Commission's Public Notice on Handset Waiver Guidelines, APCO expressed "serious misgivings" about the need or benefit of granting waivers to wireless carriers that choose to provide ALI through a handset-based approach. APCO was concerned that wireless carriers were, in truth, seeking to avoid its obligation to meet Phase II within the timeline required under Section 20.18(e).

APCO stated that many of the comments filed by wireless carriers on the handset waiver guidelines did not provide the specific data requested by the Commission in

support of any reason to believe that wireless carriers could implement ALI early, or reflected any commitment or interest by carriers to push for location-enabled handset technology in sufficiently high numbers to satisfy existing public safety concerns. As a result, APCO suggested that the handset-based approach should be viewed as a "Phase III" solution, where the network-based solutions would then serve as a back-up to Phase III handset solutions.

Recently, APCO filed a change in its position on the handset-based solution for Phase II. APCO proposed that the Commission permit a wireless carrier to implement a handset-based solution, so that PSAPs can benefit from the increased accuracy and reliability for location information GPS technology can provide today. APCO suggested specific criteria to ensure that ALI is deployed by wireless carriers as quickly as possible:

- Wireless carriers begin to provide location-enabled handsets no later than January 1, 2001;
- At least 80% of handsets being deployed on the carrier's system must be location-enabled as of December 31, 2001;
- 100% of handsets being deployed must be location-enabled as of December 31, 2002;
- 25% of all handsets in use must be location-enabled by the end of 2002;
- 50% must be location-enabled by the end of 2003;
- 75% must be location-enabled by end of 2004;
- 100% must be location-enabled by end of 2005;
- Wireless carriers must commit to a specific accuracy level substantially better than the current Phase II requirement;
- Wireless carriers must agree to implement technologies that meet industry standards for interfacing with all carriers and PSAPs; and
- Wireless carriers must agree to inform and educate subscribers.

C. IDC's Proposal

IDC believes the proposals suggested by SnapTrack and APCO could be more aggressive. Based upon industry handset churn, growth rates, and the availability of battery retrofits, IDC believes that wireless subscribers and PSAPs could realize the life saving benefits of increased accuracy and reliability of location information sooner than suggested by SnapTrack and APCO (*see below for further details*).

In recent meetings with the Commission, IDC proposed that the Commission clarify the circumstances under which it would approve any handset waivers. In those meetings, IDC suggested the following criteria for consideration by the Commission:

1. That wireless carriers must begin implementation by January 1, 2001.
2. Penetration for old/new handsets in the market that are location enabled technology should be at:
   - 33% by October 1, 2001
   - 75% by December 31, 2002
   - 90% by December 31, 2003
3. That wireless carriers only sell new handsets with location enabled technology:
   - by October 2001
4. These figures assume handset technology will provide accuracy of at least 30 meters, based upon a RMS measure.[8]

In its proposal to the Commission, IDC recognized the need to provide some margin of error for: (1) handsets that stay in a secondary market (e.g., passed onto family or friends as used-unit sales), (2) handsets that "Grandma Jones" refuses to give up, and

[8] IDC Ex Parte, May 28 and June 3, 1999

(3) handsets that are not locatable due to lack of cellular coverage, or other unaccountable reasons. Accordingly, its proposal to the Commission allows for such a margin for error.

1. Basis of IDC Churn Figures

Some of the churn figures suggested in IDC's proposal to the Commission (described above) assumed an earlier start on provisioning of location-enabled handsets by wireless carriers and equipment manufacturers.[9] Since then, IDC adjusted its estimates to be consistent with a start date of the 3rd quarter of 2000.

IDC's estimates on how quickly the handset-based approach could be implemented by wireless carriers are based upon the churn history of the wireless industry.[10] Attached to this document is an Excel chart reflecting IDC's projections on how quickly the handset solution could be implemented (*see Attachment B - "Penetration Estimates for Location-Enabled Handsets"*). The figures below are based upon projections shown in the Excel chart, the revised start date of the 3rd quarter of 2000, and include IDC's projections on new sales, sales as replacement of churn, churned handsets, and battery retrofits:

- 42% penetration by 3rd quarter, 2001
- 69% penetration by 2nd quarter, 2002
- 85% penetration by 2nd quarter, 2002
- 100% penetration by 2nd quarter, 2003[11]

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[9] IDC Ex Parte, December 29, 1998.

[10] CTIA published cellular churn rates.

[11] These figures do not include the "margin of error" considerations described in IDC's proposal to the Commission in Section C.

2. *Market Demand and Public Safety Want E911 Phase II Today*

As a result of conversations between IDC and equipment manufacturers and wireless carriers, IDC believes that many of these companies see both a market need and a public safety interest for E911 service as soon as possible.[11]

For example, True Position provided the Commission with a 1997 public poll result that indicated that 42% of the people polled think that wireless companies should be required to offer the ALI service sooner than 2001. APCO, which represents the PSAP industry, asked for a location accuracy requirement of 10 meters with a 95 percent confidence factor, for both horizontal and vertical accuracy.[12]

3. *Saving Lives - The Golden Hour*

One of the key benefits of increased accuracy is the improved ability of the PSAP to direct an emergency service call to the closest emergency personnel, thus reducing response time to the life-threatening situation. Approximately 40% of the 36 million wireless callers that call 911 are unable to relay their location to E911 call takers (*see Attachment C*). Thus, the inability to communicate location was the case for about 34,000 calls per day in 1998, based upon approximately 69.2 million wireless callers in 1998. And, it takes PSAPs 2.5 to 3 times longer to determine the correct location of the 911 call from a wireless subscriber.[13]

Accurate and reliable location information, particularly in the "golden hour" (i.e., first 50 minutes), is key to saving lives thereby ensuring that public safety interests are

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[11] With the handset solution, the only duplicative infrastructure to support both public safety and commercial applications is the handset. And, costs for public safety and commercial applications can be easily separated.

[12] E911 R&O, and Further NPRM, 11 FCC Rcd at 18744 (Para. 140, see APCO Comments at Footnote 284).

[13] Marlys Davis, King County E-911 Program Office, Washington State.

served. Accuracy and reliability of location information are especially critical in rural areas, where the number of cell site towers are fewer, and generally, cell site towers are located close to highways. Thus, location information based upon the most common network-based methods (e.g., Angle of Arrival or Time Difference of Arrival) may be difficult to obtain.

4. King County Field Test Results Support IDC's Proposal

IDC's proposal is based upon the "real world" results of its field test, which it conducted for the King County E-911 Program Office. The King County E-911 Program Office in Washington State is responsible for about 2,200 square miles, which includes the city of Seattle. The county has a population of over 1.6 million people. In 1997, there were 1.8 million 911 calls to the 18 separate PSAPs located in King County. Approximately 300,000 of those calls were from wireless subscribers with 5 different wireless carriers. According to the King County E-911 Program Office, approximately 48% of E911 calls to the PSAPs are from major highways.

a. Beta Version 1.5 GPS Chip

In IDC's field tests of the Beta Version 1.5 GPS chip from SiRF[14], which it conducted with the cooperation of the King County E-911 Program Office, IDC was able to locate 100% of all 911 calls. In the areas where King County receives the highest number of 911 calls (i.e., highways, suburban and rural areas), IDC was able to locate the caller within 70 feet, 74% of the time.

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[14] SiRF Technology, Santa Clara, California.

Furthermore, approximately 94% of *all* calls were within the FCC Phase II requirements, 75% of *all* calls were within 150 feet; 62% of *all* calls were within 100 feet; 51% of *all* calls were within 70 feet; and 31% of *all* calls were within 40 feet, or better *(see Attachment A, Graphic Page 7-14)*.[15]

b. Beta Version 3.5 GPS Chip

IDC also tested a Beta Version 3.5 GPS chip from SiRF, which increased location accuracy by 245%. IDC did not include those results in its field test report because it would have tainted the results of the field test of the Beta Version 1.5.

c. Beta Version 5.1 GPS Chip

GPS chip technology is evolving so rapidly that IDC expects to field test a Beta Version 5.1 GPS chip later this fall. IDC believes the Beta Version 5.1 will show increased accuracy of location information in buildings, subways, underground garages, and heavy foliage. IDC also believes it may have a prototype GPS handset unit to use in its field tests of the 5.1 GPS chip.

II. ROAMERS, RETROFITS, AND HANDSET TURNOVER

A. Roamer Issue Can Be Minimized

IDC recognizes that the Commission, as a policy decision, must be concerned with whether a wireless subscriber using a handset-enabled location technology can still call 911 and receive emergency services, when that caller enters an area served by a wireless carrier that relies upon a network solution to provide ALI.

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[15] IDC Report, filed in the E911 Docket No. 94-102 on May 28, 1999.

Roaming is increasingly prevalent with the increasing use of multi-band and multi-mode handsets for national carriers such as AT&T Wireless, Sprint Spectrum, and AirTouch. IDC assumed that the flexibility provided with roaming, which customers now expect with their service, had to be considered when it developed its solution to the Commission's Phase II requirements. Therefore, IDC has several suggestions on how the roamer issue can be minimized.

First, if any single wireless carrier in a market with multiple wireless carriers chooses to implement a handset-based approach to Phase II, that PSAP will be location-enabled and capable of obtaining location information from *any* roamer with a location-enabled handset. In other words, if a PSAP is capable of obtaining location information from *one* handset solution carrier, it can support as *many* enabled carriers as are introduced in that market.

Second, several major wireless carriers are building a national footprint, and if any of those carriers choose the handset-based approach, it will implement the handset-based solution throughout its footprint.

Third, any PSAP can purchase a low priced IDC receiver unit which will enable that PSAP to receive and translate that caller's location information.

And lastly, if a PSAP is not location-enabled, nor does it have an IDC receiver unit, when a caller roams to an outside market where a handset-based solution has not been implemented, and that caller does not have IDC's technology in the handset, the 911 call will simply default to providing location information based upon cell site and sector location information (i.e., Phase I).

Typically, cell site and sector information is not enough to allow a PSAP to respond as quickly as it would like in emergency situations. But then, the Commission's

current Phase II requirements of 125 meters (i.e., 517,847 square feet, or approximately 11 acres), while better, is still not as accurate as 10 to 30 meters (i.e., 33 to 99 feet) *(see Attachment A, Graphic Page 4-3)*.

