December 11, 2014

**VIA ELECTRONIC FILING**

Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

**Re: Wireless E9-1-1 Location Accuracy Requirements, PS Docket No. 07-114**

Dear Ms. Dortch,

On Tuesday, December 9, 2014, representatives from the Association of Public-Safety Communications Officials ("APCO") International, the National Emergency Number Association ("NENA"), and from wireless carriers AT&T Mobility, Sprint, T-Mobile and Verizon (collectively, the "signatories"), together with representatives from CTIA—The Wireless Association®, met with representatives from the FCC's Wireless Telecommunications Bureau and Public Safety and Homeland Security Bureau, to discuss the signatories' Roadmap to improve wireless 9-1-1 call location accuracy for indoor and outdoor calls. The list of representatives attending the meeting appears in Attachment A.

During the meeting, the signatories identified and reviewed several provisions of the Roadmap (Attachment B contains a copy of the Roadmap filed under separate cover on November 18, 2014). Consistent with the Roadmap, the signatories discussed the formation of a test bed, dispatchable location commitments, improvements in and deployments of horizontal location technologies, steps to advance vertical location technologies providing back-up solutions for indoor calls, and metrics and deliverables.

Pursuant to Section 1.1206 of the Commission's Rules, this letter is being electronically filed with your office.

Respectfully Submitted,

*/s/ Brian Josef*

Brian Josef
Assistant Vice President, Regulatory Affairs
CTIA-The Wireless Association®

cc: Attachment A

## ATTACHMENT A

**December 9, 2014 Meeting Attendees**

Chris Helzer, WTB, FCC
Kamran Etemad, WTB, FCC
Thomas Derenge, WTB, FCC
Brian Regan, WTB, FCC
Becky Schwartz, WTB, FCC*
Charles Mathias, WTB, FCC*
Roger Sherman, WTB, FCC
John Leibovitz, WTB, FCC
Tim May, PSHSB, FCC
Jeff Cohen, APCO International
Brian Fontes, NENA
Trey Forgety, NENA
Joe Marx, AT&T Services Inc.
Bill Brown, AT&T Services Inc.
Ray Rothermel, Sprint
Eric Hagerson, T-Mobile
Don Brittingham, Verizon
Brian Josef, CTIA
Matt Gerst, CTIA

*Participated via conference bridge

**ATTACHMENT B**

November 18, 2014

**VIA ELECTRONIC FILING**

Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

**Re: Wireless E9-1-1 Location Accuracy Requirements, PS Docket No. 07-114**

Dear Ms. Dortch:

The Association of Public-Safety Communications Officials ("APCO") International, the National Emergency Number Association ("NENA") and the four national wireless carriers (AT&T Mobility, Sprint, T-Mobile USA and Verizon)("Carriers")(collectively, "signatories") are pleased to announce the attached Roadmap to improve wireless 9-1-1 call location accuracy for indoor and outdoor calls.

The Roadmap is a landmark development in identifying a wireless 9-1-1 caller's location and responds to the public's growing use of their mobile phones to make 9-1-1 calls, increasingly from indoors. At its core, the Roadmap marks a new course using indoor technologies to deliver a "dispatchable location" for indoor 9-1-1 calls – meaning that First Responders will obtain the civic address of the calling party, plus additional information such as floor, suite, apartment or other information when needed to adequately identify the location of the calling party. This approach contrasts with that of the current and proposed outdoor technologies that provide estimates of location and face challenges with indoor call location accuracy.

By way of background, the Commission's 2014 Wireless E9-1-1 Location Accuracy Notice of Proposed Rulemaking acknowledged that public safety "would be best served through the delivery of a dispatchable address."[1] The Commission specifically sought comment "on alternative approaches" and "invit[ed] relevant stakeholders – including public safety and industry – to propose a consensus approach" that would better find consumers placing wireless calls to 9-1-1 from indoor environments.[2] This Roadmap does just that by building on important

[1] *Wireless E911 Location Accuracy Requirements*, Third Further Notice of Proposed Rulemaking, 29 FCC Rcd 2374, ¶ 117 (2014) ("*NPRM*").
[2] *NPRM* ¶ 26; *see also NPRM* ¶ 6 ("[W]e encourage industry public safety entities, and other stakeholders to work collaboratively to develop alternative proposals for our consideration.").

