

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

In the Matter of)	
)	
Wireless E911 Location Accuracy Requirements)	PS Docket No. 07-114
)	

**SIXTH REPORT AND ORDER
AND ORDER ON RECONSIDERATION**

Adopted: July 16, 2020

Released: July 17, 2020

By the Commission: Chairman Pai and Commissioners O’Rielly, Carr, and Starks issuing separate statements; Commissioner Rosenworcel approving in part, dissenting in part and issuing a statement.

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I. INTRODUCTION

1. Improved location accuracy capabilities are critical to help Public Safety Answering Points (PSAPs) and first responders locate wireless 911 callers. Over two thirds of 911 calls come from wireless phones,¹ and these calls are as likely to come from indoor as outdoor locations. For millions of wireless 911 callers seeking emergency assistance, time is of the essence and they expect that first responders will be able to find them.

2. To find wireless 911 callers in indoor environments, particularly multi-story buildings, PSAPs and first responders need to know not only the horizontal location, but also the vertical location of the 911 caller, and the likelihood of the caller being located at the location provided. Improving the accuracy of the vertical location information will help PSAPs and first responders more accurately identify the floor level for most 911 calls, reduce emergency response times, and save lives.

¹ According to the FCC’s annual 911 fee reports, between 2015 and 2018, American states and territories reported 910,264,881 total 911 calls, of which 614,272,592 were wireless calls. See FCC, Eleventh Annual Report to Congress on State Collection and Distribution of 911 and Enhanced 911 Fees and Charges at 10 (2019); FCC, Tenth Annual Report to Congress on State Collection and Distribution of 911 and Enhanced 911 Fees and Charges at 10 (2018); FCC, Ninth Annual Report to Congress on State Collection and Distribution of 911 and Enhanced 911 Fees and Charges at 10 (2017); FCC, Eighth Annual Report to Congress on State Collection and Distribution of 911 and Enhanced 911 Fees and Charges at 10 (2016).

3. In the November 2019 *Fifth Report and Order*, we adopted a vertical (z-axis) location accuracy metric of plus or minus 3 meters for 80% of wireless Enhanced 911 (E911) calls.² Under the timetable previously established in the Commission's E911 wireless location accuracy rules, nationwide Commercial Mobile Radio Service (CMRS) providers must meet April 2021 and April 2023 deadlines for market-based deployment of z-axis technology that complies with this metric, for the top 25 and top 50 Cellular Market Areas (CMAs), respectively.³

4. Our decision today builds upon this framework for improving the delivery and accuracy of vertical location requirements, consistent with our commitment to ensuring that *all* Americans have access to timely and effective emergency response when calling 911 from indoor and outdoor locations. We affirm the April 2021 and April 2023 vertical accuracy requirements that nationwide CMRS providers must meet in major markets and reject an untimely proposal to weaken these requirements. We allow CMRS providers to deploy technologies that focus on multi-story buildings, where vertical location information is most vital to first responders, and we require nationwide CMRS providers to deploy z-axis technology nationwide by April 2025.⁴ We also afford CMRS providers additional flexibility to provide dispatchable location (street address plus additional information such as floor level to identify the 911 caller's location), and we require dispatchable location to be delivered with wireless 911 calls when it is technically feasible and cost-effective to do so beginning January 6, 2022. Taken together, these actions place wireless carriers on track for providing PSAPs and first responders the best available vertical location information for the benefit of 911 callers seeking emergency assistance.

II. BACKGROUND

5. In 2014, the Commission proposed to revise the existing E911 framework to require delivery of accurate location information to PSAPs for wireless 911 calls placed from indoors.⁵ In 2015, the Commission adopted the *Fourth Report and Order*, which established comprehensive rules and deadlines for improving E911 wireless location accuracy.⁶ Under these rules, CMRS providers must

² *Wireless E911 Location Accuracy Requirements*, PS Docket No. 07-114, Fifth Report and Order and Fifth Further Notice of Proposed Rulemaking, 34 FCC Rcd 11592 (2019) (*Fifth Report and Order* or *Fifth Further Notice*), corrected by Erratum (PSHSB Jan. 15, 2020).

³ *Wireless E911 Location Accuracy Requirements*, PS Docket No. 07-114, Fourth Report and Order, 30 FCC Rcd 1259 (2015) (*Fourth Report and Order*), corrected by Erratum (PSHSB Mar. 3, 2015). Non-nationwide CMRS providers will have an additional year to meet these deadlines in the top 25 and 50 CMAs (i.e., April 3, 2022 and April 3, 2024, respectively).

⁴ By April 3, 2025, we require nationwide wireless carriers to deploy dispatchable location or z-axis technology nationwide if they have not done so previously. Non-nationwide CMRS providers will have an additional year to provide dispatchable location or z-axis technology throughout their network footprint (i.e., April 3, 2026).

⁵ *Wireless E911 Location Accuracy Requirements*, PS Docket No. 07-114, Third Further Notice of Proposed Rulemaking, 29 FCC Rcd 2374 (2014) (*Third Further Notice*), corrected by Erratum (PSHSB Mar. 18, 2014).

⁶ *Fourth Report and Order*, 30 FCC Rcd at 1303-05, paras. 114-20; see also 47 CFR § 9.10(i).

either convey dispatchable location (e.g., street address, floor level, and office or apartment number)⁷ or coordinate-based location information to the appropriate PSAP.⁸ The *Fourth Report and Order* established a 50-meter horizontal (x/y axis) location accuracy metric that would provide approximate location information sufficient to identify the building for most indoor calls. In addition, the Commission required the provision of vertical location (z-axis) information that would enable first responders to identify floor level for most calls from multi-story buildings.⁹ The Commission required nationwide CMRS providers to deploy z-axis technology in the top 25 Cellular Market Areas (CMAs) by April 2021 and in the top 50 CMAs by April 2023.¹⁰ However, the Commission deferred adoption of a specific z-axis metric pending further testing.¹¹

6. In the *Fifth Report and Order*, we adopted a z-axis location accuracy metric of 3 meters above or below the handset (plus or minus 3 meters) for 80% of calls made from z-axis capable devices as demonstrated in the test bed.¹² We concluded that implementing the 3-meter metric within the existing compliance timeline was technically feasible and would yield significant public safety benefits.¹³ We required CMRS providers to deliver z-axis information to PSAPs in Height Above Ellipsoid and to provide floor level information when available.¹⁴ Deployment must be consistent with the configuration used in the test bed,¹⁵ and CMRS providers must comply with requirements for confidence and uncertainty data, compliance certifications, and live call data reporting.¹⁶ Finally, we amended our rules

⁷ See *Fourth Report and Order*, 30 FCC Rcd at 1273-74, paras. 43-44. “Dispatchable location” is “[a] location delivered to the PSAP by the CMRS provider with a 911 call that consists of the street address of the calling party, plus additional information such as suite, apartment or similar information necessary to adequately identify the location of the calling party. The street address of the calling party must be validated and, to the extent possible, corroborated against other location information prior to delivery of dispatchable location information by the CMRS provider to the PSAP.” 47 CFR § 9.10(i)(1)(i).

⁸ 47 CFR § 9.10(i)(2)(i)-(ii).

⁹ *Fourth Report and Order*, 30 FCC Rcd at 1261, 1287-89, 1302-04, 1319, paras. 6, 74-77, 112-13, 116-17, 162.

¹⁰ *Id.* at 1261-62, para. 6.

¹¹ *Id.* at 1302-03, para. 113; 47 CFR § 9.10(i)(2)(ii). The *Third Further Notice*, *Fourth Report and Order*, and *Fifth Report and Order* include a detailed history of this proceeding, including an overview of the regulatory background on dispatchable location and establishing a z-axis metric. *Third Further Notice*, 29 FCC Rcd at 2377-84, paras. 7-22; *Fourth Report and Order*, 30 FCC Rcd at 1263-64, paras. 9-13; *Fifth Report and Order*, 34 FCC Rcd at 11593-95, paras. 3-8.

¹² *Fifth Report and Order*, 34 FCC Rcd at 11593, 11604, 11617, paras. 2, 24, 54; 47 CFR § 9.10(i)(2)(ii)(C), (i)(2)(ii)(D).

¹³ *Fifth Report and Order*, 34 FCC Rcd at 11596, para. 9.

¹⁴ *Fifth Report and Order*, 34 FCC Rcd at 11608, 11610-11, paras. 32, 37; 47 CFR § 9.10(i)(2)(ii)(C), (i)(2)(ii)(D).

¹⁵ *Fifth Report and Order*, 34 FCC Rcd at 11612-13, para. 43; 47 CFR § 9.10(i)(2)(iii)(A).