B. Retrofit in The Battery

1. Subscribers Who Do Not Replace Their Handsets Regularly

On average, the battery life for a wireless handset is typically 11 months. As a result, a wireless subscriber will need to replace his/her battery approximately every 11 months. According to conversations between IDC and equipment manufacturers, if the Commission makes it clear that it will accept a handset-based approach as a solution to its Phase II requirements, and that a retrofit option must be provided, equipment manufacturers will build batteries with a GPS chip to meet a retrofit requirement.

a. Prototypes: GPS Chip and GPS/Analog/Digital Antenna

During IDC's meetings with the Commission, everyone had the opportunity to see and hold a prototype of a GPS chip and a GPS antenna (that also works as both an analog and digital antenna). The size and weight of the GPS chip was similar to that of a tiny ladybug. The size and weight of the GPS antenna was no different than the current antennas used on the Nokia 6160 model. According to IDC's discussion with equipment manufacturers, both the GPS chip and the GPS antenna can easily fit into both new wireless handsets, or a battery retrofit.

2. Should Wireless Carriers Offer Free Retrofit or Discounts?

IDC believes that the public safety aspect of location-enabled handsets, a capability many subscribers currently think is already available to them, or a battery retrofit, will be a valuable new product for wireless carriers to market to its subscribers. IDC, however,

supports any reasonable requirement by the Commission that encourages rapid deployment of handset-enabled location technology in the form of discounts determined by the wireless carrier to the public; particularly since IDC's technology, as compared to other technologies, is significantly less expensive to implement by both PSAPs and wireless carriers.

3. Cost of IDC's Technology for Retrofit Battery

The Commission's Public Notice requested information on the potential cost of a retrofit option, and when wireless carriers should be obligated to retrofit or replace non-location-enabled handsets of its subscribers. IDC estimates a battery retrofit will add between $30 to $40 per battery. IDC suggests that wireless carriers could begin offering a battery retrofit at a discount price of their choosing within 2 to 3 months after equipment manufacturers make the battery retrofit available to wireless carriers. IDC believes that market demand for the public safety feature and commercial applications of a handset-enabled location technology will drive the price of the battery retrofit down even further.

IDC also proposes that in the interest of encouraging rapid deployment of location-enabled handsets, even for wireless carriers that choose to implement a network solution, that it would be in the public interest to require wireless carriers to offer only location-enabled handsets as of the Phase II deadline October 1, 2001. Wide-spread deployment of location-enabled handsets allows a roamer whose wireless service provider uses a network solution for Phase II, to also use a different wireless service provider's handset-based solution in another state or market.

4. Cost of IDC's Technology to PSAPs

IDC estimates that the total cost of location-enabled handset technology to the PSAPs is approximately .10 to .25 cents per month per handset. This amount includes the modest cost for IDC's signaling protocol which enables the transport of location data with

voice. One of the significant differences in cost between IDC's technology and other technologies is that it provides location information in the call-path (i.e., voice channel), and thereby requires only minor modifications to existing PSAP networks and customer premise equipment. Typically, such modifications to the PSAP's network involve installation of a GPS antenna and a communications receiver.

If the PSAP chooses to use IDC's selective routing feature, then it only needs to add IDC's technology to its router, which involves only a minor modification to the Local Exchange Carrier's existing equipment. IDC made all necessary modifications to existing call-taker and selective router equipment during its field test for the King County E911 Program Office.

5. Cost of IDC's Technology for New Handsets

IDC estimates that putting its location technology and a GPS chip into the handset will increase the price of the handset by approximately $10.00, a cost increase which is often subsidized by the wireless carrier, through discounts, promotional sales, or service contracts. As the prices of handsets drop every year, IDC believes that any increase in the price of a "location-enabled handset" will be temporary as both production and competition drive the price down. If any short-term price increase is necessary, wireless carriers can market the additional "value" of location enabling technology – similar to the way that features such as caller ID, voice dialing, and speakerphones were offered at a price premium when they were first introduced to subscribers. The increase in the purchase price of a new wireless "location-enabled" handset will not be discernable as other components of the handset continue to go down in price.

In terms of cost recovery, IDC estimates that the (temporary) increased cost of a "location-enabled handset" will be the equivalent to approximately .80 cents per handset per month for the first year of ownership.

C. Phase II Must Catch the Handset Turnover Wave

The Commission has stated on several occasions that its rules for Phase II and application of those rules are intended to be technologically and competitively neutral...that the [Commission] does not intend that the implementation deadline, the accuracy standard, or other rules to hamper the development and deployment of the best and most efficient ALI technologies and systems."[16]

At present, the evolution from analog to digital technology, and eventually to third generation wireless handsets, creates a transition wave whereby subscribers will purchase new handsets in order to benefit from new wireless handsets, or advancements in wireless applications (e.g., web browsing or offerings of data applications). It is important that the Commission allow wireless carriers the cost benefit of fulfilling its obligation to provide ALI, by catching the transitional wave as it begins.

The Commission stated that it would consider proposals that result in increased improvements in ALI capabilities as discussed in the E911 Further NPRM. The Commission also stated that it would consider state-of-the-art technology that provides improvements to public safety, even if the cost of that technology is high, as long as the benefit of that technology outweighs the cost.[17]

The current GPS technology provides increased improvements because it provides both <u>increased accuracy and reliability</u> of location information. And, both increased accuracy and reliability of location are available at a *significantly lower* initial cost, and at a *significantly lower* on-going operating cost for wireless carriers and PSAPs.

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[16] E911 Recon Order, 12 FCC Rcd at 22725 (Para. 124).

[17] E911 R&O, Further NPRM, 11 FCC Rcd at 18744-18745, (Paras. 141-143).

1. Approving a Phase-In Implementation is Technologically and Competitively Neutral Because Phase II Rules Assumes a Flashcut Solution, Which Undeniably Favors a Network Solution

In exchange for earlier implementation and higher accuracy, the Commission should permit wireless carriers to utilize a phase-in approach, because GPS technology only recently evolved to its current ability to provide highly accurate and reliable location information in the form of a wireless handset. It is undeniably in the public interest to increase the ability of PSAP to respond more quickly to emergency situations. And, one of the Commission's primary mandates is to preserve and protect public safety.[18]

When the Commission issued its E911 Order, it believed that a five-year implementation schedule was a reasonable period of time to allow wireless carriers to provide ALI. Some parties (i.e., BellSouth, PCIA, Omnipoint, and Nokia), argued that the Phase II timeline was premature, and that the Commission's projections on the pace and affordability of new or developing technologies were not reasonable.[19]

Today, a handset-based approach using GPS is a more accurate and reliable solution for Phase II due to the following: (1) highly refined algorithms, (2) improvements to antenna technology, (3) rapid and ever-increasing evolution of chip technology, and (4) IDC's signaling protocol which enables transport of location data with voice. The result of these changes and improvements enable IDC to prove that GPS not only meets the Commission's Phase II requirements, but exceeds them.

Since the Commission did not intend for its implementation deadline to hamper the deployment of the "best and most efficient ALI technologies," the Commission should not be swayed by arguments that the public interest would not be served by permitting a

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[18] Section 1 of the Communications Act, 47 U.S.C. Section 151.

[19] FCC E911 Recon Order, 12 FCC Rcd at 22665 (Paras. 117 to 120), December 1, 1997.

phased-in implementation, particularly when increased accuracy and reliability of location information will help to save lives every day.

2. *Hybrid Options*

Similar to the handset solution, hybrid options will also need time to "phase-in" their technologies in order to meet the Commission's Phase II requirements as currently written. Hybrid options, which rely upon a wireless carrier's network to obtain location information, are simply an overlay solution. Several portions of the wireless carrier's network will require modifications or upgrades in order to accommodate these technologies capabilities to provide location information.

The biggest change must occur at the cell site. There are approximately 80,000 cell sites today throughout the United States. Some technologies, such as Angle of Arrival (AOA) and Time Difference of Arrival (TDOA) vary in method of implementation; both require modifications – in some fashion – at *every single cell site* in the United States.

These modifications can include replacement or an increase of additional antenna arrays on the cell site or placement of more equipment inside a tower shelter. In theory, this process sounds quick and simple, but in truth, the process could require an enormous amount of time on the part of the wireless carrier to implement. Each modification to the cell site must be repeated for every individual cell site in the United States, and therefore, must be implemented painstakingly by every wireless carrier.[20] Thus, it will be necessary for hybrid options to also have the ability to phase-in their technologies.

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[20] The following is a list of the activities that must occur to implement a solution that is reliant upon modifications to a wireless carrier's network: (1) Tower loading and equipment shelter evaluation to determine if the site can support the physical and electrical load of the equipment. Typical turnaround: 1 week; (2) Request for landlord approval in the form of a fully executed lease modification for additional equipment or antenna to support the technology. Turnaround: 1 month. Many leases are "by the stick" (antenna) and/or "by the rack" (equipment), so the wireless carrier must obtain a lease modification --- often at a higher per-month price -- prior to conducting any work. Violators could forfeit their lease and be without coverage in a highly valued area; additional modifications – or expansion – to the equipment

III. DETERMINATION OF ALI ACCURACY

When IDC first looked at the Commission's requirements for Phase II, it accepted the fact that the Root Mean Square (RMS) methodology was the only acceptable measuring standard. Thus, IDC developed its technology assuming that it had to meet the Commission's Phase II requirements based upon the RMS measure.

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shelter may also be needed to accommodate the equipment – at additional expense and time; (3) Request for groundlease landlord approval (if applicable) - also in the form of a lease modification - for the additional equipment and/or antenna to support the solution. Turnaround: 1 month. This is where the wireless carrier has an additional lease for the ground in which the site is located - typical in monopole structures in rural and suburban areas; (4) Request for and obtain additional interconnect at the cell site to support the solution (if applicable): Typical turnaround: 1 month for the LEC; (5) Zoning approval for the change in antenna type, or number of antennas, required for the cell site (required in most jurisdictions as it effects the aesthetics of the site): Typical turnaround: 3 months. All together, this can take approximately 6 months or more in certain jurisdictions with particularly tough zoning regulations. If any of those towers were constructed with special arrays for aesthetic purposes (e.g. church tower, faux tree), modification may be impossible without substantially changing - and revealing - the cell site; (6) Obtaining of permits for the cell site change (may be done concurrently with zoning): 2 weeks; (7) Installation of the equipment and/or antenna upon completion of modified lease, zoning, and permitting of the cell site: 1 week; (8) Addition cell sites to obtain location to Phase II requirements if served by only 1 cell site includes: Leasing, zoning, permitting, construction, integration, and testing: Turnaround: 6 months; (9) Final integration and testing of the modified site upon completion of all of the above steps: Turnaround: 1 week. This process involves numerous parties which can cause a cascading series of delays: the tower owner, the zoning board, legal teams for leases, the LEC (for additional interconnect), contractors, and other companies involved in this industry.