9-1-1 location principles – dispatchable, verifiable, flexible, and reasonable time[3] – and ensuring, as Chairman Wheeler put it, "technologies that already exist and are already widely deployed should be able to provide granular location today... [t]oday, for instance, stores in the mall know when you enter because they bounce a Wi-Fi signal off your mobile handset."[4]

As described below, the Roadmap commits to meaningful improvements and FCC-enforceable timeframes to deliver effective location solutions. The Roadmap is technology neutral and allows carriers to employ a variety of location technologies, and enables carriers to leverage existing location based service technologies prevalent in the market today. The Roadmap also includes commitments to improve traditional latitude/longitude location solutions for outdoor calls and for those indoor calls where dispatchable location is not available. The Roadmap promotes the development of vertical location technologies as well, providing back-up solutions for indoor calls. Finally, the Roadmap contains metrics to ensure tangible, timely results. Key elements include the following:

***Establish a Test Bed.*** Within 12 months, wireless carriers will work with APCO and NENA to create a technology neutral test bed to characterize the performance of 9-1-1 location technology solutions that may result in improved horizontal (latitude/longitude) and vertical (altitude) accuracy, and the provision of a dispatchable location. The test bed will be operated in an open, transparent, and competitively neutral manner, as to technologies, carriers and location solution vendors. In addition, the test bed will assess the performance of location solutions in real-world conditions and morphologies to support the Carrier commitments made in the Roadmap. This test bed is intended to be a departure from some prior test beds and other specially designed testing environments, in order for the public safety community to fully vet any potential solutions.

***Deliver Dispatchable Location.*** Signatories will leverage location based service ("LBS") solutions to provide First Responders with a dispatchable location for an indoor wireless 9-1-1 caller's location. Today, commercial entities use LBS – solutions distinct from E9-1-1 location technologies but familiar to most consumers – to locate consenting consumers by harnessing wireless handsets' ability to identify signals from nearby fixed wireless devices, such as increasingly prevalent Wi-Fi® access points and Bluetooth® Low Energy (LE) beacons. Wi-Fi® hotspots are popping up ubiquitously, as wireless providers and other communications companies, conference centers, hoteliers, restaurants, municipalities and others are keen to deliver connectivity across the nation. Similarly, Bluetooth® LE beacons are being deployed throughout the country in numerous settings, including retail and sports venue settings. Leveraging this growing LBS market and infrastructure will provide PSAPs with actionable location information for indoor 9-1-1 calls. The Roadmap includes a number of commitments to promote the implementation of dispatchable location solutions, including the development of standards, introduction of compatible devices and products, the development of a secure and resilient national emergency address database, and implementation of network-wide capabilities that will facilitate the delivery of accurate location information.

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[3] *See* Remarks of Commissioner Jessica Rosenworcel, APCO International 80th Conference & Expo, at 4 (Aug. 6, 2014).
[4] *NPRM*, Statement of Chairman Wheeler.

***Enhance Horizontal Solutions.*** Carriers agree to conduct testing of OTDOA and A-GNSS (e.g., GPS, GLONASS) for improved outdoor and indoor accuracy, to deploy OTDOA in their networks, and to introduce new, secure devices with A-GNSS 9-1-1 capabilities.

***Advance Vertical (z-axis) Technology.*** While dispatchable location solutions will provide the vertical component necessary to accurately locate a 9-1-1 caller, signatories agree to concurrently study other location technologies that would provide a vertical component and to take steps to promote the development of such solutions, when necessary to supplement dispatchable location solutions. This includes an accelerated study of the use of uncompensated barometric pressure data. Carriers will promote the development and approval of standards for use of uncompensated barometric pressure data with 9-1-1 calls within 18 months, and will take steps to facilitate the delivery of such data to requesting PSAPs from the increasing number of handset models that support the capability within 36 months, if the signatories determine such data to be beneficial to public safety.