¹⁶ *Fifth Report and Order*, 34 FCC Rcd at 11612-15, paras. 40-43, 47-48, 50; 47 CFR § 9.10(i)(2)(ii)(C), (i)(2)(ii)(D), (i)(2)(iii), (j)(1), (j)(4).

to provide explicit privacy protection for z-axis location information, stating that such information may only be used for 911 purposes, except with prior express consent or as required by law.¹⁷

7. In the *Fifth Further Notice*, we sought comment on additional issues associated with implementation of vertical location accuracy requirements. Specifically, we sought comment on the feasibility of phasing in a stricter z-axis standard (e.g., 2 meters) over time, and ultimately whether to require CMRS providers to deliver floor level information in addition to or instead of z-axis measurements for wireless indoor 911 calls.¹⁸ We also proposed to adopt additional z-axis deployment options for CMRS providers to choose from as alternatives to the CMA-based deployment metric in the current rules.¹⁹ Finally, we proposed to revise our dispatchable location rules to allow provision of dispatchable location information from sources other than the National Emergency Address Database.²⁰

8. In response to the *Fifth Further Notice*, we received 20 comments²¹ and 12 reply comments,²² filed by public safety entities, technology vendors, wireless carriers, technology companies, and industry associations. In addition, APCO filed a Petition for Clarification of the *Fifth Report and Order* regarding implementation and testing of location accuracy technology and certification of compliance by CMRS providers.²³ BRETSA filed a Petition for Reconsideration of certain portions of the *Fifth Report and Order* regarding performance testing and correlating z-axis information to floor level.²⁴

¹⁷ *Fifth Report and Order*, 34 FCC Rcd at 11615, para. 50; 47 CFR § 9.10(i)(4)(v).

¹⁸ *Fifth Further Notice*, 34 FCC Rcd at 11619-20, paras. 61, 63.

¹⁹ *Fifth Further Notice*, 34 FCC Rcd at 11619, 11622-25, 11632-33, paras. 61, 71-78, Appx. B.

²⁰ *Fifth Further Notice*, 34 FCC Rcd at 11619, 11625-26, 11632-33, paras. 61, 79-83, Appx. B.

²¹ Association of Public-Safety Communications Officials-International, Inc. (APCO); Apple Inc. (Apple); The Alliance for Telecommunications Industry Solutions (ATIS); AT&T Services, Inc. (AT&T); Boulder Regional Emergency Telephone Service Authority (BRETSA); Competitive Carriers Association (CCA); CTIA; Google LLC (Google); International Association of Fire Chiefs (IAFC); International Association of Fire Fighters (IAFF); Industry Council for Emergency Response Technologies, Inc. (iCERT); National Association of State 911 Administrators (NASNA); NENA: The 9-1-1 Association (NENA); NextNav, LLC (NextNav); National Sheriffs' Association (NSA); Polaris Wireless, Inc. (Polaris); RapidDeploy, Inc. (RapidDeploy); Texas 9-1-1 Alliance, the Texas Commission on State Emergency Communications (CSEC), and the Municipal Emergency Communication Districts Association (Texas 9-1-1 Entities); T-Mobile USA, Inc. (T-Mobile); and Verizon.

²² APCO; AT&T; BRETSA; CTIA; Environmental Systems Research Institute, Inc. (ESRI); Google; IAFC; IAFF; Motorola Solutions, Inc. (Motorola); National Public Safety Telecommunications Council (NPSTC); NextNav; and T-Mobile.

²³ APCO Petition for Clarification, PS Docket No. 07-114 (filed Feb. 7, 2020), <https://ecfsapi.fcc.gov/file/10207203296835/APCO%20Petition%20for%20Clarification%20-%20Z-Axis%20Final2.pdf> (APCO Feb. 7, 2020 Petition).

²⁴ BRETSA Petition for Reconsideration of the Fifth Report and Order, PS Docket No. 07-114 (filed Dec. 26, 2019), <https://ecfsapi.fcc.gov/file/122780657175/BRETSA%20191226%20Pet%20Recon%205th%20R%26O%20%20PS%20Docket%2007-114.pdf> (BRETSA Dec. 26, 2019 Petition). For a discussion of the *Order on Reconsideration*, see *infra* Section IV.

CTIA, AT&T, and T-Mobile filed oppositions to the BRETSA Petition,²⁵ and BRETSA filed a reply to oppositions.²⁶

9. After the close of the comment and reply comment cycle, the Commission received additional submissions. CTIA, on behalf of the 9-1-1 Location Technologies Test Bed, LLC (Test Bed), submitted a test bed report (Stage Za Report) to update the Commission on the most recent testing of 911 z-axis location technologies, Stage Za, by the Test Bed.²⁷ Stage Za testing evaluated Google's Android-based Emergency Location Service.²⁸ According to CTIA, "Google's [Emergency Location Service] achieved ± 3 meter accuracy for more than half of calls in the test bed, and exceeded the 80th percentile metric in one morphology."²⁹ On June 25, 2020, the Public Safety and Homeland Security Bureau granted the Test Bed and Google's request for confidential treatment of the Stage Za Report.³⁰

²⁵ Opposition of CTIA to Petition for Reconsideration of BRETSA, PS Docket No. 07-114 (filed Mar. 25, 2020) (CTIA Mar. 25, 2020 Opposition); AT&T Opposition to the BRETSA Petition for Reconsideration, PS Docket No. 07-114 (filed Mar. 25, 2020) (AT&T Mar. 25, 2020 Opposition); Opposition of T-Mobile USA, Inc., to BRETSA's Petition for Reconsideration, PS Docket No. 07-114 (filed Mar. 25, 2020) (T-Mobile Mar. 25, 2020 Opposition).

²⁶ BRETSA Reply to Oppositions to Petition for Reconsideration of the Fifth Report and Order, PS Docket No. 07-114 (filed Apr. 6, 2020) (BRETSA Apr. 6, 2020 Reply to Opposition).

²⁷ Letter from Thomas K. Sawanobori, Senior Vice President & Chief Technology Officer, CTIA, and Scott K. Bergmann, Senior Vice President, Regulatory Affairs, CTIA, to Marlene H. Dortch, Secretary, FCC, PS Docket No. 07-114 (filed Apr. 29, 2020) (CTIA Apr. 29, 2020 Cover Letter). The Test Bed has requested confidential treatment of the Stage Za Report based on Google's assertions that the Report contains "proprietary and commercially sensitive information." Letter from Thomas C. Power, Secretary, 911 Location Technologies Test Bed, LLC, to Marlene H. Dortch, Secretary, FCC, PS Docket No. 07-114, Stage Za Test Bed Report—Request for Confidential Treatment, at 1 (filed Apr. 29, 2020) (Confidentiality Request) (arguing that the Stage Za Report comprises confidential and proprietary information about Google's Android-based Emergency Location Service that, if subject to public disclosure, could cause an adverse impact on Google's competitive standing and deprive it of marketplace benefit, and that it is protected by Exemption 4 of the Freedom of Information Act (FOIA), and 47 CFR §§ 0.457(d)(2) and 0.459(b)). BRETSA opposes the request and seeks public disclosure of the Stage Za Report. BRETSA Response in Opposition to Confidentiality Request CTIA Stage Za Test Bed Report, PS Docket No. 07-114 (filed May 12, 2020) (BRETSA May 12, 2020 Opposition) (among other reasons, arguing that Google does not customarily treat its Emergency Location Service location test results and accuracy as confidential). Google and the Test Bed oppose BRETSA's Opposition. Reply of 911 Location Technologies Test Bed, LLC and Google LLC Opposing Release of Confidential Stage Za Test Bed Report, PS Docket 07-114 (filed May 26, 2020).

²⁸ CTIA states that "[i]n May 2019, Google announced its plans to measure the location functionality of Android [Emergency Location Service] in Stage Za—the only technology vendor to apply to participate in Stage Za. [Emergency Location Service] is a feature on the vast majority of active Android devices as part of the Android operating system (Android OS version 4.0/Ice Cream Sandwich or above). [Emergency Location Service] is available without the need for proprietary hardware, infrastructure, or downloading a separate application to a smartphone. The locations delivered through [Emergency Location Service] come from the Android Fused Location Provider, which is the location source used by most Android applications, from ride services to map applications." CTIA Apr. 29, 2020 Cover Letter at 2 (footnote omitted) (citing Google May 20, 2019 Comments at 1-2).

²⁹ CTIA Apr. 29, 2020 Cover Letter at 3.

³⁰ *Wireless E911 Location Accuracy Requirements*, PS Docket No. 07-114, Order, DA 20-663 (PSHSB June 25, 2020).

10. Finally, Polaris filed a Petition for Emergency Declaratory Ruling asking the Commission to (1) reaffirm the deadlines established in the *Fifth Report and Order* and (2) dismiss certain alternative proposals advanced in comments.³¹

III. SIXTH REPORT AND ORDER

11. With this *Sixth Report and Order*, we adopt our proposals in the *Fifth Further Notice* to expand the options for CMRS providers choosing to deploy z-axis technology to meet the April 2021 and April 2023 compliance benchmarks, with some revisions and clarifications. We also require nationwide CMRS providers to deploy z-axis technology nationwide by April 2025 and require non-nationwide CMRS providers to do the same throughout their service areas by April 2026. We adopt our proposal to allow CMRS providers flexibility to develop dispatchable location solutions that do not depend on the National Emergency Address Database, which has been discontinued. In addition, to make our wireless dispatchable location rules consistent with our dispatchable location rules for other services adopted pursuant to Section 506 of RAY BAUM'S Act,³² as of January 6, 2022, we require CMRS providers to provide dispatchable location for wireless 911 calls when it is technically feasible and cost-effective for them to do so. We also address implementation issues for dispatchable location solutions that are not based on the National Emergency Address Database, including (1) privacy and security and (2) confidence and uncertainty data requirements.