In addition, any incidental modifications of the site pattern (additional sites, omni to sector conversions) may require additional changes to the antenna arrays at the site and/or new equipment. This would repeat the process described above all over again.

Finally, if each wireless carrier were to implement a different network-based solution, this process would be repeated for each carrier. Additional modifications, depending upon the type of implementation, may require the addition of hardware, software, and infrastructure (particularly the signaling infrastructure) at the mobile switch or the network itself. For example, network providers may utilize a Service Control Point architecture will require additional data links and service from an ALI provider. Certain network solutions require an additional piece of equipment in the mobile switching center itself to manage the traffic from the modified or new cell site. In most major MSAs, there are a minimum of 4 wireless carriers (A side, B side, PCS, and iDEN). Each of these wireless carriers would have to introduce new pieces of hardware and software into the infrastructure. This would require engineering by the network solution provider for each of the wireless carriers to complete the solution.

A. Root Mean Square

IDC's Report of its field test to King County were presented in a raw format. Only 6% of the 911 calls made during the field test fell outside the Commission's Phase II requirements, but every one of those calls were located. King County did not wish to throw out any of the calls, nor adjust for the infinity problems with RMS, by placing any bounds (i.e., assumptions) on the variables. Therefore, under the Commission's RMS measure, if IDC had thrown out those 6% of 911 calls outside the Commission's Phase II requirements, IDC's field test results would have been even better. Thus, IDC believes that RMS is an appropriate measure and an achievable standard for location technology.

B. Circular Error Probability

Circular Error Probability (CEP), as used by the military, is expressed in terms of the radius of a circle within which 50% of the missiles fired will impact. Thus if a missile has a CEP of 1 km this means that 50% of missiles fired at a given target should impact within 1 km of their intended target and the remaining 50% will impact more than 1 km from their target. IDC believes that the CEP measure is less conservative than RMS, and thus, would provide wireless carriers with a greater margin of error than needed given the advances in GPS technology.

IV. HANDSET WAIVERS ARE IN THE PUBLIC INTEREST BECAUSE A HANDSET-BASED APPROACH PROVIDES INCREASED PUBLIC SAFETY BENEFITS TO WIRELESS SUBSCRIBERS

A. Commission Waiver Rules

Section 22.119(a) of the Commission's rules, 47 C.F.R. @ 22.119(a) provides that the Commission may grant a request for waiver if it is shown that:

(1) the underlying purpose of the rule(s) would not be served or would be frustrated by application to the instant case, and that a grant of the requested waiver would be in the public interest; or

(2) in view of unique or unusual factual circumstances of the instant case, application of the rule(s) would be inequitable, unduly burdensome or contrary to the public interest, or that the applicant has no reasonable alternative."

1. The Underlying Purpose of the Commission's Phase II Requirements Would Not Be Served If Wireless Carriers Are Not Provided The Opportunity to Implement a Handset-based Approach.

Due to the rapid growth of wireless subscribers and increasing public safety use of wireless handsets by subscribers to call 911, the Commission stated that, "[our] goal is to ensure the rapid, efficient, and effective deployment of ALI as part of E911, in order to promote the public safety and welfare."[21] Clearly, the Commission hoped that advancements in technology would, in time, provide greater accuracy and reliability of location information than its current Phase II rules requires of wireless carriers.

[21] E911 Recon Order, 12 FCC Rcd at 22725 (Para. 123).

Thus, the underlying purpose of the Phase II requirements would not be best served if the recent advancements in GPS technology that allow a location-enabled handset to provide increased accuracy and reliability of location information, at a significantly lower cost, is not recognized as another, potentially better, technology that can satisfy the Commission's Phase II requirements.

IDC developed and field tested its signaling protocol, which enables the transport of location data with voice, in a real world environment with the King County E-911 Program Office in Washington state. Marlys Davis, E-911 Program Manager, filed a letter in support of the performance of the GPS handset solution (*see Attachment D*).

Initially, APCO did not support a handset-based approach due to its concerns with delay of the Phase II October 1, 2001 deadline. However, once APCO realized that a handset-based approach can provide increased accuracy and reliability of location information at a faster rate than previously understood, and thereby save more lives, it filed comments that extensions to the Phase II deadline may be justified under certain conditions. Also, the Wireless Consumers Alliance filed comments supporting the choice of a handset solution because of the public safety benefits of increased accuracy and reliability of location information that can be provided to wireless subscribers, and the significant cost difference between the handset-based approach and the network approach.[23]

[23] APCO Comments in Response to Requests for Waiver of Phase II Requirements, May 25, 1999; Petition of the Wireless Consumers Alliance to Modify 47 C.F.R. Section 20.18(e) & (f), June 1, 1999.

2. *IDC's Selective Routing, Transfer of Location Information, and Tracking and Refreshing, Are Special Features That Are Unique and Provide Significant Enhancements for Public Safety*

When a 911 call is received, IDC's unique technology has the accuracy and reliability to transfer the location information with the call to the appropriate PSAP, based upon the geographic location of the caller. This is a particularly valuable feature for PSAPs when a 911 caller is in a vehicle and leaves the interstate highway to take an exit to a downtown side street or rural side road. The PSAP can choose to transfer the 911 caller's location information to another call-taker, supervisor, or jurisdiction, as appropriate *(see Attachment A, Graphic Page G-2)*.[24]

On a highway, travelling at 50 to 60 miles per hour, the location of the caller can change rapidly. IDC's technology includes software that allows PSAPs to track a mobile 911 caller by watching a pop-up screen showing location, speed and direction of travel, to within 40 feet in many cases *(see Attachment A, Graphic Page 8-2)*.[25]

V. CONCLUSION

The Commission's Phase II rules do not preclude wireless carriers from choosing to implement a handset-based approach. But, the handset-based solution, the latest state-of-the-art technology, only recently became available as another option for PhaseII. Wireless carriers that would prefer to implement a technology that provides increased accuracy and reliability of location information are concerned that they will be unable to meet the Commission's Phase II requirements for all handsets by the October 1, 2001 deadline, as currently written.

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[24] IDC Ex Parte, December 29, 1998.
[25] Id.

Therefore, in the interest of public safety, the option of a waiver with specific milestones, or a technological and competitively neutral rule change, is needed to provide wireless carriers with the assurance that it can meet the Commission's Phase II requirements through implementing a phase-in approach if it chooses a handset solution.

IDC respectfully submits that the Commission would be acting consistently with the original purpose of its E911 Order to take action that permits wireless carriers and PSAPs to implement and provide a handset-based approach for Phase II. Any temporary delay of the Commission's Phase II October 1, 2001 deadline, will be rewarded by the many lives that will be saved because a PSAP was able to find the wireless subscriber who made that 911 call from a location-enabled handset.

Submitted By,

ATER WYNNE, LLP

Angela Wu, Esq.

cc: Dan Allen, President
Dan Preston, CTO/Co-Founder

ATERWYNNE LLP
ATTORNEYS AT LAW

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206-623-4711
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May 28, 1999

Via Hand Delivery

Magalie Roman Salas
Secretary
Federal Communications Commission
The Portals
445 12th St., SW
Washington, D.C. 20554

Re: CC Docket No. 94-102 - FCC E911 Order
Ex Parte Presentation

Dear Ms. Salas:

On May 27th, 1999, Dan Allen, President & CEO of Integrated Data Communications (IDC), a provider of a signaling protocol technology for the handset solution, and Dan Preston, Co-Founder and Chief Technology Officer of IDC, and I, as attorney for IDC, met with Deputy Bureau Chief Jim Schlichting, the Wireless Telecommunications Bureau Policy staff, and the Office of Engineering and Technology. We met with Nancy Boocker, Daniel Grosh, Won Kim, Barbara Ridler, Marty Liebman, and Ron Netro from the Policy Division; and with Rebecca Dorch, Robert Bromery, Bob Eckert, and Harry Wong from the Office of Engineering and Technology.

The purpose of the meetings was to discuss IDC's official report (IDC Report) on its field test results for the King County E911 Program Office in Washington State. Copies of IDC's Report were distributed to FCC staff. In our meetings, we discussed the following:

Attachment A

ATERWYNNE LLP
ATTORNEYS AT LAW

Suite 5450
601 Union Street
Seattle, WA 98101-2327
206-623-4711
Fax 206-467-8406

June 3, 1999

Via Federal Express

Magalie Roman Salas
Secretary
Federal Communications Commission
The Portals
445 12th St., SW
Washington, D.C. 20554

Re: CC Docket No. 94-102 - FCC E911 Order
Ex Parte Presentation

Dear Ms. Salas:

On June 1st, 2nd and 3rd, Dan Allen, President & CEO of Integrated Data Communications (IDC), a provider of a signaling protocol technology for the handset solution, and Dan Preston, Co-Founder and Chief Technology Officer of IDC, and I, as attorney for IDC, met with Ari Fitzgerald, Commissioner Harold Furchtgott-Roth, Bob Calaff, Ron Netro and Marty Liebman, Peter Tenhula, and Dan Connors.

The purpose of the meetings was to discuss IDC's official report (IDC Report) on its field test results for the King County E911 Program Office in Washington State. Copies of IDC's Report were distributed to the Chairman's office, and to each of the Commissioner's offices. In our meetings, we discussed the following:

I. PURPOSE OF REPORT - MEET KING COUNTRY E911 REQUIREMENTS

IDC prepared its report on a field test conducted in the "real world" using existing customer premises equipment and vendor technology for the King County E911 Program Office

in Washington State. IDC's technology enables increased public safety through improved call response time.

A. Requirements

First, King County wanted to know whether FCC requirements for Phase II were technically achievable. Second, King County wanted to know if IDC's technology could work with existing PSAP equipment and current vendor technology. Thereafter, King County requested additional requirements, more stringent than FCC requirements, for Phase II *(see attached graphic page 4-3)*:

1. Selectively route calls by latitude and longitude of caller to appropriate PSAP;
2. Compatibility with all wireless carriers' systems;
3. Locate caller to within 40 feet;
4. Display of caller's location graphically, using legacy CPE;
5. Provide caller's latitude, longitude, altitude, speed, and direction of travel;
6. Refresh ALI; and
7. Find 90% of all callers.