***Report Metrics.*** Carriers will collect and report data to APCO and NENA from live wireless 9-1-1 calls to evaluate the effectiveness of various positioning source methods used to locate wireless 9-1-1 callers across several regions with representative morphologies. Signatories will use this newly available data to assess the trend in positioning performance over time. Additionally, APCO and NENA intend to facilitate regular opportunities for PSAPs to provide feedback.

***Deliver Improved Accuracy for Outdoor and Indoor Calls.*** Carriers commit to achieve improved location accuracy for outdoor and indoor 9-1-1 calls using a variety of "heightened location accuracy technologies" that provide PSAPs with a dispatchable location or the 9-1-1 caller's location within 50 meters using a variety of technologies. Carriers commit to achieve this objective through a number of milestones based (for the first time) on *live* wireless 9-1-1 call data: 40% of all wireless 9-1-1 calls within 24 months, 50% of all wireless 9-1-1 calls within 36 months, 75% of all VoLTE wireless 9-1-1 calls within 60 months, and 80% of all VoLTE wireless 9-1-1 calls within 72 months.

These significant and meaningful commitments recognize the challenges associated with providing accurate location information indoors, while spurring the deployment of new technologies and devices with improved location accuracy. Improvements in the early years will take advantage of the introduction of advanced positioning technologies such as OTDOA and A-GNSS, while the significant ramp-up beginning in year five will reflect the increased availability of dispatchable location solutions. Importantly, carriers agree to base the metrics on a combination of indoor and outdoor performance in the representative rural, suburban, urban and dense urban environments of the six geographic test regions already under development through ATIS ESIF. These milestones initially apply across all existing handset and network technologies and in later years would apply to VoLTE calls when dispatchable location and VoLTE technologies will be more widely deployed.

***Assess Progress.*** The Roadmap includes numerous benchmarks upon which the signatories can assess the progress of the overall plan and individual components throughout its implementation. Within 36 months, signatories will assess whether dispatchable location solutions are on track. If dispatchable location solutions are not on track, certain provisions in the Roadmap will be supplanted with provisions for the implementation of alternative location

solutions that improve x/y and z performance. These provisions include specific benchmarks for network deployment and introduction of new handsets with z-axis capability. This approach ensures that sufficient time is afforded to the implementation and assessment of dispatchable location solutions, which have been identified as the preferred location solution, while ensuring a pathway to alternative location solutions that are verified in the test bed to satisfy feasible metrics.

* * *

We look forward to working with the Commission and other interested stakeholders to implement the provisions of the Roadmap that will improve the safety of wireless 9-1-1 callers by providing PSAPs and First Responders that serve them with the actionable, dispatchable location information they need.

Respectfully Submitted,

| | |
|---|---|
| */s/ John Wright* | */s/ Charles W. McKee* |
| **APCO International** | **Sprint** |
| */s/ Joan Marsh* | */s/ Kathleen O'Brien Ham* |
| **AT&T Services, Inc.** | **T-Mobile USA** |
| */s/ Christy Williams* | */s/ Kathleen Grillo* |
| **NENA- The 9-1-1 Association** | **Verizon** |