12. For the time being, we defer the issues raised in the *Fifth Further Notice* of whether to migrate from 3 meters to a stricter z-axis metric or to require CMRS providers to deliver floor level information. Based on the comments received on these issues, we believe that further work is needed to develop improved location technology that can achieve these capabilities and that adopting a timetable for such requirements at this stage would be premature. We direct the Public Safety and Homeland Security Bureau to consider whether to refer certain technical issues to a federal advisory committee, such as the Communications Security, Reliability and Interoperability Council (CSRIC). In response to APCO's Petition for Clarification, we address other implementation matters and clarify certain aspects of the *Fifth Report and Order*.

13. We deny BRETSA's Petition for Reconsideration of the *Fifth Report and Order*. We defer consideration of a number of other issues raised in comments that fall outside the scope of the *Fifth*

³¹ Petition for Emergency Declaratory Ruling by Polaris Wireless, Inc., PS Docket 07-114 (filed May 27, 2020) (Polaris May 27, 2020 Petition).

³² Section 506 of RAY BAUM'S Act requires "adopting rules to ensure that the dispatchable location is conveyed with a 9-1-1 call, regardless of the technological platform used" though it did not require that the Commission revisit wireless E911 location accuracy rules that it had already adopted. Section 506 of the Repack Airwaves Yielding Better Access for Users of Modern Services Act of 2018 (RAY BAUM'S Act), Pub. L. No. 115-141, 132 Stat. 348, 1095, § 506(a) (2018) (codified at 47 U.S.C. § 615 note); *id.* § 506(b) (providing that "nothing in this section shall be construed to require the Commission to reconsider any information or conclusion from a proceeding regarding the accuracy of the dispatchable location for a 9-1-1 call in which the Commission has adopted rules or issued an order before the date of the enactment of this Act").

*Further Notice.*³³ Finally, we grant Polaris’ Petition for Emergency Declaratory Ruling to the extent stated herein. Taken together, we conclude that the benefits of today’s decision outweigh the costs and that our actions will assist PSAPs and first responders in locating wireless 911 callers in the most populous areas in the near term and nationwide over the long term.

A. Timely Z-Axis Deployment

14. Under the current vertical location accuracy rules, nationwide CMRS providers electing the z-axis option for meeting vertical accuracy requirements must deploy z-axis technology meeting the 3-meter accuracy standard (for 80% of calls made from z-axis capable devices as demonstrated in the test bed) in each of the top 25 CMAs by April 3, 2021, and in each of the top 50 CMAs by April 3, 2023.³⁴ As a preliminary matter, we grant Polaris’s Petition for Emergency Declaratory Ruling to the extent it asks the Commission to reaffirm the deadlines established in the *Fifth Report and Order*. We did not seek comment on changing those deadlines (and no one petitioned to reconsider those deadlines) and hence doing so now would be beyond the scope of the current proceeding.³⁵

³³ We defer consideration of the following matters: (1) narrowing the horizontal location accuracy metric; (2) imposing 911 requirements on operating system providers (OSPs) and original equipment manufacturers (OEMs); (3) establishing a 911 incubator program; (4) addressing Phase I misroutes; (5) funding for unprotected service areas; (6) loss of short-messaging service (SMS) text-to-911 coverage; (7) diversion of 911 calls to 988. The *Fifth Further Notice* focused on improving the z-axis metric, expanding z-axis deployment options, and encouraging dispatchable location technologies. Therefore, the above-referenced matters raised by commenters are outside the scope of this current proceeding.

³⁴ 47 CFR § 9.10(i)(2)(ii)(C), (i)(2)(ii)(D).

³⁵ Some CMRS providers assert that the ongoing COVID-19 pandemic may delay or otherwise adversely affect the testing of vertical location technologies. *See, e.g.*, Letter from John Nakahata, Kristine Laudadio Devine, and Landyn Wm. Rookard, Counsel to T-Mobile USA, Inc., Harris, Wiltshire & Grannis LLP, to Marlene H. Dortch, Secretary, FCC, PS Docket No. 07-114, at 11-12 (filed July 9, 2020) (T-Mobile July 9, 2020 *Ex Parte*) (stating that the COVID-19 pandemic “has jeopardized testing plans for the remainder of 2020 and potentially beyond”); AT&T July 9, 2020 *Ex Parte* at 2 (stating that “AT&T anticipates challenges associated with the testing required to demonstrate compliance for the upcoming April 2021 benchmarks as a result of the current COVID-19 pandemic”). Public safety commenters acknowledge that the pandemic poses challenges, but also note that vertical location requirements were adopted six years ago and that the public urgently needs accurate 911 location. *See, e.g.*, Letter from Ralph A. Haller, Chairman, NPSTC, to Marlene H. Dortch, Secretary, FCC, PS Docket No. 07-114, at 1-2 (filed July 8, 2020) (NPSTC July 8, 2020 *Ex Parte*) (stating that NPSTC does not support delay of E911 location requirements to wait for a reduction in the prevalence of the COVID pandemic and that “multiple location technology vendors, including Apple, Google, NextNav and Polaris have indicated that their services either already are, or soon can be, made available on a nationwide basis”); Letter from Alan Purdue, Executive Director, Safer Buildings Coalition, to Ajit Pai, Chairman, Michael O’Rielly, Commissioner, Brendan Carr, Commissioner, Jessica Rosenworcel, Commissioner, and Geoffrey Starks, Commissioner, FCC, PS Docket No. 07-114, at 2 (filed July 9, 2020) (SBC July 9, 2020 *Ex Parte*). To address any potential impact of the pandemic on upcoming testing, CMRS providers should work with public safety agencies in the relevant jurisdictions to facilitate the testing process as much as possible. In addition, parties that can show good cause due to pandemic-related hardship may seek a waiver in accordance with the Commission’s rules. *See* 47 CFR §§ 1.3, 1.925.

1. Alternative Means to Demonstrate Compliance within a CMA

15. Deployment within a CMA is established by deploying the technology to cover 80% of the CMA population.³⁶ In the *Fifth Further Notice*, we sought comment on expanding the z-axis deployment options available to CMRS providers for meeting the 80% coverage threshold.³⁷ First, we sought comment on an alternative that would focus on deployment where multi-story buildings are concentrated, for example, an option to cover 80% of the buildings that exceed three stories in the CMA.³⁸ Second, we sought comment on an alternative that would allow CMRS providers to rely on handset-based solutions to hit our benchmark (the 3-meter accuracy standard for 80% of calls made from z-axis capable devices as demonstrated in the test bed), which would imply a nationwide deployment.³⁹

16. *Urban and Dense Urban Morphologies.* We now afford nationwide CMRS providers the option of deploying z-axis technology to cover 80% of the buildings that exceed three stories in the CMA rather than 80% of the population. Public safety and industry commenters support this option, and no commenter opposes it.⁴⁰ IAFF states that first responders need vertical location information for tall structures, which are not limited to the top CMA population centers.⁴¹ IAFF also states that transitioning from a population-based compliance approach to one focused on tall structures would presumably assist emergency personnel by “ensuring that vertical location capabilities are made available as much as possible where they are most needed, and not just in low-rise residential areas where the vertical dimension is not a significant factor for public safety.”⁴² iCERT asserts that this alternative approach will help to ensure that network infrastructure investments are directed to areas of the country where there is a greater percentage of large, multi-story buildings.⁴³ NextNav states that tall buildings remain relatively clustered in a discrete number of locations in each community. NextNav asserts that, as a result, providing vertical location coverage to 80% of tall buildings is technically feasible and

³⁶ *Id.* § 9.10(i)(2)(ii)(C)(2).

³⁷ *Fifth Further Notice*, 34 FCC Rcd at 11622, para. 71.

³⁸ *Id.* at 11622-23, paras. 72-73; *id.* at 11632, Appx. B (proposed rules 47 CFR § 9.10(i)(2)(ii)(C)(2)(b) and (i)(2)(ii)(D)(2)(b)).

³⁹ *Id.* at 11623-24, paras. 74-76 (seeking comment on proposals for deployment of handset-based solutions on a nationwide basis); *id.* at 11632-33, Appx. B (proposed rules 47 CFR § 9.10(i)(2)(ii)(C)(2)(c) and (i)(2)(ii)(D)(2)(c)).

⁴⁰ *See, e.g.*, IAFF Feb. 21, 2020 Comments at 2-3; IAFC Feb. 21, 2020 Comments at 3; IAFC Mar. 20, 2020 Reply Comments at 1; NENA Feb. 21, 2020 Comments at 12; Polaris Feb. 21, 2020 Comments at 4; NextNav Feb. 21, 2020 Comments at 9-11.

⁴¹ IAFF Feb. 21, 2020 Comments at 2-3.

⁴² IAFF Feb. 21, 2020 Comments at 3.