IDC was able to meet and exceed many of those additional, more stringent, King County requirements.

B. Duration and Location

King County field tests were conducted from June 1, 1998 to November 30, 1998 throughout the Seattle metropolitan area. IDC and King County both wished to create a "real-world" environment in which to conduct the tests. Accordingly, a variety of testing locations were sampled using live air-interface networks and an actual King County 9-1-1 trunk was modified to respond to a call of "5-1-1" for the field test. Calls were placed, relayed, and routed through the system in the same manner of an actual emergency.

Calling locations included *(see attached graphic page 6-1)*:

- Downtown Seattle (urban canyon);
- Mercer Island (suburban and waterborne);
- North Bend (rural);
- Snoqualmie Pass (mountainous);
- Seattle Arboretum (densely forested); and
- Washington State Dept. of Transportation monuments (various roads).

IDC worked closely with King County to determine the appropriate mix of calling environments in order to best reflect the true distribution of callers to PSAPs. That distribution is illustrated as follows:

- Urban - 20%
- Suburban - 30%
- Rural - 20%
- Mountainous/Remote - 20%
- Other - 10%

IDC worked primarily with the cooperation of US West, GTE Wireless, AirTouch, and Nextel. Through use of personal accounts, IDC also used AT&T Wireless and Sprint PCS phones and networks to make test calls. Field test results were based on 4,870 scientifically documented calls, using 10 different handset unit models from Motorola, NOKIA, Sony, and Ericsson *(see attached graphic page 7-20)*.

IDC tested 4 wireless air interfaces AMPS, N-AMPS, CDMA, iDEN, using both digital and analog modes as available by the carrier *(see attached graphic page 7-20)*:

- 21% of calls were AMPS;
- 22% of calls were N-AMPS:

- 54% of calls were CDMA; and
- 3% of calls were iDEN.

Over 50% of the calls were CDMA because IDC frequently used GTE Wireless' system to test its selective routing capabilities (see below). GSM calls were not tested because that technology was not available in the Washington state market. However, IDC is having discussions with Western Wireless about conducting tests of its *new* VoiceStream network, which uses GSM. Although TDMA works with IDC's technology as well, TDMA calls were not "officially" tested, and therefore, those results are not a part of IDC's Report.

Overall, the field tests showed increasing improvement based on continuing evolution of the GPS product from SiRF technology. IDC's test results are based on its use of the Beta 1.5 version of a GPS chip from SiRF. In testing, Beta 3.5 demonstrated a **245%** increase in accuracy (of location) over the Beta 1.5 version. The test results from Beta 3.5 are not included in IDC's Report because that technology was used in the latter part of the field test and would have skewed the test results. IDC will be testing a Beta 4.6 version, and possibly a Beta 5.1 version, later this year. IDC expects these new versions to show improved coverage in buildings, tunnels, and other structures, with penetration of foliage, and increased accuracy up to 20 feet.

II. RESULTS IN IDC'S REPORT

First, 100% of all calls were located. Next, according to information from King County, approximately 48% of E911 calls to the PSAPs are from the major highways. The results of the field test were as follows *(see attached graphic page 7-14)*:

1. 94% of all calls fell within the FCC Phase II requirements of 406 feet (125 meters);
2. 75% of all calls were within 150 feet accuracy;
3. 62% of all calls were within 100 feet accuracy;

4. 51% of all calls were within 70 feet accuracy; and

5. 31% of all calls were within 40 feet accuracy.

A. Limitations

Currently, IDC's technology cannot show that it can locate a caller by floor in a building without the assistance of a small GPS repeater antennae. However, IDC can provide the last known location of the caller (e.g., front door address of the building). Nor, can IDC currently locate wireless calls made in tunnels or subways. IDC did not test battery life, power consumption, or antennae types or placement. According to discussions with some equipment manufacturers, however, battery drain or power consumption would be negligible. Also, GPS would not interfere with the antennae, or require different placement of the antennae on the handset.

In addition, because urban canyons produced a reflective effect, that effect diminished the ability to consistently locate the caller to within 40 feet, but IDC was still able to locate those callers within FCC Phase II requirements. And lastly, IDC's technology is not able to transmit location data in areas with no cellular coverage.

B. Special Features

Accurate and reliable location information is key to public safety. Apparently, about 40% of wireless callers are unable to relay their location to E911 call takers. The inability to communicate location was the case for about 34,000 calls per day in 1998, which as a result, takes public safety 2.5 to 3 times longer to determine the correct location for wireless calls. Therefore, the ability to selectively route calls to the correct PSAP, when a mobile wireless caller makes a 911 call, and to track and refresh the location information of that caller, saves time and thereby saves lives.

1. Selective Routing

In the urban canyon environment, there are three types of calls which must be correctly routed to the appropriate PSAP: (a) from an interstate highway that runs through a city; (b) from an interstate highway as the caller takes an exit ramp; or (c) from a downtown street location. Each of these calls were correctly routed 100% of the time: (a) a call from an interstate highway that runs through a city was routed to the Washington State Patrol; (b) a call from an interstate highway exit ramp was routed to Seattle City Police Department; and (c) a call from a downtown street location was correctly routed to the Seattle City Police Department.

In the suburban environment, calls were correctly routed to the King County Sheriff's office. In rural and mountainous environments, calls were correctly routed to the Washington State Patrol *(see attached graphic page G-2)*.

2. Tracking, Refreshing and Call Transfer

During its field test, IDC was able to show on a map, using existing customer premises equipment at the PSAP, the wireless caller's longitude, latitude, altitude, speed, heading, and location specified in feet *(see attached graphic page 8-2)*. In fact, a map with the wireless caller's location came up on the PSAP screen just before the phone rang with the 911 call! IDC's technology can refresh location information on demand by the call-taker, thus allowing the call-taker to track the caller who made the 911 call. IDC's technology can also allow for transfer of a 911 call, from one call-taker to another call-taker, along with the map showing the caller's location information.

III. IDC's PROPOSAL FOR E911

IDC supports the FCC's Phase II October 1, 2001 deadline for E911. IDC believes that only a small percentage of wireless handsets will require a waiver, if implementation begins now.

At present, several equipment manufacturers and wireless carriers see the market opportunity for location technology, particularly for E911. But, those companies do not think the FCC has been sufficiently clear that it would accept a handset-based approach to meeting its E911 requirements for Phase II. As a result, equipment manufacturers and wireless carriers are hesitant to independently make the investment to provide E911 capability in the wireless handset.

IDC proposes that the FCC clarify the circumstances under which it would approve any handset waivers. IDC suggests the following criteria for consideration by the FCC:

1. That wireless carriers must begin implementation by January 1, 2001.
2. Penetration for old/new handsets in the market that are location enabled technology should be at:
   - 33% by October 1, 2001
   - 75% by December 31, 2002
   - 90% by December 31, 2003
3. Penetration for new handsets with location enabled technology going forward should be at:
   - 100% by October 2001
4. These figures assume handset technology will provide accuracy of at least 30 meters, based upon a RMS measure; and CTIA's published cellular churn rate.

Pursuant to Commission's Rule Section 1.1206, two (2) copies of this ex parte letter with attachments are enclosed for filing in this docket. Two (2) copies of IDC's Report were filed with

the May 28th ex parte. If you, or anyone else, have questions on this matter, I can be reached at 206.623.4711. Thank you.

Very truly yours,

ATER WYNNE LLP

Angela Wu

Angela Wu /cac

Attachments

cc: Dan A. Allen, President & CEO
Dan A. Preston, Co-founder & CTO
James A. Vroman, Co-founder & Executive Vice President

4.3.8.1 Mountainous areas
4.3.8.2 Skyscrapers and urban canyons
4.3.8.3 Tunnels
4.3.8.4 Highways serviced by: Seattle Police Department, Washington State Patrol and the King County Sheriff's Office.
4.3.8.5 General neighborhoods
4.3.8.6 Waterways

4.3.9 PSAPs To Be Included In Test (total of 3)

4.3.9.1 King County Sheriff PSAP (downtown Seattle)
4.3.9.2 Seattle Police Department PSAP (downtown Seattle)
4.3.9.3 Washington State Patrol (Eastgate, 156th Street)

4.4 KING COUNTY REQUIREMENTS VS. FCC REQUIREMENTS

The King County requirements stated in paragraph 4.3 are more stringent than the FCC requirements. While the FCC requires the location to be accurate within 125 meters (406 feet) for 67% of the calls, King County requested accuracy to 40 feet (12.3 meters), 90% of the time. *It is the consensus of the PSAPs in King County, WA that approximately 40 feet is the level of accuracy needed for the location to be usable for effectively dispatching assistance to the caller.* **Figure 4-2** (below) compares these requirements – using both radiuses from the actual location (406-ft. meters vs. 40-ft. meters) and the area of the location (517,847 square feet vs. 5,025 square feet). Based upon the accuracy of the area, the King County, WA requirements are 103 times more accurate than the FCC Phase II requirement.