Attachment

# Roadmap for Improving E911 Location Accuracy

This paper describes a roadmap for achieving improved location accuracy for both outdoor and indoor 9-1-1 calls, and is based on an agreement between APCO, NENA, and AT&T, T-Mobile USA, Sprint and Verizon Wireless ("wireless carriers") ("signatories to the Agreement"). This roadmap includes short term (0-2 years), medium term (2-4 years), and long term (4+ years) initiatives that will advance E911 location accuracy utilizing a variety of technological solutions including those based on traditional latitude/longitude methods for both outdoor and indoor calls (e.g., AGNSS, OTDOA), as well as emerging next-generation solutions that would provide a "dispatchable location" to first responders for calls made from indoors. Dispatchable location is the civic address of the calling party plus additional information such as floor, suite, apartment or similar information that may be needed to adequately identify the location of the calling party. A chronological summary of some of the more critical initiatives is provided below (with estimated timelines based on date of signed Agreement of Nov. 14, 2014):

*Short Term (0-2 years)*

- Advance implementation of improved latitude/longitude-based solutions that have been recently developed (i.e., OTDOA and A-GNSS) (6-12 months) **[[3(a)]]**;
- Conduct a pre-standards demonstration of a dispatchable location solution (9 months)**[[2(c)]]**;
- Develop and implement a technology test bed in accordance with CSRIC recommendations and work undertaken by ATIS (12 months) **[[1(a)]]**;
- Develop the design, operations and maintenance requirements for the National Emergency Address Database (NEAD) (12 months) **[[2(e)(ii)]]**;
- Establish a database owner, funding mechanisms, and other requirements for the NEAD (12-24 months) **[[2(e)(iii)]]**;
- Develop outreach program to promote the development of dispatchable location solutions (12 -24 months) **[[2(e)(iv)]]**;
- Introduce new products and devices that improve location accuracy, e.g., new wireless products that support dispatchable location and new mobile devices that support A-GNSS (18-24 months) **[[2(b)(i) & 3(c)(i)]]**;
- Promote development and approval of 3GPP standards that support the delivery of dispatchable location data (18 months) **[[2(d)]]**; and
- Obtain a location fix using heightened accuracy location technologies for 40% of all wireless 9-1-1 calls (24 months) **[[4(c)(i)]]**.

*Medium Term (2-4 years)*

- Continue introduction of products and devices that support advanced solutions (e.g., A-GNSS, dispatchable location solutions) (24-48 months) **[[2(b)(i) & 3(c)(i)-(iii)]]**;
- Design, develop, and implement the NEAD (36 months) **[[2(e)]]**;

- Obtain a location fix using heightened location accuracy technologies for 50% of all wireless 9-1-1 calls (36 months) **[[4(c)(ii)]]**;
- Enable the delivery of dispatchable location information across voice over LTE (VoLTE) networks (42 months) **[[2(g)(i)]]**; and
- Demonstrate support for the end-to-end functionality of such solutions (48 months) **[[2(h)(i)]]**.

*Long Term (4+ years)*

- Obtain a location fix using heightened accuracy location technologies for 75% of all VoLTE wireless 9-1-1 calls (60 months) **[[4(c)(iii)]]**; and
- Obtain a location fix using heightened accuracy location technologies for 80% of all VoLTE wireless 9-1-1 calls (72 months) **[[4(c)(iv)]]**.

As described below, implementation and execution of the elements within this document may be subject to a number of variables, including but not limited to standards development and third party resources, which may require the signatories to reassess the progress of this Agreement. In any event, the objective of these initiatives is to increase the accuracy of location information for wireless 9-1-1 calls. Each of the carrier signatories to this Agreement has made an individual decision to implement the provisions below. Moreover, carriers agree to comply with this Agreement on a prospective basis, in particular as they implement new VoLTE networks and handsets.

**Beacons and battery backup**. We recognize that battery backup for WiFi Access Points when used for locating 9-1-1 calls from indoor locations is important. Most managed WiFi Access Points will be powered by commercial power and many can be expected to have some amount of backup power. WiFi Access Points used in enterprise locations, for example, will typically have some type of Uninterruptible Power Supplies (UPS) that will provide backup power on the order of a couple of hours which will survive most power outages. Bluetooth Low Energy (LE) beacons draw an extremely small amount of power and batteries can be expected to support operations for 2 years. We anticipate that some Bluetooth LE beacons used for 9-1-1 would also be connected to commercial power, which would further extend operations well beyond 2 years.