⁴³ iCERT Feb. 21, 2020 Comments at 4.

economically efficient, and it redirects the placement of z-axis infrastructure to those locations where it is truly needed.⁴⁴

17. We find that such an alternative may lower the costs for CMRS providers of timely deploying a z-axis solution consistent with our existing deadlines. NextNav states that its vertical location service will be available for use by wireless carriers and public safety within the top 25 and top 50 CMAs “well in advance” of the Commission’s April 2021 and April 2023 compliance deadlines, respectively, and that its network will be able to provide z-axis service covering more than 80% of the tall buildings in these CMAs.⁴⁵ NextNav also notes that in constructing its network, it employed the services of a privately managed, commercially-available database of tall multi-tenant buildings in the United States to identify the locations of tall buildings.⁴⁶ In other words, cost-effective mechanisms already exist to identify buildings that exceed three stories for providers that choose this option, and this additional option will give providers valuable flexibility in determining how they meet their obligations. We thus disagree with CTIA’s assertion that such an alternative may require a nationwide database of building structures, which in turn would require significant resources to develop.⁴⁷ What is more, we find that affording CMRS providers an option based on coverage of tall buildings rather than population in the CMA will encourage providers to invest in z-axis solutions that focus on the areas with the greatest need for vertical location information—i.e., those areas with the greatest concentration of multi-story buildings.

18. *Handset Deployment.* We also adopt our proposal in the *Fifth Further Notice* to afford nationwide CMRS providers the option of meeting vertical location accuracy requirements by deploying z-axis technology on handsets. No commenter opposes such an option. And we find that because a handset-based technology would be expected to be available nationwide, it would implicitly be available to 80% of the population of a CMA and thus meet our deployment metrics (so long, of course, as it meets the 3-meter accuracy standard for 80% of calls made from z-axis capable devices as demonstrated in the test bed).⁴⁸

⁴⁴ NextNav Feb. 21, 2020 Comments at iii, 9. NextNav also notes that the placement of tall buildings remains relatively centralized in an identifiable number of geographic locations in each CMA and that this permits coverage that greatly exceeds 80% of tall buildings in each CMA without the construction of a “sprawling vertical location network primarily covering single-family homes.” *Id.* at 10-11. Polaris similarly states that “[p]roviding 3m accuracy to large geographic areas without multistory buildings simply to satisfy a population requirement unnecessarily adds cost without providing value.” Polaris Feb. 21, 2020 Comments at 4.

⁴⁵ NextNav Feb. 21, 2020 Comments at 1.

⁴⁶ *Id.* at 9 n.23.

⁴⁷ CTIA Mar. 20, 2020 Reply Comments at 8. And, of course, to the extent a CMRS provider decides not to pursue this alternative without such a database, it is free to do so—but it is unclear what objection such a provider would have to it being an option.

⁴⁸ We clarify that CMRS providers may use different z-axis technologies in different areas to meet the nationwide benchmark, so long as all technologies used are validated by testing to meet the accuracy requirements. For

(continued....)

19. To ensure sufficient coverage for consumers and public safety, we sought comment on how to ensure that a handset-based solution would be widely available to consumers.⁴⁹ The record indicates that the principal z-axis location solutions available to CMRS providers in the near term can all be delivered via software upgrades to a wide range of legacy handsets. Google's Emergency Location Service is already installed on most Android devices, and Apple's Hybridized Emergency Location is already installed on most iOS devices.⁵⁰ In addition, the Cover Letter to the Stage Za Report states that Google's Emergency Location Service achieved 3-meter accuracy for more than 50% of calls in the test bed, "and exceeded the 80th percentile metric in one morphology."⁵¹ Google's participation in the test bed underscores that z-axis technology continues to rapidly improve, and commercial solutions such as Emergency Location Service are widely available today.⁵² Google's comments suggest that Google will

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example, CMRS providers may deploy one z-axis technology in a particular morphology (e.g., urban) and another technology in the remaining morphologies, so long as the combination results in nationwide coverage. This approach adds flexibility by allowing CMRS providers to focus infrastructure-based solutions in urban and dense urban areas while using handset-based solutions to target suburban and rural morphologies.

⁴⁹ *Fifth Further Notice*, 34 FCC Rcd at 11623, para. 75.

⁵⁰ Letter from John Nakahata and Kristine Laudadio Devine, Counsel to T-Mobile USA, Inc., Harris, Wiltshire & Grannis LLP, to Marlene H. Dortch, Secretary, FCC, PS Docket No. 07-114, at 2 (filed Apr. 23, 2020) (T-Mobile Apr. 23, 2020 *Ex Parte*); Google May 20, 2019 Comments at 3; *see also* Letter from Paul Margie, Counsel for Apple Inc., Harris, Wiltshire & Grannis LLP, to Marlene H. Dortch, Secretary, FCC, PS Docket No. 07-114, at 4 (filed Oct. 29, 2019) (stating that Apple's "Hybridized Emergency Location (HELO) solution has offered z-axis estimates and uncertainties beginning in 2013, and those estimates have been consumed by carriers since its first adoption in 2015").

⁵¹ CTIA Apr. 29, 2020 Cover Letter at 3.

⁵² The Public Safety and Homeland Security Bureau granted the Test Bed's Confidentiality Request. In response to comments of BRETSA and Polaris, we note that access to the test report to which the Confidentiality Request pertains is unnecessary to inform comment on, or to resolve, the issues raised in the *Fifth Further Notice* and decided here for several reasons. *See* BRETSA May 12, 2020 Opposition (arguing that the Stage Za Test results should not be confidential); Polaris May 27, 2020 Petition at 2 ("Should the Commission deem it necessary to reevaluate the accuracy metric established in the Order, such an action should be done through a rulemaking evaluating the Stage Za test report and any other relevant studies to allow for meaningful review. But, especially in this time of a pandemic, the Commission cannot allow these belated and incomplete undertakings to delay implementation of the Fifth Report and Order."). First, Google's comments in the record already offer assurance that device-based hybrid (DBH) solutions are widely available and Google is focused on refining Emergency Location Service to meet the April 2021 deadline. *See, e.g.*, Google May 20, 2019 Comments at 4. Second, Google's Emergency Location Service is only one device-based hybrid solution currently available; we understand that Apple is continuing to work on and test its solution. Third, as noted, NextNav and Polaris' barometric pressure solutions are already available to CMRS providers. Fourth, to the extent that the nationwide CMRS providers argue that no solution has been demonstrated to meet our z-axis metric in all morphologies, we already found in the *Fifth Report and Order* that the z-axis metric adopted would be feasible within the time constraints adopted by the Commission, especially in light of the flexibility on options we are adopting herein on both z-axis and dispatchable location as a means to identify wireless E911 callers' vertical location. Google's test results regarding its incremental progress toward offering one solution to help carriers provide such information are irrelevant to that decision. Rather, to the extent that Google or any other vendor is positioned to offer the z-axis capability by the

(continued....)

continue to refine its z-axis solution,⁵³ and we expect that those enhancements could be made available in advance of the April 2021 deadline or with even greater likelihood before the April 2023 deadline. Further, Apple will test its Hybridized Emergency Location solution in the Test Bed’s Stage Zb testing campaign, which is scheduled to begin field testing in October 2020.⁵⁴ Consequently, we expect that any upgrade to Google’s Emergency Location Service or Apple’s Hybridized Emergency Location to support z-axis capability will be widely available to consumers. We also expect that the solutions offered by Polaris and NextNav could be made widely available to consumers. Although the latter solutions will only work with handsets equipped with barometric sensors, we have previously noted that most smartphones in the market are equipped with such sensors.⁵⁵ Moreover, data show that as of 2019, 81% of Americans owned a smartphone.⁵⁶

20. NENA suggests that the Commission “require manufacturers and carriers take reasonable efforts to measure and report z-axis handset penetration during the transition period to a z-

(Continued from previous page) _____

schedule contained in the Commission’s rules, this is but one option. CMRS providers may choose that solution or any other solution to satisfy the Commission’s vertical location accuracy information. At that time, solutions validated through the test bed process would form the basis for demonstrating compliance. *See* 47 C.F.R. § 9.10(i)(3)(i), (i)(2)(iii).

⁵³ *See, e.g.*, Google May 20, 2019 Comments at 4 (stating that “Google is continually working to improve [Emergency Location Service], including by providing accurate altitude and floor location and enhancing location quality for challenging environments such as urban canyons and indoors”); Letter from Megan Anne Stull, Counsel, Google LLC, to Marlene H. Dortch, Secretary, FCC, PS Docket No. 07-114, at 3 (filed Nov. 15, 2019) (stating that “Google expects to quickly iterate and improve our services”).

⁵⁴ *See, e.g.*, 911 Location Technologies Test Bed LLC, *9-1-1 Location Technologies Test Bed Seeks Vendor Participants for 2020 Stage Zb Campaign*, http://www.911locationtestbed.org/Stage_zb.html (last visited July 7, 2020) (Stage Zb estimated field test start date Oct. 1, 2020); T-Mobile Apr. 23, 2020 *Ex Parte* at 2 (stating that Apple is expected to test in Stage Zb later this year); *see also* Press Release, CTIA, CTIA’s 9-1-1 Location Accuracy Technologies Test Bed Announces Additional Testing in 2020 (Jan. 24, 2020), <https://www.ctia.org/news/press-release-ctia-9-1-1-location-accuracy-technologies-test-bed-announces-additional-testing-in-2020> (Stage Zb Announcement).