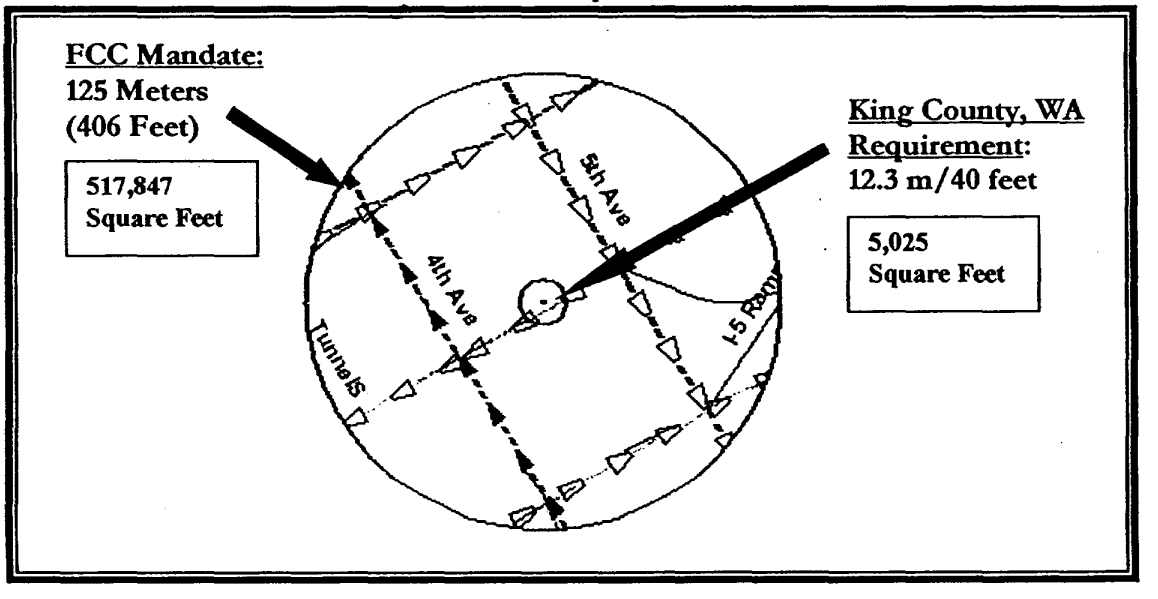


Figure 4-2. Comparative radius and area accuracies – FCC requirements vs. King County, WA Requirements

6.0 TECHNICAL EVALUATION
THE PLAN AND STUDY

6.1 OVERVIEW OF THE TECHNICAL STUDY

6.1.1 Background

In the search for an accurate location service that required minimal impact to the existing infrastructure, Integrated Data Communications (IDC) and King County conducted a comprehensive handset-based wireless E-911 field trial. IDC supplied the inband communications protocols and integration for a team of participants to implement a "wireless handset to dispatcher headset" location solution, which included selective routing of calls to the appropriate Public Safety jurisdiction. At King County's request, IDC used existing equipment and vendor technology, while adding new participants and products as required to complete implementation of the parts of the model discussed in Section 5.0. IDC's augmentation of Global Positioning System (GPS) receivers and its proprietary Data Control protocols to the handsets was all that was required of the wireless carriers involved in the demonstration.

6.1.2 Test Areas

The King County E911 Program Office determined the test calling areas and required IDC to demonstrate its wireless location system in diverse environments to include; urban canyons, waterfronts, mixed-use suburban areas, and mountainous areas near Snoqualmie pass (east of Seattle on I-90). Weather conditions in Seattle and in the mountain regions included substantial inclement weather throughout the demonstration. **Figure 6-1** includes actual photographs of calling locations used during the field trial; note that calls were made from a variety of challenging venues throughout the greater Seattle, Washington area.

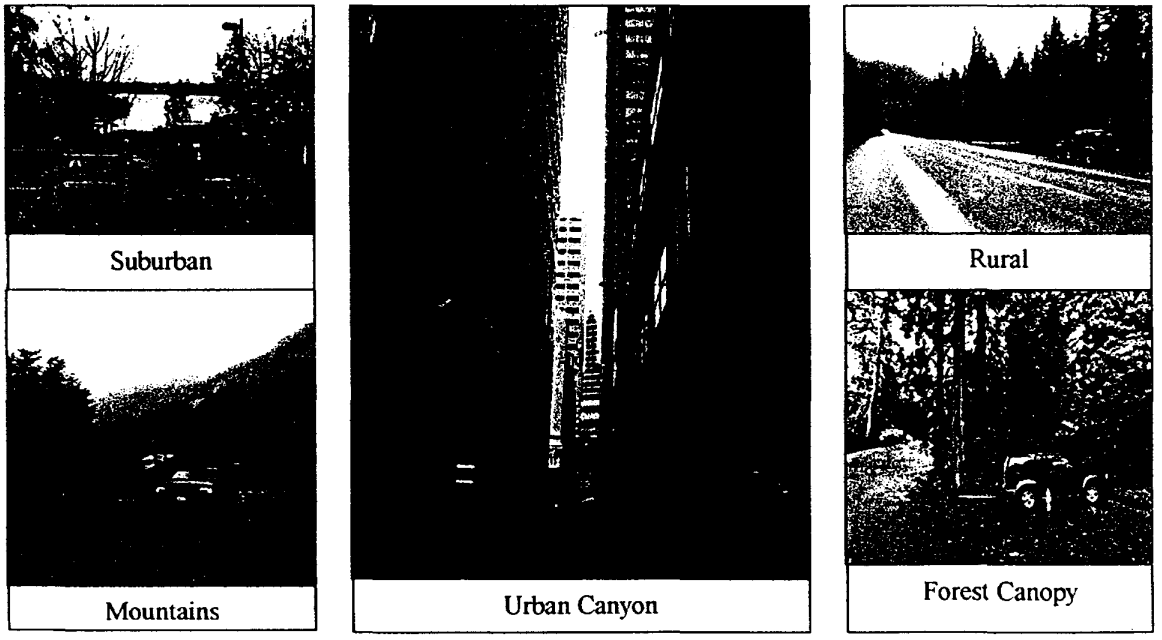
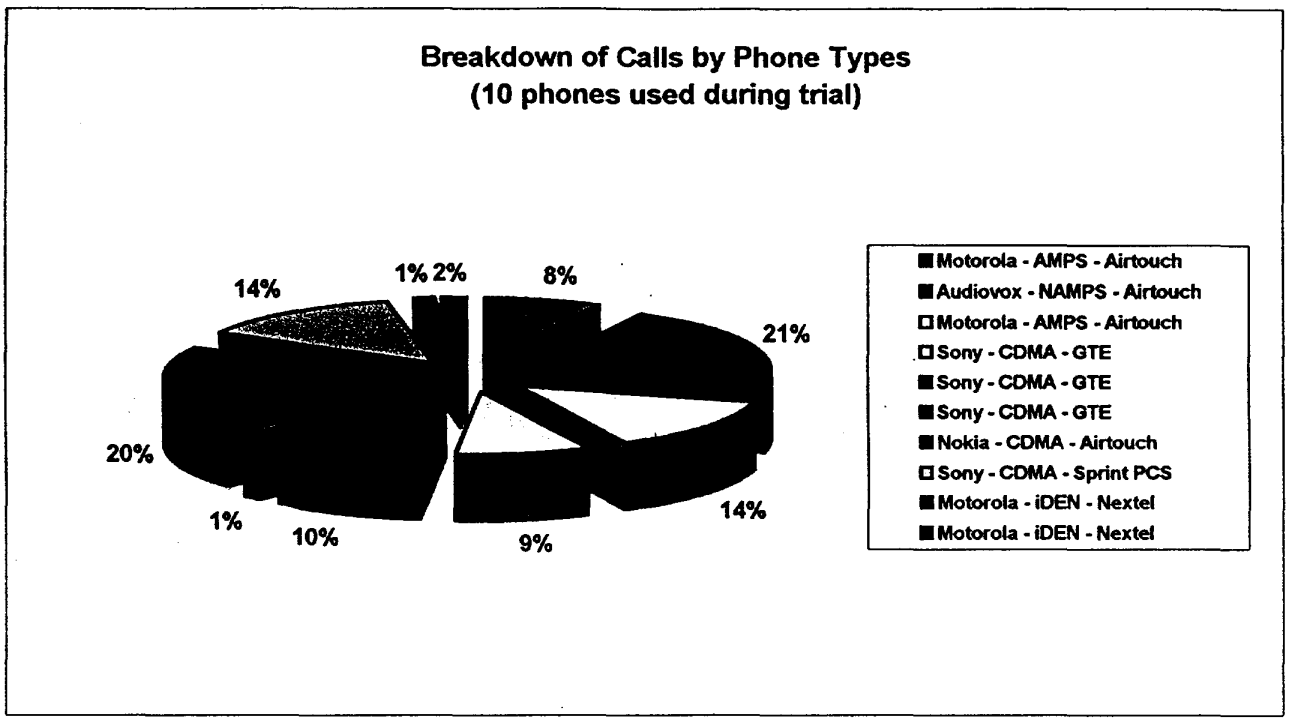