**1) Test Bed**

a) Carriers agree to support a test bed that will facilitate the testing of 9-1-1 location technologies that will provide location information for outdoor and indoor 9-1-1 calls. The test bed will be operated in a technology neutral manner, and will be used to test OTDOA/A-GNSS, dispatchable location solutions, and other possible location solutions (including but not limited to technologies described in PS Docket No. 07-114). Carriers agree to work with APCO and NENA to establish the test bed within 12 months of this Agreement.

   i) The test bed will be managed by a non-governmental entity (e.g., Alliance for Telecommunications Industry Solutions (ATIS)) and operated in an open, transparent, and competitively neutral manner, as to technologies, carriers and location solution vendors;

   ii) The test bed will be utilized both to demonstrate vendor performance of E911 location solutions and to characterize performance of E911 location technologies, including OTDOA/A-GNSS, in order to establish appropriate E911 location benchmarks. While the test bed will be available to and can be used by vendors to assess the performance of solutions not yet standardized or commercially available, only testing of solutions based on industry standards and commercial configurations will be relied on to verify performance expectations to an E911 location benchmark.

   iii) The test bed will be consistent with the elements recommended by the Communications Security, Reliability and Interoperability Council (CSRIC) III Working Group and with the work undertaken by the Emergency Services Interconnection Forum (ESIF) established by ATIS.

b) Carriers, APCO and NENA agree to work together to develop an appropriate funding framework for the test bed that includes funding support from carriers and affected E911 location vendors, and also to investigate the potential for obtaining other sources of funding (e.g., government grants).

**2) Location Solutions Providing Dispatchable Location**

a) Dispatchable location is the civic address of the calling party plus additional information such as floor, suite, apartment or similar information that may be needed to adequately identify the location of the calling party. The civic address of the calling party number will be validated. In addition, the civic address will be corroborated against other location information prior to delivery of the address with the 9-1-1 call to the PSAP to the extent possible.

b) Some dispatchable location solutions will require a National Emergency Address Database (NEAD), which is described in Section 2(e), while other solutions can be implemented without the use of the NEAD. Prior to the completion of the NEAD, carriers will take steps to make such non-NEAD dispatchable location information available for delivery to PSAPs (through a variety of carrier-provisioned and third party sources), and further commit to the following:

i) To the extent that a carrier plans to introduce new wireless consumer home products, such carrier agrees to introduce such products that will provide dispatchable location within 18-24 months of the date of the Agreement. Products not installed by carrier representatives may require the customer to input dispatchable location data (e.g., apartment number) into the product or device.

(1) Signatories will work with public safety to study and consider further steps to providing wireline equivalent routing for wireless consumer home products that provide a dispatchable location.

ii) Within 30 days of the anniversary of the Agreement, CTIA will report the total number of sources that carriers utilize to make dispatchable location information available for delivery to PSAPs until the completion of the NEAD in Section 2(e).

c) Conduct a pre-standards demonstration of a dispatchable location 9-1-1 solution within 9 months from the date of the Agreement.

i) While Bluetooth LE and WiFi are standardized technologies, there are no standards for use of these technologies with 9-1-1 calls. This proof of concept demonstration will show how such technologies could be used including a demonstration of handsets detecting Bluetooth LE and/or WiFi location beacons, reporting to the network, followed by a database look-up of dispatchable location (for display on a map or other signaling to a PSAP).

d) Promote development and approval of standards within 18 months of the date of the Agreement.

i) Carriers agree to formally sponsor 3GPP Study Item RP-141003 as the standards vehicle that will allow handsets to deliver Bluetooth LE and WiFi information to the network, and to work through the standards process to incorporate the Bluetooth LE and WiFi

dispatchable location concept into the 3GPP technical report within 12 months of the Agreement.

ii) Carriers agree to participate actively in the work of the relevant standards organizations, and to work with APCO and NENA, technology companies, and others in the private sector to promote efforts to prioritize the completion of those standards described above – at a minimum including –