⁵⁵ *Fifth Report and Order*, 34 FCC Rcd at 11604, para. 23 & n.100 (noting that since 2014, the iPhone 6 and later models have had a barometer, while Samsung Galaxy smartphones have had barometers since 2011) (citing Kaveh Waddell, *How Phones can Help Predict Thunderstorms* (Aug. 11, 2016), <https://www.theatlantic.com/technology/archive/2016/08/how-phones-can-help-predict-thunderstorms/495389/>); *Fourth Report and Order*, 30 FCC Rcd at 1299, para. 107 & n.269 (noting that new units per year in 2014 were more than eight times the 82 million new units per year in 2012); *see also* Press Release, Apple, Apple Announces iPhone 6 & iPhone 6 Plus—The Biggest Advancements in iPhone History,

(Sept. 9, 2014) <https://www.apple.com/newsroom/2014/09/09Apple-Announces-iPhone-6-iPhone-6-Plus-The-Biggest-Advancements-in-iPhone-History/> (noting that the Apple iPhone 6 and 6 Plus include “the new barometer, which senses air pressure to provide relative elevation”).

⁵⁶ Pew Research Center, *Mobile Fact Sheet* (June 12, 2019), <https://www.pewresearch.org/internet/fact-sheet/mobile/>.

axis-only handset marketplace.”⁵⁷ We note that CMRS providers must certify their compliance with the vertical location accuracy requirements within 60 days after each benchmark,⁵⁸ and we expect these certifications to provide information on the extent to which z-axis capable handsets are being deployed on carrier networks. We do not believe additional reporting is warranted at this time. However, we will continue to monitor developments on these issues.

2. Establishing a Nationwide Z-Axis Deployment Benchmark

21. Under our existing rules, a nationwide CMRS provider choosing the CMA-based deployment option to meet the April 2021 and 2023 benchmarks would have no further obligation to support vertical location outside the top 50 CMAs. In the *Fifth Further Notice*, we sought comment on mandating nationwide deployment of z-axis technology with a particular focus on handset-based versus network-based solutions.⁵⁹

22. Commenters generally support deploying z-axis technology on a nationwide basis.⁶⁰ APCO suggests expanding the requirements in the rules beyond the top 50 CMAs,⁶¹ and NENA states that “the ultimate goal is accurate z-axis location information for the entire country.”⁶² iCERT states that reliance on a CMA-by-CMA, population-based approach to assess conformance “appears to run counter to the direction of today’s leading 911 location solutions.”⁶³ T-Mobile asserts that as promulgated, the Commission’s vertical location rules would cover only a percentage of the U.S. population, “thus leaving millions of Americans outside of the designated CMAs potentially without any vertical location

⁵⁷ NENA Feb. 21, 2020 Comments at 11.

⁵⁸ See 47 CFR § 9.10(i)(2)(iii).

⁵⁹ *Fifth Further Notice*, 34 FCC Rcd at 11623, para. 74 (“How do the costs change between deploying in the top 50 CMAs and nationwide? Can deployment nationwide be handled [with] approaches that would require additions or modifications to network at the handset level rather than incurring infrastructure costs? We additionally seek comment on the costs and benefits of both deploying z-axis capable handsets in the top 50 CMAs and deploying them nationwide. We seek data on how likely consumers carrying z-axis capable handsets may travel in and out of one of the top 50 CMAs. What do carriers or other industry actors estimate the cost per handset is? Will a nationwide implementation of the instant rules reduce costs per handset? Can deployment nationwide be handled at the handset level rather than incurring infrastructure costs? We seek comment on how a nationwide deployment would impact compliance costs.”).

⁶⁰ See, e.g., APCO Mar. 20, 2020 Reply Comments at 4; NENA Feb. 21, 2020 Comments at 11-12; see also IAFC Feb. 21, 2020 Comments at 3 (asserting that the FCC should adopt a ± 3 -meter vertical location accuracy metric nationwide by 2025 for all buildings above three stories); IAFF Feb. 21, 2020 Comments at 3 (endorsing nationwide coverage to multi-story buildings); CTIA Feb. 21, 2020 Comments at 12 (noting that today’s most promising vertical solutions are device-based and “offer the promise of scaling nationwide”).

⁶¹ APCO Mar. 20, 2020 Reply Comments at 4.

⁶² NENA Feb. 21, 2020 Comments at 12.

⁶³ iCERT Feb. 21, 2020 Comments at 3-4.

information.”⁶⁴ Google states that carriers should be permitted to deploy z-axis capable handsets nationwide and should be encouraged to do so if these solutions prove superior overall.⁶⁵

23. The record also indicates that deploying z-axis technology on a nationwide basis is technically feasible—or at least will be in the near future. CTIA states that Google’s Android Emergency Location Service and Apple’s Hybridized Emergency Location “have the potential to provide granular location information to [PSAPs] without deployment of new network infrastructure and with use of hardware with diverse capabilities (i.e., barometric pressure sensors with varying degrees of accuracy or non-barometric pressure sensor based solutions).”⁶⁶ Google notes that many handset solutions involve determination of location on the device itself, without deployment or maintenance of new infrastructure, and that this makes deployments “readily scalable, up to nationwide approaches.”⁶⁷ T-Mobile points out that mobile operating system (OS) provider z-axis solutions such as those offered by Google and Apple “have the ability to be deployed nationwide and are available on nearly all existing devices.”⁶⁸

24. We agree with commenters who contend that our deployment requirements should ultimately ensure that vertical location information meeting our accuracy standards is provided nationwide.⁶⁹ As the Commission stated in the *Fourth Report and Order* in this proceeding, “our ultimate objective is that all Americans using mobile phones—whether they are calling from urban or rural areas, from indoors or outdoors—have technology that is functionally capable of providing

⁶⁴ T-Mobile Feb. 21, 2020 Comments at 16; *see also* T-Mobile Mar. 20, 2020 Reply Comments at 1 (“The FCC should embrace the adoption of commercial vertical location technologies, with their attendant continued innovation and development, for 911 nationwide, rather than relying on 911-specific solutions for only a portion of the country.”).

⁶⁵ Google Feb. 21, 2020 Comments at 8. While NextNav does not oppose a nationwide z-axis handset deployment option, it cautions that “the Commission should carefully consider the significant drawbacks that accompany such an approach.” NextNav Feb. 21, 2020 Comments at 17. NextNav comments that z-axis solutions that rely on privately owned unlicensed transmitters, such as Wi-Fi and Bluetooth devices, could be unreliable during power outages and experience variable accuracy. NextNav Feb. 21, 2020 Comments at 13, 15-16.

⁶⁶ CTIA Mar. 20, 2020 Reply Comments at 3.

⁶⁷ Google Feb. 21, 2020 Comments at 8.

⁶⁸ T-Mobile Apr. 23, 2020 *Ex Parte* at 2; *see also id.* at 1 (noting that “T-Mobile’s proposed alternative compliance plan relies on mobile OS provider z-axis location solutions and is compatible with the vast majority of devices in use today”); CTIA Mar. 20, 2020 Reply Comments at 1 (noting that the record reflects an emerging consensus that advances in device-based z-axis solutions “may enable the Commission to extend the 9-1-1 vertical location regulatory regime beyond the Top 25/Top 50 CMAs to nationwide coverage that benefits all wireless 9-1-1 callers”).

⁶⁹ T-Mobile Mar. 20, 2020 Reply Comments at 11-12; AT&T Mar. 20, 2020 Reply Comments at 2; Verizon Feb. 21, 2020 Comments at 3; CTIA Mar. 20, 2020 Reply Comments at 7; IAFC Feb. 21, 2020 Comments at 3; NSA Feb. 21, 2020 Comments at 1; NENA Feb. 21, 2020 Comments at 12; NextNav Feb. 21, 2020 Comments at 9-11; Google Feb. 21, 2020 Comments at 8-10; IAFF Feb. 21, 2020 Comments at 2-3; iCERT Feb. 21, 2020 Comments at 3-4; APCO Mar. 20, 2020 Reply Comments at 4.

accurate location information so that they receive the support they need in times of emergency.”⁷⁰ And we conclude that requiring nationwide deployment on an appropriate timescale will allow CMRS providers to use nascent z-axis technologies that can be widely deployed in consumer handsets through software-based upgrades. In addition, nationwide deployment means first responders and emergency callers everywhere will benefit from these technologies.

25. Accordingly, we require nationwide CMRS providers to deploy z-axis location technology or dispatchable location to all CMAs nationwide by April 2025.⁷¹ This will ensure that all regions of the country and all consumers receive the benefits of z-axis location by a date certain, even if nationwide providers choose to deploy CMA-focused solutions to meet the earlier deadlines. The record strongly supports our conclusion that it is technically feasible for all nationwide providers to deploy z-axis technology nationwide by April 2025, if not sooner.⁷² No commenter opposes our conclusion. As evidenced in comments responding to the *Fifth Further Notice*, z-axis technology is improving rapidly, and new and innovative solutions are likely to become widely available. Therefore, it is appropriate for us to take this further action to help make all Americans safer.

26. In contrast, we reject calls by some quarters to weaken our existing benchmarks and replace them with exclusive nationwide benchmarks that do not meet our current accuracy target. In

⁷⁰ *Fourth Report and Order*, 30 FCC Rcd at 1262, para. 8.

⁷¹ As in the case of our 2021 and 2023 deployment benchmarks, CMRS providers may deploy dispatchable location as opposed to z-axis technology to meet this requirement and we require deployment to cover 80% of the population or 3-story buildings in each CMA, which may be shown by the deployment of a widely available handset-based solution.