Figure 6-1. Samples of Diverse Calling Environments for the King County Trial

6.1.3 Additional Test Participants and Roles



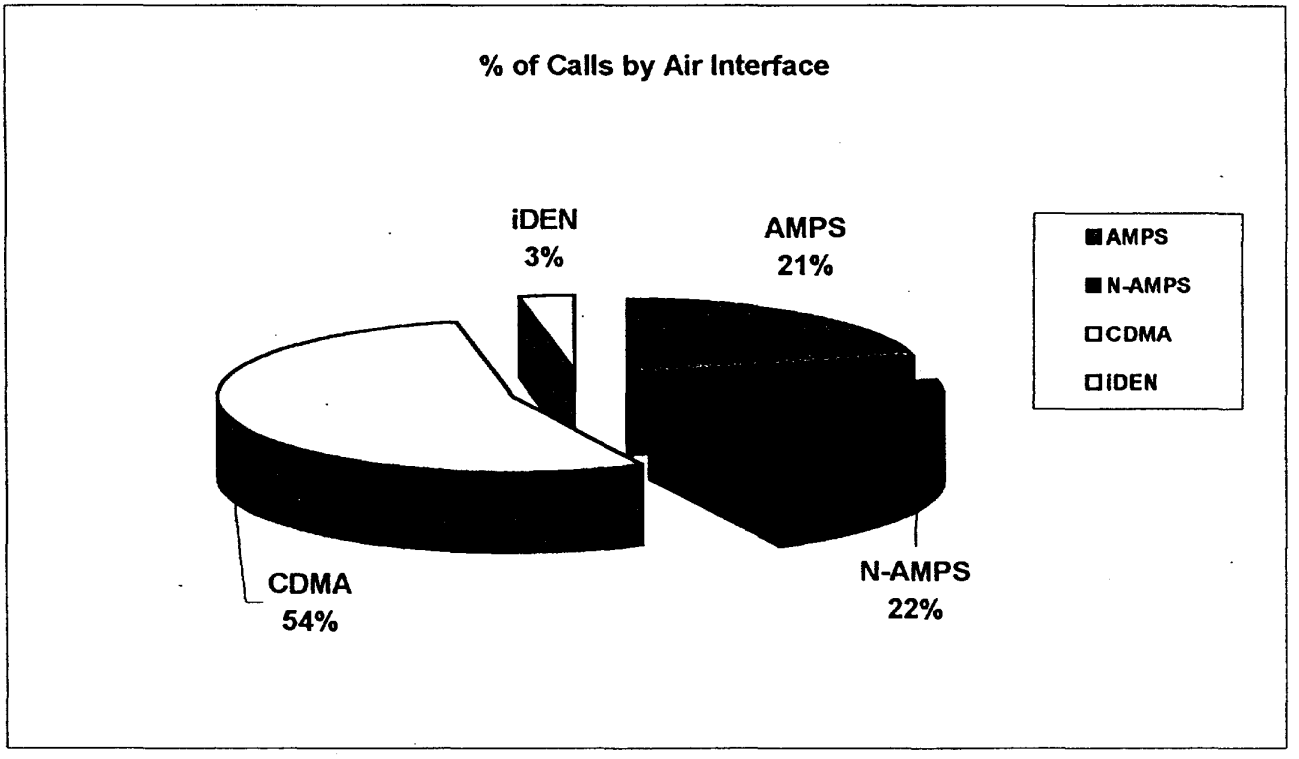
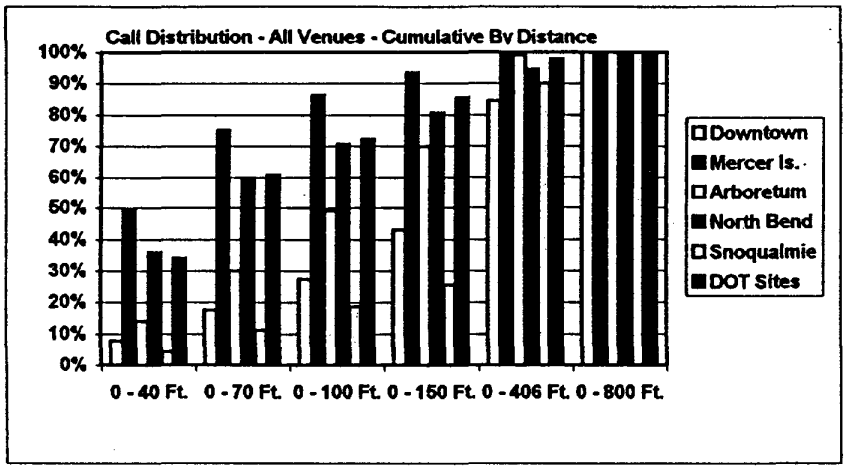
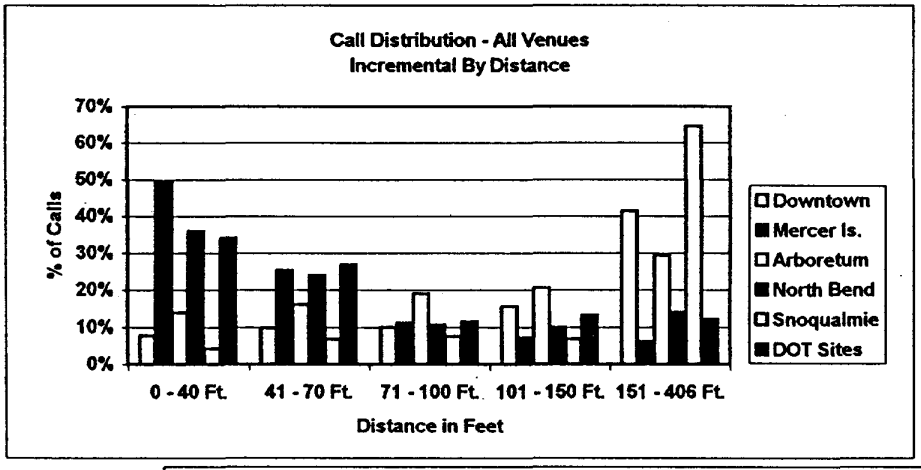


Figure 7-10. Breakdown of Calls by Phone Model Type. Breakdown of Calls by Air Interface Type





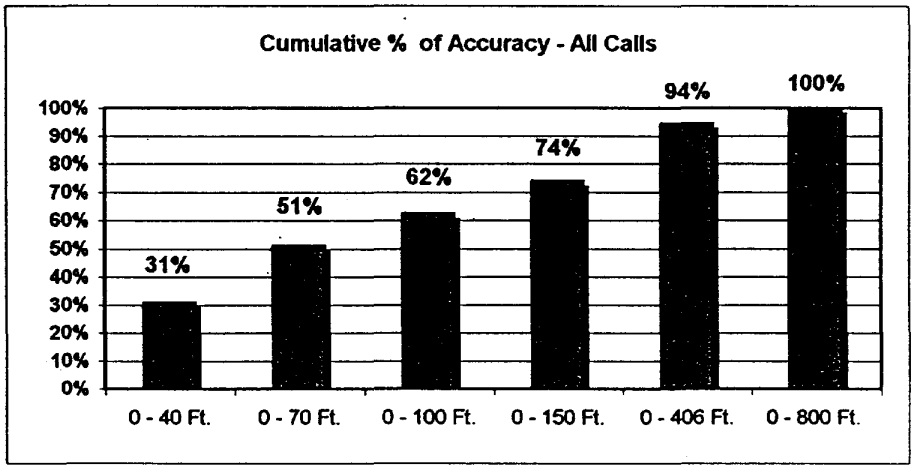


Figure 7-5. Call Distribution - By Venue (Cumulative and Incremental) and Cumulative Accuracy of all Calls

APPENDIX G

ROUTING PHASE - SCREEN CAPTURES

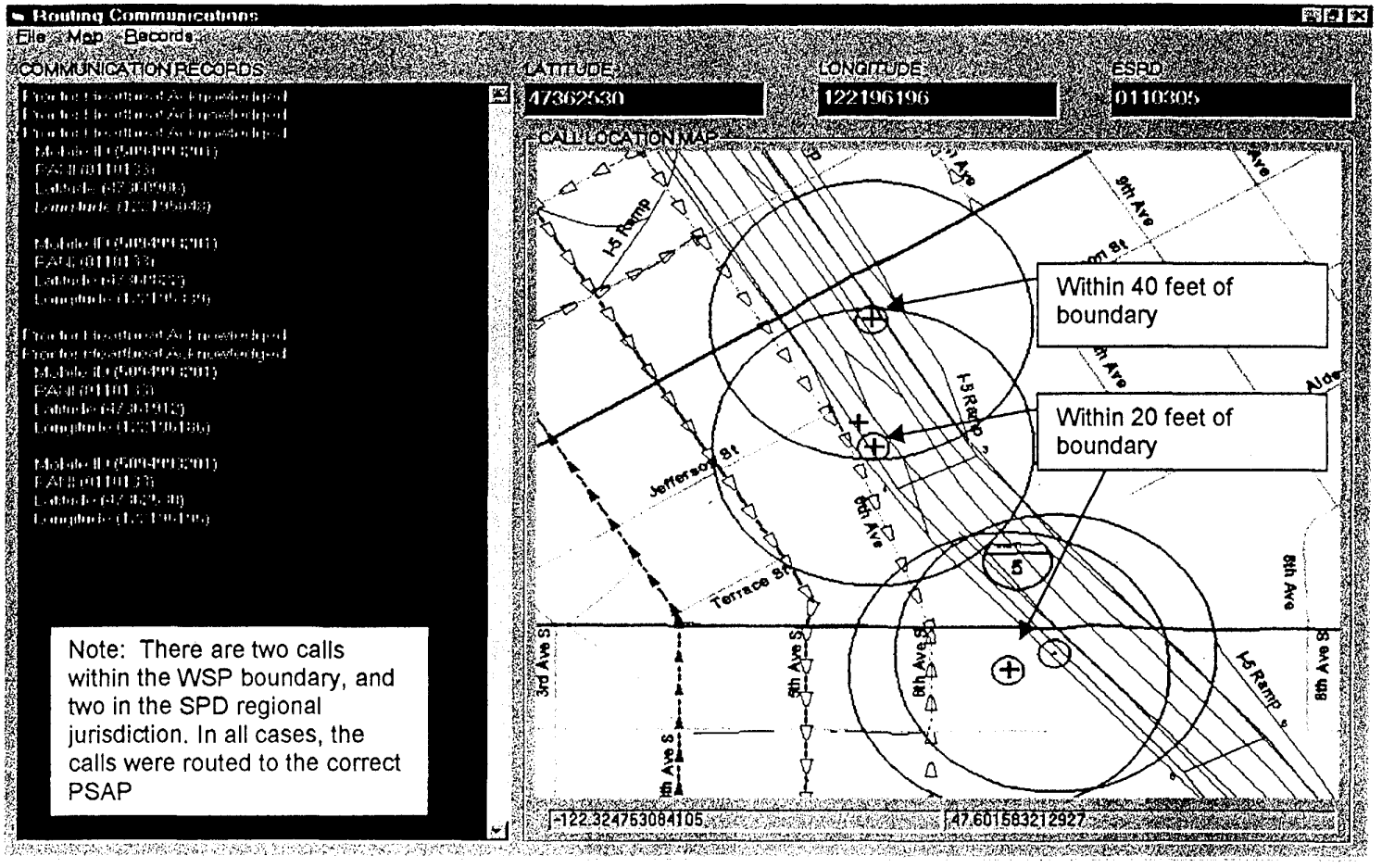


Figure G-1

In **Figure 8-2** (below) this call taker display screen illustrates the caller's position on the highway, and provides information regarding speed and direction. In this example, he caller is in the westbound lane of I-90, traveling NW at 61 MPH. This example proves that IDC was able to obtain, transport, and display location information on the existing Customer Premise Equipment at the Public Safety Answering Point (PSAP). Altitude, speed, and heading were also obtained and displayed on the call taker maps.