(1) Relevant 3GPP Specifications (e.g., LTE control plane location 3GPP LPP spec 36.355)

(2) Standards to support dispatchable location (e.g., J-STD-036)

iii) Carriers agree to sponsor standards activities to operationalize the display of dispatchable location in pre NG-911 PSAPs.

e) Design, develop, and implement the NEAD within 36 months from the date of the Agreement.

i) The NEAD is the database that provides the correlation between MAC address and dispatchable location.

ii) Carriers, APCO and NENA agree to work together to develop the design, operations, and maintenance requirements for the NEAD within 12 months of the Agreement.

iii) Carriers, APCO and NENA agree to work together to establish a database owner, funding mechanisms, provisions for defining security/privacy, performance, and management aspects, and to launch the initial database within 12-24 months after the development of the design requirements described above.

iv) Carriers, APCO and NENA agree to work together at the federal, state, and local level to develop an outreach program that will promote a broader integration of a variety of dispatchable location sources into the NEAD, and enlist the support of other organizations (e.g., hotel associations) to achieve this goal.

f) Handset Design and Development

i) 25% of all new VoLTE handset models offered by carriers will have the capability to support delivery of beacon information, e.g., Bluetooth LE and WiFi, to the network in conjunction with a 9-1-1 call made on VoLTE within 18-24 months after the completion of standards.

ii) 50% of all new VoLTE handset models offered by carriers will have the capability to support delivery of beacon information, e.g., Bluetooth LE and WiFi, to the network in conjunction with a 9-1-1 call made on VoLTE within 24-30 months after completion of standards.

iii) 100% of all new VoLTE handset models offered by carriers will have the capability to support delivery of beacon information, e.g., Bluetooth LE and WiFi, to the network in

conjunction with a 9-1-1 call made on VoLTE within 30-36 months after completion of standards.

iv) Carriers, APCO and NENA will jointly work with original equipment manufacturers, operating system providers, the Federal Communications Commission, and other stakeholders as necessary to address issues that may arise concerning the NEAD's and carriers' access to Bluetooth LE, WiFi beacon, and other handset-related information necessary for the NEAD and other dispatchable location methods to function effectively.

g) Network Design and Development

i) Carriers will enable their VoLTE networks to deliver beacon information from the handsets to the Location Server within 24 months after completion of standards.

h) Initial End-to-End Functionality

i) Carriers agree to provide initial end-to-end dispatchable location functionality on their respective VoLTE networks no later than 48 months from the date of this Agreement, after completion of the steps specified in Sections 2(b)-(e).

i) 36 Month Assessment of Dispatchable Location

i) Carriers, APCO and NENA agree to jointly conduct a formal assessment of the progress made in developing and implementing dispatchable location solutions 36 months after the date of the Agreement in accordance with Section 6.

**3) Location Solutions Providing Latitude/Longitude**

a) Carriers agree to conduct testing of OTDOA and A-GNSS (GPS and GLONASS) for both outdoor and indoor accuracy on each of their respective VoLTE platforms within 6-12 months from the date of the Agreement, and to conduct formal test bed evaluations once the formal test bed process is established. Since OTDOA for use with 9-1-1 calls requires VoLTE, any operational testing of OTDOA in conjunction with 9-1-1 calls will necessarily hinge on VoLTE implementation, which will vary by carrier and by market.

b) Carriers agree to deploy OTDOA in their networks in association with VoLTE, with implementation (including related testing) in each market as they transition 9-1-1 calls to VoLTE. OTDOA will be used in conjunction with A-GNSS as the primary location solution, and will operate on a standalone basis only when A-GNSS is not available. Until such time as OTDOA implementation is complete, carriers will provide APCO and NENA with reports on the progress of its OTDOA implementation for use with 9-1-1 calls on a semi-annual basis.