⁷² See Verizon Feb. 21, 2020 Comments at 3-4 (proposing new z-axis benchmarks that require ± 3 meters of accuracy for 80% of calls nationwide by April 2025); AT&T Mar. 20, 2020 Reply Comments at 3-4 (supporting Verizon’s proposed z-axis benchmarks); T-Mobile Mar. 20, 2020 Reply Comments at 10-11 (stating that the record demonstrates “a growing consensus among stakeholders in favor of a nationwide approach” and expressing support for nationwide benchmarks); CTIA Mar. 20, 2020 Reply Comments at 1 (noting that the record reflects an emerging consensus that advances in device-based z-axis solutions “may enable the Commission to extend the 9-1-1 vertical location regulatory regime beyond the Top 25/Top 50 CMAs to nationwide coverage that benefits all wireless 9-1-1 callers”); T-Mobile Apr. 23, 2020 *Ex Parte* at 1 (noting that “T-Mobile’s proposed alternative compliance plan relies on mobile OS provider z-axis location solutions and is compatible with the vast majority of devices in use today”); Polaris May 27, 2020 Petition at 4 (stating that “Polaris Wireless does not oppose serving consumers nationwide” and that “NextNav and Polaris Wireless can provide service beyond the Top 50 markets”); Letter from Bruce A. Olcott, Jones Day, to Marlene H. Dortch, Secretary, FCC, PS Docket No. 07-114, at 3 (filed Apr. 1, 2020) (stating that NextNav “will achieve nationwide coverage to multi-tenant buildings with three or more stories by the April 2021 deadline”); NPSTC July 8, 2020 *Ex Parte* at 2 (stating that NPSTC “strongly supports” z-axis data being provided nationwide by April 2025, and noting it should not be burdensome for wireless carriers given that multiple location technology vendors, including Apple, Google, NextNav, and Polaris, have indicated “their services either already are, or soon can be, made available on a nationwide basis”); SBC July 9, 2020 *Ex Parte* at 2.

their comments, CMRS providers propose an alternative timeline for deployment of z-axis technology meeting the accuracy standard adopted by the Commission in the *Fifth Report and Order*.⁷³ T-Mobile, Verizon, and AT&T support an option for nationwide deployment that would require meeting the ± 3 -meter vertical location accuracy metric for 50% of calls by April 2021, 70% of calls by April 2023, and 80% of calls by April 2025.⁷⁴ T-Mobile asserts that under this alternative, z-axis technology would be available “across the country on nearly all devices” by April 2021.⁷⁵ Verizon and AT&T also support a schedule for introducing z-axis capable devices nationwide.⁷⁶

27. We agree with IAFF: While the Commission “fully supports expanding vertical location requirements beyond the largest 50 CMAs,” it does not support any deployment option that delays or diminishes the Commission’s vertical location accuracy rules.⁷⁷ What is more, the CMRS providers’ alternative proposal constitutes an untimely petition for reconsideration of issues that were settled in the *Fifth Report and Order* and are outside the scope of the issues raised in the *Fifth Further Notice*.⁷⁸ CMRS providers propose a weaker accuracy standard and longer timeline based on the same arguments they raised prior to the *Fifth Report and Order*, i.e., that no party has demonstrated in the test bed process that 3-meter accuracy for 80% of calls can be met by the 2021 or 2023 deadlines and that a

⁷³ T-Mobile Apr. 23, 2020 *Ex Parte* at 1; Verizon Feb. 21, 2020 Comments at 3.

⁷⁴ T-Mobile Apr. 23, 2020 *Ex Parte* at 1; Verizon Feb. 21, 2020 Comments at 3; AT&T Mar. 20, 2020 Reply Comments at 3-4, *corrected by* Erratum (AT&T Apr. 1, 2020).

⁷⁵ T-Mobile Apr. 23, 2020 *Ex Parte* at 1; *see also* T-Mobile July 9, 2020 *Ex Parte* at 7 (asserting that third-party solutions are unlikely to provide ± 3 meter z-axis location estimates from more Americans than the carriers’ OS-based proposal); Letter from Matthew Gerst, Vice President, Regulatory Affairs, CTIA, to Marlene H. Dortch, Secretary, FCC, PS Docket No. 07-114, at 1 (filed June 15, 2020) (CTIA June 15, 2020 *Ex Parte*) (asserting that the nationwide CMRS providers’ mobile OS-based solutions “can deliver ± 3 meter vertical location information for twenty times more 9-1-1 calls than the existing benchmark focused on the Top 25 CMAs”); Letter from Matthew Gerst, Vice President, Regulatory Affairs, CTIA, to Marlene H. Dortch, Secretary, FCC, PS Docket No. 07-114, at 2 (filed July 9, 2020) (CTIA July 9, 2020 *Ex Parte*) (asserting that the CMRS providers’ alternative framework would yield the delivery of more 911 calls with a ± 3 meter location estimate).

⁷⁶ *See* Verizon Feb. 21, 2020 Comments at 4-5; AT&T Mar. 20, 2020 Reply Comments at 2-4.

⁷⁷ IAFF Mar. 20, 2020 Reply Comments at 3. Public safety overwhelmingly supports maintaining our current z-axis accuracy requirements and deployment benchmarks. *See* Letter from IAFC, IAFF, IACP, NSA, and the National Association of State EMS Officials (NASEMSO), to Marlene H. Dortch, Secretary, FCC, PS Docket No. 07-114, at 1 (filed July 9, 2020) (IAFC *et al.* July 9, 2020 *Ex Parte*) (urging the FCC to “roundly reject all proposals to change or delay the implementation of the existing z-axis benchmarks”); NPSTC July 8, 2020 *Ex Parte* at 1-2 (supporting adherence to vertical location accuracy requirement of 3 meters for 80% of wireless 911 calls); SBC July 9, 2020 *Ex Parte* at 2.

⁷⁸ Petitions for reconsideration of the *Fifth Report and Order* were due within 30 days after publication of a summary of the *Fifth Report and Order* in the Federal Register, or on February 18, 2020. T-Mobile and Verizon filed their initial comments on the *Fifth Further Notice* on February 21, 2020.

phased-in approach starting with a less rigorous metric is therefore warranted.⁷⁹ We considered and rejected these arguments in the *Fifth Report and Order* when we established the z-axis location accuracy standard of plus or minus 3 meters for 80% of wireless E911 calls and affirmed the 2021 and 2023 deadlines for implementation of this standard.⁸⁰

28. We disagree with T-Mobile's assertion that our exploration of additional z-axis deployment options in the *Fifth Further Notice* was an invitation to commenters to revisit the adopted accuracy standard or timetable; the *Fifth Further Notice* sought comment on how to expand the options to implement the earlier adopted requirements or make vertical location accuracy available to wireless 911 callers on an equally strong basis. The *Fifth Further Notice* sought comment "on establishing an option for CMRS providers to deploy z-axis capable handsets nationwide *as a means of complying with our z-axis deployment requirements*," i.e., the requirements and deadlines adopted in the *Fifth Report & Order*.⁸¹ It also sought comment on tightening the 3-meter standard over time, e.g., to 2 meters or 1 meter.⁸² Thus, contrary to T-Mobile's assertion, the alternatives on which the *Fifth Further Notice* sought comment did not include *weakening* the z-axis metric or extending the 2021 or 2023 deadlines.⁸³ In addition, CMRS providers offer no new facts to indicate that they will be unable to meet the Commission's longstanding benchmarks, while the vendors of both solutions tested in Stage Z of the test bed continue to indicate that their solutions will be available to CMRS providers in time to enable them

⁷⁹ CTIA June 18, 2019 Reply Comments at 6 ("Many commenters including CTIA support adoption of a \pm 3-meter z-axis metric as an important target to achieve over time, but recognize that further testing is required to prove the capability and scalability of this metric."); T-Mobile May 20, 2019 Comments at 4 ("[A]ny decision by the Commission today to establish a decisive \pm 3 meter accuracy metric will be highly aggressive and present considerable risk, especially within the currently proposed timelines."); T-Mobile May 20, 2019 Comments at 6 ("A proposed mandate that 80 percent of all wireless 911 calls must include vertical location information within the \pm 3 meter accuracy metric may not be in the public interest when as many as 50 percent of handsets in use may not contain barometers and less than 40 percent of 911 calls come from urban/dense urban areas.... T-Mobile recommends a required accuracy metric measured at the 80th percentile of the test calls *collected* in the Test Bed, rather than for 80 percent of all indoor wireless calls to 911, as proposed in the FNPRM.") (footnote omitted); AT&T June 18, 2019 Reply Comments at 3 ("Given the open questions about generation of actionable z-axis data, the best way to speed the availability of this data may be through adoption of a phased-in approach," and arguing "a more relaxed standard" is preferable).

⁸⁰ *Fifth Report and Order*, 34 FCC Rcd at 11596-604, paras. 9-22; 47 CFR § 9.10(i)(2)(ii)(C)-(D).