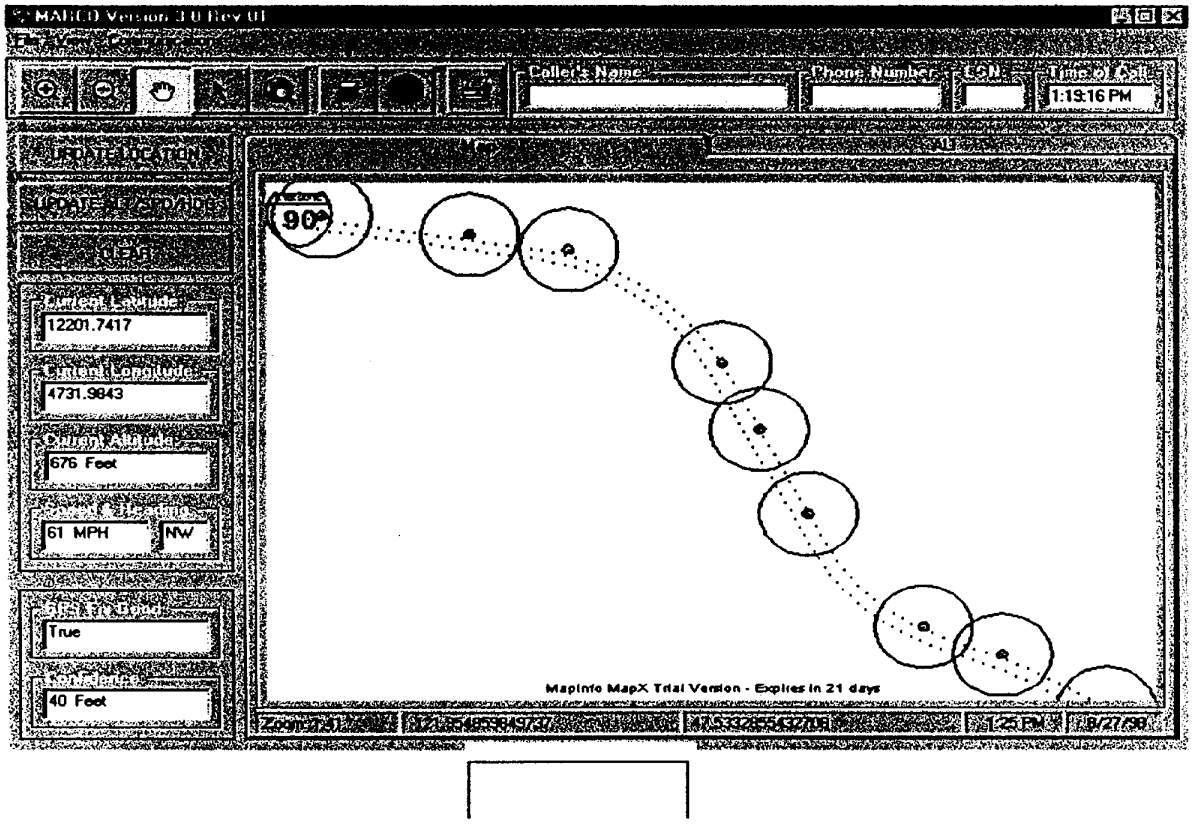


Figure 8-2. Screen Capture to Demonstrate Call Tracking Ability

8.3 CALL PATH SIGNALING: A VIABLE APPROACH

Testing the components individually was a necessary step to:

- Identify "Best in Class" suppliers;
- Help identify the system variables; and
- Control the variables in the data gathering/logging phase.

When IDC integrated the entire system in a live "511" environment[1], we objectively demonstrated and documented that call path signaling across all wireless carrier protocols in

[1] GTE-Wireless, US West and King County set up a 511 system to parallel the existing 911 service so that testing would be as close to actual PSAP environment as possible.

Exhibit 1

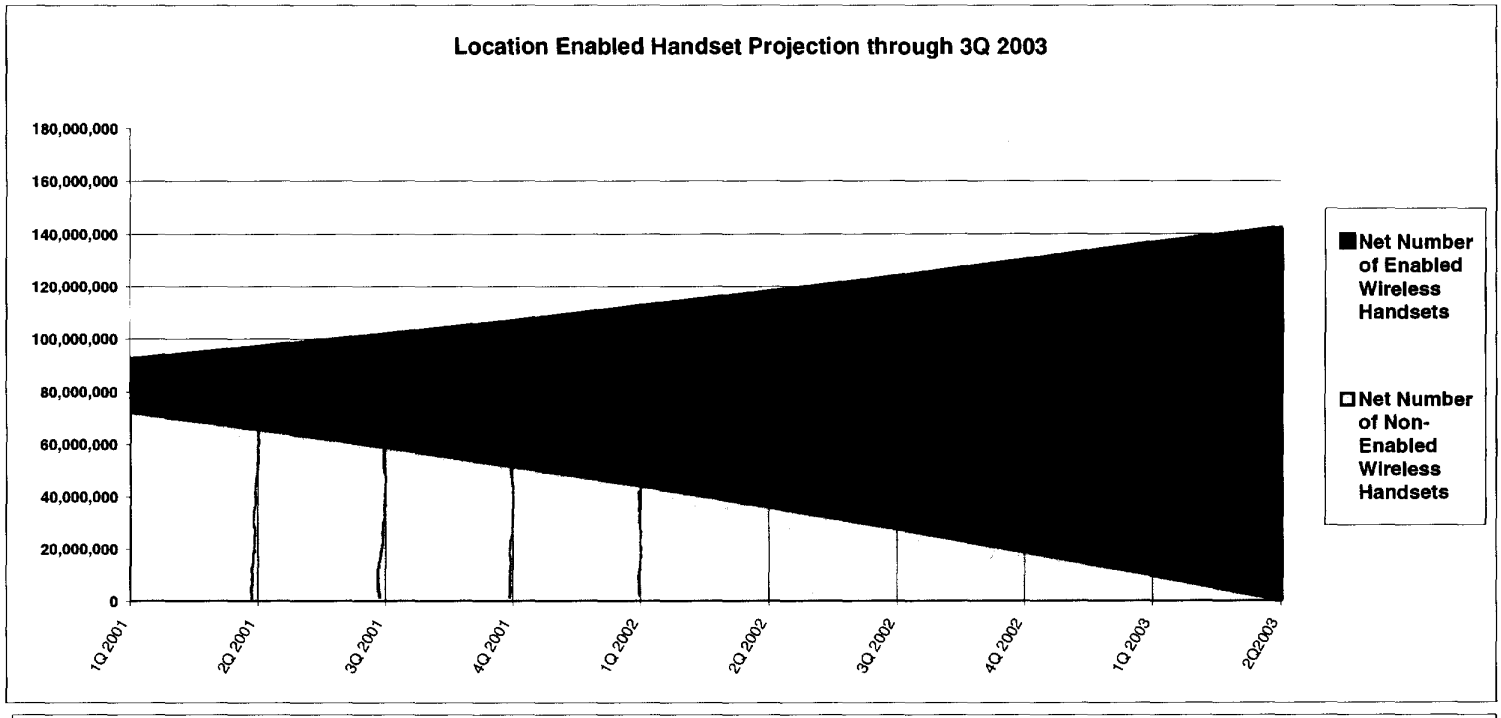
	3Q 2000	4Q 2000	1Q 2001	2Q 2001	3Q 2001	4Q 2001	1Q 2002	2Q 2002	3Q 2002	4Q 2002	1Q 2003	2Q2003
Installed Base of Wireless Handsets for United States	84,000,000	88,200,000	92,610,000	97,240,500	102,102,525	107,207,651	112,568,034	118,196,436	124,106,257	130,311,570	136,827,149	142,300,235
Total Number of Enabled Wireless Handsets thru New Sales	1,200,000	5,421,000	13,403,100	24,284,775	35,710,534	47,707,580	60,304,479	73,531,223	87,419,305	102,001,790	117,313,399	132,022,318
Total Number of Enabled Handsets Thru Churn Sales (27% Ann. Churn)	1,701,000	3,572,100	6,251,175	6,563,734	6,891,920	7,236,516	7,598,342	7,978,259	8,377,172	8,796,031	9,235,833	9,605,266
Total Number of Non-Enabled, Churned Handsets Returned to Service	-170,100	-357,210	-625,118	-656,373	-689,192	-723,652	-379,917	-398,913	-418,859	-439,802	0	0
Total Number of Enabled Handsets thru battery sales	840,000	882,000	926,100	972,405	1,021,025	1,072,077	562,840	590,982	620,531	651,558	0	0
	3Q 2000	4Q 2000	1Q 2001	2Q 2001	3Q 2001	4Q 2001	1Q 2002	2Q 2002	3Q 2002	4Q 2002	1Q 2003	2Q2003
Net Number of Non-Enabled Wireless Handsets	80,429,100	78,682,110	72,654,743	66,075,960	59,168,238	51,915,129	44,482,289	36,494,883	28,108,108	19,301,993	10,277,917	672,651
Net Number of Enabled Wireless Handsets	2,901,000	8,993,100	19,654,275	30,848,509	42,602,454	54,944,097	67,902,822	81,509,483	95,796,477	110,797,821	126,549,232	141,627,584
	3Q 2000	4Q 2000	1Q 2001	2Q 2001	3Q 2001	4Q 2001	1Q 2002	2Q 2002	3Q 2002	4Q 2002	1Q 2003	2Q2003
PERCENTAGE OF ENABLED HANDSETS	3%	10%	21%	32%	42%	51%	60%	69%	77%	85%	92%	100%
	3Q 2000	4Q 2000	1Q 2001	2Q 2001	3Q 2001	4Q 2001	1Q 2002	2Q 2002	3Q 2002	4Q 2002	1Q 2003	2Q2003
Effective Price Per Enabled Subscriber Unit Per Quarter	$6.41	$2.17	$1.07	$0.74	$0.58	$0.48	$0.42	$0.37	$0.34	$0.31	$0.29	$0.28
Effective Price Per Enabled Subscriber Unit Per Month	$2.14	$0.72	$0.36	$0.25	$0.19	$0.16	$0.14	$0.12	$0.11	$0.10	$0.10	$0.09
Growth and Enabling Assumptions	3Q 2000	4Q 2000	1Q 2001	2Q 2001	3Q 2001	4Q 2001	1Q 2002	2Q 2002	3Q 2002	4Q 2002	1Q 2003	2Q2003
New Non-Enabled Handsets (percentage of new units)	70%	40%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
New Enabled Net Handsets (percentage of new units)	30%	60%	100%	100%	100%	100%	100%	100%	100%	100%	100%	100%
Growth of Non-Enabled Handsets to base (Quarter-Quarter)	4%	2%	0%	0%	0%	0%	0%	0%	0%	0%	0%	0%
Growth of Enabled Handsets to base (Quarter-Quarter)	1%	3%	5%	5%	5%	5%	5%	5%	5%	5%	4%	4%
Percentage of Non-Enabled, Churned Handsets Returned to Service	10%	10%	10%	10%	10%	10%	5%	5%	5%	5%	0%	0%
Percentage of GPS Battery Pack Sales to Total Base	1.0%	1.0%	1.0%	1.0%	1.0%	1.0%	0.5%	0.5%	0.5%	0.5%	0%	0%