c) Carriers agree to introduce new devices with A-GNSS 9-1-1 capabilities in accordance with the following benchmarks:

   i) 50% of all new VoLTE handset models offered by carriers will have the capability to support A-GNSS (e.g., GPS and GLONASS) for 9-1-1 calls made on VoLTE within 24 months of the date of the Agreement.
   ii) 75% of all new VoLTE handset models offered by carriers will have the capability to support A-GNSS (e.g., GPS and GLONASS) for 9-1-1 calls made on VoLTE within 36 months of the date of the Agreement.
   iii) 100% of all new VoLTE handset models offered by carriers will have the capability to support A-GNSS (e.g., GPS and GLONASS) for 9-1-1 calls made on VoLTE within 48 months of the date of the Agreement.

d) Carriers agree to test delivery of crowd-sourced latitude/longitude from WiFi beacons once the capability becomes available (estimated to be 30-36 months from the date of the Agreement).

**4) Metrics for Assessing Performance of Location Methods**

a) Carriers agree to collect data for all live wireless 9-1-1 calls on a monthly basis that would show the percentage of time that each 'positioning source method' is used to deliver a wireless 911 call, consistent with the following:

   i) 'Positioning source method' would include dispatchable location methods as well as positioning based on latitude/longitude (e.g., A-GPS, GLONASS, OTDOA, AFLT, RTT, Cell ID or a hybrid of any of the listed or future technologies); and
   ii) Data would be collected in and reported for six geographic areas that correspond to the six geographic test regions recommended by ATIS ESIF. After careful consideration by public safety, wireless carriers and other relevant stakeholders, these test regions were selected to be representative of common indoor use-cases for wireless 9-1-1 calls across the nation. The test regions include dense urban, urban, suburban, and rural morphologies, are generally distributed across the country, and cover various building construction materials, densities, and heights. Data would be collected in the six cities recommended by ATIS ESIF, subject to carrier provision of service in those cities.

b) Carriers would provide reports to APCO and NENA on a quarterly basis, subject to appropriate confidentiality protections, with the first report due 18 months after the date of this Agreement. Carriers, APCO and NENA will use the data from these reports to assess the trend in positioning performance over time.

c) Carrier signatories commit to obtain a location fix using "heightened location accuracy technologies" for the following percentage of wireless 9-1-1 calls from the date of the Agreement consistent with Section 4(a). (call data):

   i) 40% of all wireless 9-1-1 calls within two years;
   ii) 50% of all wireless 9-1-1 calls within three years;
   iii) 75% of all VoLTE wireless 9-1-1 calls within five years; and
   iv) 80% of all VoLTE wireless 9-1-1 calls within six years.

   Wireless 9-1-1 calls that originate from "heightened location accuracy technologies" are calls with fixes for A-GNSS (GPS and/or GLONASS), dispatchable location, and the proportion of calls from any other technology or hybrid of technologies capable of location accuracy performance of 50m using a blended composite of indoor and outdoor based on available data from a test bed and/or drive test performance. For example, if OTDOA is shown through testing to deliver 50m accuracy in 60% of calls, then 60% of OTDOA calls can be used to support the metrics above.

d) Each carrier will ensure that its location technology deployment is consistent between the geographic areas designated for reporting and coverage areas outside these areas, so that empirical test results established in the test bed regions are reflective of performance

achievable from a particular location technology under similar environmental conditions in a mature deployment in other indoor locations where 9-1-1 calls are made. In addition, carriers will continue to ensure that handset models offered by carriers provide location performance consistent with handsets used for testing in the regional test beds, consistent with Sections 2(f) and 3(c).