⁸¹ See *Fifth Further Notice*, 34 FCC Rcd at 11623, para. 74 (emphasis added); see also *id.* at 11622, para. 71 ("In each CMA where CMRS providers use z-axis technology to comply with vertical location requirements, the current rules require that CMRS providers deploy z-axis technology to cover 80% of the CMA population. We seek comment on whether expanding options beyond the population-based CMA coverage requirement would serve the public interest.").

⁸² See *Fifth Further Notice*, 34 FCC Rcd at 11619-20, paras. 62-63.

⁸³ See T-Mobile July 9, 2020 *Ex Parte* at 3 (arguing that the *Fifth Further Notice* sought comment on changing the accuracy metric).

to meet the April 2021 benchmark.⁸⁴ As IAFF states, “[t]he process of reaching a consensus position on these important issues is too demanding on key stakeholders to constantly revisit the decision year after year.”⁸⁵

29. As a separate and independent ground for rejecting CMRS providers’ alternative proposal, even if the CMRS providers’ alternative proposal were timely, we conclude that there is no basis for taking this approach. We disagree with the assertion by T-Mobile and CTIA that their proposal should be preferred because it would provide z-axis location information for more 911 calls overall than solutions that only support z-axis location for 911 calls in major markets.⁸⁶ While T-Mobile and CTIA argue that their solution could be quickly deployed nationwide and would work in most handsets, the fact remains that their solution would not meet the Commission’s 3-meter/80% of calls accuracy standard by April 2021 or even by April 2023 in any market, but would delay compliance in all markets until 2025.

30. Moreover, as public safety commenters note, if CMRS providers intend to use a 911 location technology that is still under development and currently incapable of meeting the +/- 3-meter benchmark more than 50% of the time, the technology needs to be improved within the timetable adopted by the Commission to meet the standard; the standard should not be weakened to conform to the current status of the technology in development when other solutions that meet the standard are technically feasible. The National Sheriffs’ Association (NSA) points out that in an emergency dispatch situation where time is of the essence, “it is critically important that the information that is provided to law enforcement officers in the field be accurate and reliable.”⁸⁷ Further, “[a]ny location information that may not be sufficiently accurate as much as 50% of the time cannot be used as a resource for public

⁸⁴ See, e.g., NextNav Feb. 21, 2020 Comments at 1 (stating that NextNav’s vertical location service will be available for use by wireless carriers “well in advance” of the Commission’s April 2021 and 2023 compliance deadlines and that the network will provide z-axis service covering more than 80% of the population and an even higher percentage of tall buildings in the top 50 CMAs); Letter from Bruce A. Olcott, Jones Day, to Marlene H. Dortch, Secretary, FCC, PS Docket No. 07-114, at 1 (filed May 26, 2020) (NextNav May 26, 2020 *Ex Parte*) (“NextNav’s vertical location network will be available for use in 105 cellular market areas . . . well in advance of the April 2021 deadline for the provision of 3 meter accurate vertical location information to support public safety in the largest 25 CMAs.”); Letter from Ian D. Volner and Meryl E. Bartlett, Counsel to Polaris Wireless, Inc., Venable LLP, to Marlene H. Dortch, FCC, PS Docket No. 07-114, at 1 (filed Apr. 9, 2020) (Polaris Apr. 9, 2020 *Ex Parte*) (Polaris “can be ready for implementation at the 3-meter metric mandated by the Order, or perhaps more precise levels, on the scheduled timeline”). Polaris also states that “[t]here are at least two vendors that can currently meet the 3-meter metric and be fully deployed by the April 2021 deadline so long as the Commission makes clear to all stakeholders that the April 2021 deadline is fixed.” Polaris Apr. 9, 2020 *Ex Parte*. at 3.

⁸⁵ Letter from Harold A. Schaitberger, General President, IAFF, to Ajit Pai, Chairman, FCC, PS Docket 07-114, at 1 (filed May 15, 2020).

⁸⁶ See T-Mobile July 9, 2020 *Ex Parte* at 6-12; T-Mobile Apr. 23, 2020 *Ex Parte* at 1; CTIA July 9, 2020 *Ex Parte* at 1-3; CTIA June 15, 2020 *Ex Parte* at 2, Attach. B at 5.

⁸⁷ Letter from Jonathan F. Thompson, Executive Director and CEO, NSA, to Ajit Pai, Chairman, FCC, *et al.*, PS Docket 07-114, at 2 (filed June 25, 2020).

safety and must be discarded.”⁸⁸ With only 50% reliability, passing such z-axis information to PSAPs could waste precious minutes while first responders search in vain the wrong floors of a building—and ultimately lead the public safety community to simply ignore z-axis information over the longer term. Such an outcome would serve no one—not first responders, not the public, and not the CMRS providers that invested in such technologies.⁸⁹

31. We also disagree with T-Mobile’s assertion that the CMRS providers’ alternative is superior because it would be deployed nationwide rather than being limited to major markets.⁹⁰ T-Mobile’s preferred solution instead is just a trade-off—potentially earlier nationwide deployment of a technology solution that does not meet the accuracy levels needed to protect public safety. And T-Mobile ignores the reasons why the Commission adopted the market-based approach to z-axis deployment in the 2015 *Fourth Report and Order*—an approach that was taken directly from the 2015 Amended Roadmap jointly agreed to and submitted by the wireless carriers and public safety entities.⁹¹ The parties to the Roadmap proposed deployment of z-axis technology in the top 50 markets because identifying a 911 caller’s vertical location is most crucial for calls coming from multi-story buildings.⁹² The Commission’s analysis of U.S. Geological Survey data indicates that more than 84% of census block groups with average building heights of three or more stories are located in the top 50 markets. In other words, federal data showing the average height of buildings by census block group show that over 84% of block groups in the three tallest quantiles are in the top 50 markets.⁹³ As the wireless providers

⁸⁸ *Id.*

⁸⁹ NPSTC July 8, 2020 *Ex Parte* at 1-2 (stating that provision of 3 meter accuracy for anything less than 80% of calls would be “insufficiently accurate to be useful as actionable information,” and urging the Commission to reject proposed deferred timelines as “stalling measures”).

⁹⁰ See T-Mobile July 9, 2020 *Ex Parte* at 7.

⁹¹ See Letter from Joan Marsh, AT&T Services, Inc., Kathleen O’Brien Ham, T-Mobile USA, Ray Rothermel, Sprint, and Kathleen Grillo, Verizon, to Marlene H. Dortch, Secretary, FCC, PS Docket No. 07-114, at 2 (filed Jan. 21, 2015) (Amended Roadmap Cover Letter) <https://ecfsapi.fcc.gov/file/60001014958.pdf> (attaching Addendum to Roadmap) Letter from John Wright, APCO; Charles W. McKee, Sprint Corporation; Joan Marsh, AT&T Services, Inc., Kathleen O’Brien Ham, T-Mobile USA, Inc., Christy Williams, NENA; Kathleen Grillo, Verizon Wireless, to Marlene H. Dortch, Secretary, FCC, PS Docket No. 07-114 (filed Nov. 18, 2014) (Roadmap Cover Letter), Attach. A, “Roadmap for Improving E911 Location Accuracy” (Roadmap) <http://apps.fcc.gov/ecfs/document/view?id=60000986637>. Together, the Roadmap and the Addendum are known as the “Amended Roadmap.”

⁹² See Amended Roadmap Cover Letter at 2 (noting that the carriers commit in the Amended Roadmap to implement either a dispatchable location or z-axis location solution in the 50 most populous CMAs; “[t]he revised commitments target these areas where consumers and First Responders would derive the most benefit, covering approximately 153 million people. CMA by CMA compliance assures meaningful and balanced distribution of reference points across the 50 most populous areas, or Z-axis deployment in a CMA in the event the dispatchable location metric is not achieved.”).

⁹³ Specifically, Commission staff performed an analysis of a dataset published online by the U.S. Geological Survey which categorizes each of the over 200,000 census block groups by average building height. Falcone, J.A., 2016, U.S. national categorical mapping of building heights by block group from Shuttle Radar Topography Mission data: (continued....)

acknowledged in the Amended Roadmap,⁹⁴ it is much more important to have reliable z-axis information for 911 calls from these environments, even if they represent a small percentage of overall calls, than for the many 911 calls that come from ground level (e.g., calls from outdoor locations, single family homes, and other single story buildings). Yet the T-Mobile/CTIA alternative would allow CMRS providers to abandon this targeted approach to z-axis deployment, which has been in the Commission's rules since the 2015 *Fourth Report and Order* and which encourages deployment of vertical location resources in the areas where they are most needed.⁹⁵

32. In addition, we disagree with T-Mobile and CTIA's argument that their OS-based alternative would provide greater consumer benefits than solutions offered by NextNav and Polaris because (1) the OS-based alternative would be available on most current handsets, whereas the NextNav and Polaris solutions will only work on handsets equipped with barometric sensors, and (2) the OS-based alternative can be made available to consumers automatically, whereas the NextNav and Polaris solutions require consumers to "opt in" and many consumers may decline to do so.⁹⁶ We find these arguments unpersuasive. NextNav argues that the CMRS providers underestimate the availability of barometer-equipped handsets⁹⁷ and contends that its software "can be uploaded/pushed to capable devices without user opt-in."⁹⁸ CTIA also provides no support, other than conjecture, for its estimate that only 5% of consumers asked to opt in to a 911 solution would do so.⁹⁹ Moreover, even if we assume that the NextNav and Polaris solutions would only benefit consumers in major markets who

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U.S. Geological Survey data release, available at <https://www.sciencebase.gov/catalog/item/5775469ce4b07dd077c7088a>. Of block groups in the three tallest categories based on the average, over 84% are located within the 50 largest cellular market areas (CMAs). Indeed, over 91% of block groups in the tallest category—with an average building height of 10 stories or greater—are located in the top 50 CMAs.