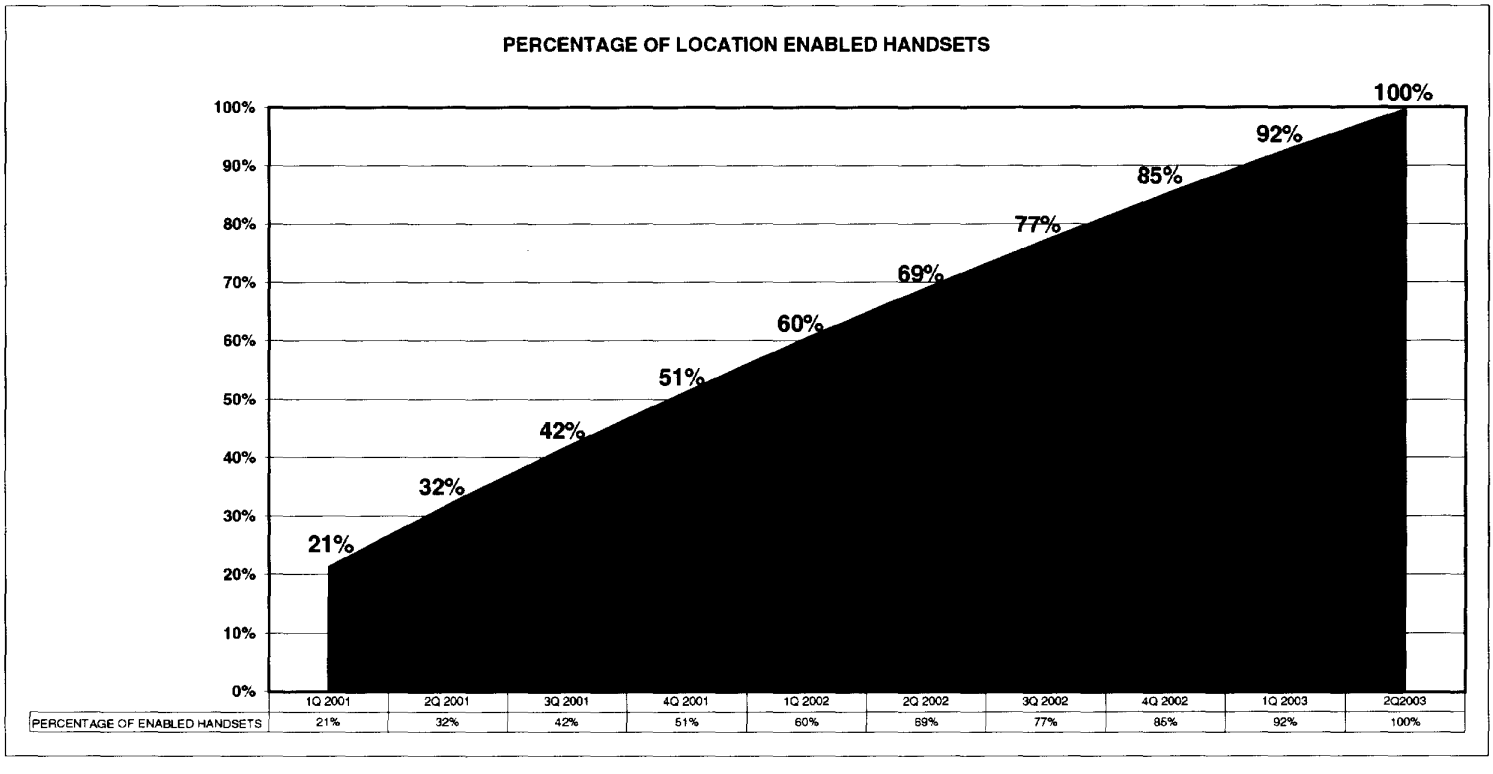
Penetration Estimates for Location-Enabled Handsets

Attachment B
(Page 1 of 2)

6/11/99, 10:32 AM

Exhibit 2





	1Q 2001	2Q 2001	3Q 2001	4Q 2001	1Q 2002	2Q 2002	3Q 2002	4Q 2002	1Q 2003	2Q2003
PERCENTAGE OF ENABLED HANDSETS	21%	32%	42%	51%	60%	69%	77%	85%	92%	100%

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Statistics & Surveys

Wireless 9-1-1 and Distress Calls

Year	Ending Subscribers	U.S. 9-1-1 Annually	U.S. 9-1-1 Monthly	U.S. 9-1-1 - Daily
1985	340,213	193,333	16,111	530
1986	681,825	649,659	54,138	1,780
1987	1,230,855	1,202,336	100,195	3,294
1988	2,069,441	2,382,855	198,571	6,528
1989	3,508,944	4,311,497	359,291	11,812
1990	5,283,055	5,914,653	492,888	16,205
1991	7,557,148	8,007,586	667,299	21,939
1992	11,032,753	12,641,470	1,053,456	34,634
1993	16,009,461	15,491,344	1,290,945	42,442
1994	24,134,421	17,910,620	1,492,552	49,070
1995	33,785,661	20,059,894	1,671,658	54,959
1996	44,042,992	21,659,967	1,804,997	59,180
1997	55,312,293	30,517,327	2,543,110	83,609
1998	69,209,321	35,805,405	2,942,910	98,097

Sources: CTIA, Cellular Carriers Association of California, California Highway Patrol, New York State Police, and other state officials and wireless carriers.

YEAR 2000 EFFORT click here

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Attachment C

King County
E-911 Program Office
Emergency Management Division
Department of
Information and Administrative Services
7300 Perimeter Road South, Room 128
Seattle, WA 98108-3848
(206) 296-3910

November 24, 1998

Nancy Boocker, Deputy Bureau Chief
Wireless Bureau
Federal Communications Commission
2025 M Street
7th Floor, Room 7002
Washington, DC 20554

Dear Ms. Boocker:

The purpose of this letter is to inform you of our assessment of Integrated Data Communications' (IDC) wireless phone location technology. The King County E-911 system is heavily impacted by wireless 911 calls, and due to the difficulties and delays in handling these calls due to the lack of location information, has been actively involved in evaluating the various Phase II location technologies which are developing throughout the country. As part of this process, our office, along with the local exchange carrier which provides our Enhanced 911 service and several wireless carriers, participated in a technical evaluation of IDC's GPS location technology. This evaluation was conducted from June 1 to October 1, 1998 in various areas within King County. Based on the results of this technical evaluation, including the observations and use of the technology by my staff, 911 call takers, and myself, it is our belief that GPS technology is very effective at locating wireless callers and is a viable solution in meeting the FCC's requirements for Phase II wireless Enhanced 911 service. This technology is an effective solution for a variety of reasons, which are outlined below.

Accuracy

One of the most critical factors in being able to quickly respond to wireless 911 calls based on Phase II location information is the accuracy of the location provided. Many wireless callers who make 911 calls are in situations where they are unable to accurately describe their location to the 911 call taker. In such situations, the accuracy of the location technology used to locate the caller will be critical to being able to provide rapid emergency assistance. For the purposes of this technical evaluation, our office established the requirement of locating wireless callers to within 40 feet. This requirement was developed through discussions with 911 centers in Washington State, where the terrain in which wireless callers need to be located includes large

urban, suburban, rural, and mountainous areas. In order to test the ability of GPS technology to locate callers in these difficult terrains, areas of King County which include these different settings were identified as test areas.

In the field tests conducted during the technical evaluation, IDC's GPS technology was repeatedly capable of locating the wireless caller to within 40 feet, 80% of the time. In the other 20% of calls, IDC's technology located the wireless callers well within the FCC Phase II requirements of 125 meters, 67% of the time. This included calls from all of the different terrains discussed in the previous paragraph. I personally had the opportunity to make test calls from narrow alleys between the skyscrapers in downtown Seattle, and call takers at the 911 center were able to repeatedly pinpoint my exact location.

In addition to test calls from static locations, several tests in which the caller was moving were conducted. In these situations, 911 call takers were able to track the progress of the caller on the 911 computer screen as IDC's technology pinpointed each consecutive location.

Reliability

Another important function of Phase II location technology is the reliability of the technology in being able to locate callers. During this technical evaluation, IDC's GPS technology was able to locate 100 % of the calls which were transmitted. All calls which processed through the wireless network to reach the 911 network and the 911 center were located. Once again, this is a critical factor in evaluating Phase II location technologies.

Selective Routing

King County's Enhanced 911 system provides service to 1.6 million people through 18 different 911 centers. Due to the complexity of our system, it is critical that the Phase II location technology implemented within our area be highly accurate so that the selective routing of wireless 911 calls to the appropriate 911 center is possible based on the caller's location. As a result, this was included as a requirement for this technical evaluation.

IDC was able to demonstrate the selective routing of wireless calls based on the caller's location. In multiple situations, test callers drove on freeways and then exited onto local roads while making test calls. The calls from the freeways routed to the Washington State Patrol's 911 center, and the calls from the local roads routed to the local police 911 centers. In one of these field tests, I drove on the major interstate through downtown Seattle, exited in the downtown area and proceeded on a city street which runs parallel and adjacent to the freeway. IDC's technology clearly distinguished between the freeway and the surface street, and routed my wireless calls to the appropriate 911 center.

Based on our experience in participating in this technical evaluation and on the results of this test, we are very excited about the capabilities of IDC's GPS technology. This technology has

proven to be highly accurate and reliable, and has the capability of providing 911 centers with the tools they need to locate and provide emergency service to wireless 911 callers.

I strongly encourage the FCC to ensure that all Phase II location technologies, including handset solutions which use GPS technology, be given an equal opportunity to be evaluated as viable solutions for providing Phase II location technology to 911 centers.

I would be happy to answer any questions you or others at the FCC may have regarding this technical evaluation. Please feel free to contact me by phone at (206)296-3911, by fax at (206)296-3909, or by e-mail at marlys.davis@metrokc.gov if I can be of any assistance.

Sincerely,

Marlys R. Davis

Marlys R. Davis
E-911 Program Manager

Cc: Kevin Kearns, Manager, King County Emergency Management Division