**5) Vertical Location Information**

a) Carriers agree to promote the development and approval of standards within 18 months of the date of the Agreement that would enable the delivery of uncompensated barometric pressure data to PSAPs with 911 calls.

b) Carriers agree to work with APCO, NENA, and other interested parties to conduct and complete

   i) a study within six months of the Agreement to evaluate options for utilizing uncompensated barometric pressure data to obtain a z-axis and any corresponding benefits to PSAPs and first responders; and
   ii) a further study within 24 months of the Agreement that would include test bed evaluation of z-axis solutions (including compensated barometric pressure sensor-based location solutions) and the readiness of PSAPs to effectively utilize z-axis data.

c) If the signatories determine that there is sufficient benefit to PSAPs associated with the delivery of uncompensated barometric pressure data, carriers agree to deliver such data to the PSAPs from any handset that supports such a capability within 3 years, subject to timely availability of standards referenced in paragraph (a) above.

d) A z-axis location accuracy metric will be established pursuant to standards necessary for industry and PSAP utilization. The z-axis metric shall be expressed in terms of a vertical component for a specific percentage of VoLTE 9-1-1 calls from z-axis capable handsets, and shall be based on the location accuracy achieved by at least two proven candidate technologies as demonstrated in the test bed.

**6) 36 Month Assessment of Dispatchable Location**

a) Signatories agree to determine, within 36 months after the execution of this Agreement, whether dispatchable location solutions are on track, consistent with the timeframes described in Section 2, to provide improved location estimates.

b) If the dispatchable location solutions are not on track, the dispatchable location provisions contained in this document would be supplanted with provisions designed to promote the implementation of alternative location solutions, in accordance with this section. Carrier signatories may, however, continue to implement dispatchable location solutions and such implementations may be used to demonstrate compliance with location commitments.

i) Any solutions implemented as an alternative to dispatchable location must be technically feasible, and fit within network plans and architectures, and must satisfy the following conditions:

(1) Solutions must be standardized, scalable and commercially available across carrier networks from multiple sources;

(2) Solutions may require consumers to purchase equipment and/or to incur additional costs but would not include additional 9-1-1 service fees. For example, to the extent that new handset hardware is needed or existing handset software cannot be updated over-the-air or manually, a consumer may need to purchase a new handset and, depending on the service provider and the customer's existing plan, a modified service plan;

(3) Solutions must demonstrate through the test bed the ability to provide a meaningful, substantial improvement in indoor location accuracy and reliability over currently implemented location solutions or those location solutions in deployment (including OTDOA and A-GNSS) in all test bed environments.

ii) Carrier signatories agree to the following commitments regarding provision of z-axis solutions:

(1) Carriers will implement either a dispatchable location or z-axis location solution that satisfies the z-axis metric in the most populous 25 CMAs within 36 months of the assessment in Section 6(a) and most populous 50 CMAs within 60 months of the assessment in Section 6(a).

(2) If necessary, carriers agree to introduce new handsets that are capable of delivering z-axis location information that satisfies the z-axis metric in accordance with the following benchmarks:

(a) 25% of all new VoLTE handset models offered by carriers will have the capability to deliver z-axis location information for 9-1-1 calls made on VoLTE within 36 months of the assessment in Section 6(a).

(b) 50% of all new VoLTE handset models offered by carriers will have the capability to deliver z-axis location information for 9-1-1 calls made on VoLTE within 48 months of the assessment in Section 6(a).

(c) 100% of all new VoLTE handset models offered by carriers will have the capability to deliver z-axis location information for 9-1-1 calls made on VoLTE within 60 months of the assessment in Section 6(a).

(3) Implementation timelines for z-axis solutions must recognize the interdependence of different activities, e.g., development of industry standards, handset availability, phased-in deployment over covered POPs, PSAP readiness, etc.; and

(4) Any z-axis solution implemented to satisfy these commitments must meet the conditions specified in Section 6(b)(i).

**7) Sections for Inclusion in the FCC's Rules**

a) The signatory parties have identified the following sections to develop regulatory language, consistent with the intent of the parties to the Agreement, for inclusion in the FCC's rules:

Section 2(a);

Section 2(f)(i), (ii), (iii);

Section 2(g);

Section 2(h);

Section 3(c); and

Section 4(a), (b), (c).