⁹⁴ See Amended Roadmap Cover Letter at 2 n.2 (citing, *inter alia*, Letter from Russell E. Sanders, Executive Secretary, Metropolitan Fire Chiefs Association, to Marlene H. Dortch, Secretary, FCC, PS Docket No. 07-114, at 2 (filed July 14, 2014) ("While location accuracy and speed of response is important in all geographies, the urgency of the problem is particularly crucial in large urban environments, both because of the density and complexity of structures as well as the criticality of vertical location in multi-level high-rise buildings.")).

⁹⁵ The record also suggests that NextNav and Polaris have the potential to support z-axis location beyond the top 50 markets in the near term. NextNav asserts that its solution will provide geographic coverage of 90% of the U.S. by 2021, including 105 CMAs. Letter from Bruce A. Olcott, Jones Day, to Marlene H. Dortch, Secretary, FCC, PS Docket No. 07-114, at 1, Attach. at 1 (filed July 1, 2020) (NextNav July 1, 2020 *Ex Parte*). Polaris similarly has stated that its solution will provide "nationwide coverage immediately upon initial deployment." Letter from James Arden Barnett, Jr., Counsel for Polaris Wireless, Inc., to Marlene H. Dortch, Secretary, FCC, PS Docket No. 07-114, Attach. at 3 (filed Sept. 10, 2018).

⁹⁶ CTIA June 15, 2020 *Ex Parte* at 2, Attach. B at 5.

⁹⁷ See NextNav July 1, 2020 *Ex Parte* at 2, Attach. at 1; *see also* Letter from Bruce A. Olcott, Jones Day, to Marlene H. Dortch, Secretary, FCC, PS Docket No. 07-114, at 4 (filed July 13, 2020).

⁹⁸ NextNav July 1, 2020 *Ex Parte*, Attach. at 1.

⁹⁹ See CTIA June 15, 2020 *Ex Parte*, Attach. B at 5.

have barometer-equipped handsets and who choose to opt in, those consumers would have access by April 2021 to z-axis solutions meeting the 3-meter/80% of calls standard. In addition, consumers without z-axis capable devices would have the ability to acquire them. By contrast, the T-Mobile/CTIA alternative would provide far less consumer benefit because it would deprive *all* consumers of access to z-axis solutions meeting the 3-meter/80% of calls standard for an additional four years—until April 2025. Aside from failing to quantify how many legacy handsets a change in approach might address, T-Mobile’s argument fails to address the same fundamental problem: enabling E911 technology that delivers accurate location information only 50% of the time is not useful to public safety officials, will not be used by PSAPs, and thus eliminates the benefits of deployment in 2021 and 2023.

33. Finally, there is no merit to T-Mobile’s argument that our rejection of its alternative proposal is arbitrary and capricious because we have not undertaken a cost-benefit comparison of its preferred OS-based solution against the solutions proffered by NextNav and Polaris.¹⁰⁰ First, despite our request in the *Fifth Further Notice* for commenters to provide data on costs and benefits for alternative solutions,¹⁰¹ neither T-Mobile nor any other CMRS provider submitted cost/benefit data that would be needed to make such a comparison. Second, and more fundamentally, because our location accuracy rules are technology-neutral, the purpose of our cost-benefit analysis is not to compare the costs and benefits of particular location methodologies, but rather to show that the cost ceiling imposed by our location requirements is below the expected benefit floor. In the *Fifth Report and Order*, we determined that the cost ceiling imposed by our z-axis standard would not exceed \$36 million and that this was well below the expected annual benefit floor.¹⁰² Once these values are established, CMRS providers are free to adopt whatever technology they want, including OS-based solutions, as long as it meets our prescribed standards. The fact that one technology is more or less costly than another does not require us to re-do our cost-benefit analysis or mean that use of either one would cause costs to exceed benefits. Finally, while the costs of T-Mobile’s alternative may be lower in 2021 and 2023 (although T-Mobile does not quantify how much lower), the record also shows that T-Mobile’s proposed approach would largely eliminate the benefits of the 2021 and 2023 benchmarks because the results would be insufficiently accurate for first responders to actually use them. As a result, the net benefits of our approach exceed the net benefits of T-Mobile’s proposed alternative.

3. Deployment of Location Software to Z-Axis Capable Handsets

34. In the *Fifth Report and Order*, we stated that the 3-meter metric should apply to all “z-axis capable” handsets, which we defined as handsets that “can measure and report vertical location without a hardware upgrade.”¹⁰³ We further used this definition as the basis for our deployment

¹⁰⁰ See T-Mobile July 9, 2020 *Ex Parte* at 5-6.

¹⁰¹ See *Fifth Further Notice*, 34 FCC Rcd at 11622-25, paras. 73-74, 76, 78.

¹⁰² See *Fifth Report and Order*, 34 FCC Rcd at 11619, para. 60.

¹⁰³ *Fifth Report and Order*, 34 FCC Rcd at 11605, para. 25.

requirements, stating that “any device technically capable of measuring and reporting vertical location information without a change in hardware must be enabled to do so.”¹⁰⁴

35. Several commenters direct their comments toward the definition of “z-axis capable handset,” while others seek more specification on what mechanisms for making handsets z-axis capable will be considered sufficient to meet the Commission’s deployment requirements. We address these issues below and codify our previously adopted definition and refinements thereto.

36. APCO points out that the handset-based location solutions offered by NextNav and Polaris require the deployment of external data sources such as beacons, weather stations, or location databases to support location determination in the handset.¹⁰⁵ APCO asks us to confirm that in such instances, our rules require not just deployment of z-axis capable handsets, but also deployment of any network infrastructure that is necessary to support delivery of location information by the handset.¹⁰⁶ We agree. In order to meet deployment thresholds under either the CMA-based or the nationwide handset-based alternative, CMRS providers must deploy and activate all network infrastructure necessary to support z-axis location by z-axis capable handsets throughout the deployment area.

37. Polaris asks the Commission to confirm that for barometric-based location solutions, only devices with barometric sensors can be considered z-axis capable.¹⁰⁷ We agree that the definition of what constitutes a “z-axis capable” handset may vary depending on the specific location solution being used. Because we defined z-axis capability in the *Fifth Report and Order* to exclude handsets that require a hardware upgrade,¹⁰⁸ the applicability of the definition to particular handsets may vary depending on what hardware is required for a particular 911 location solution to work. Thus, we agree with Polaris that for location solutions that rely on barometric pressure sensor information, only handsets that have such sensors installed would be considered z-axis capable. On the other hand, in the case of location solutions that do not require barometric pressure sensor information, both handsets with and without barometric sensors would be considered z-axis capable, assuming they are software-upgradable.¹⁰⁹

¹⁰⁴ *Id.*

¹⁰⁵ APCO Feb. 7, 2020 Petition at 6-7. APCO notes that NextNav’s technology requires the use of beacons and weather reference stations and that Polaris’ technology requires use of a proprietary location server. *See id.* at 6-7 nn.14-16.

¹⁰⁶ *Id.* at 6-7.

¹⁰⁷ Polaris Apr. 9, 2020 *Ex Parte* at 2; *see also* Polaris May 27, 2020 Petition at 5 (noting that Polaris has asked the Commission to clarify that only devices with barometric sensors can be considered z-axis capable for barometric-based solutions).

¹⁰⁸ *Fifth Report and Order*, 34 FCC Rcd at 11619, para. 59.

¹⁰⁹ *See, e.g.*, T-Mobile Apr. 23, 2020 *Ex Parte* at 2 (noting that with mobile OS solutions such as those offered by Google and Apple, “nearly 100% of existing devices are capable of generating z-axis location information, regardless of whether the device has a barometer”).

38. T-Mobile questions whether CMRS providers can rely on third-party apps to deliver location software upgrades.¹¹⁰ CMRS providers may deliver upgrades to handsets either by installing the location software as an upgrade to the handset OS or by offering it to end users as an over-the-top software upgrade. This approach will give CMRS providers additional flexibility in meeting the April 2021 deadline.

39. AT&T asks whether a handset will be considered z-axis capable if activating the software requires customer consent, and the customer declines to do so.¹¹¹ We recognize, as AT&T points out, that some location software upgrades may require affirmative consent by the end user to activate the software in the handset. In such instances, the CMRS provider will be deemed to have met its deployment obligation so long as it either pre-installs or affirmatively “pushes” the location software to end users so that they receive a prompt or other notice informing them that the application or service is available and what they need to do to download and enable the technology on their phone.¹¹² Moreover, the CMRS provider will be deemed in compliance when it makes location software available to the end user in this manner even if the end user declines to use the software or subsequently disables it.¹¹³ However, we expect CMRS providers to clearly and conspicuously disclose the benefits of any location solution they offer so that consumers can make informed decisions whether to enable it.

40. Some carriers question whether older barometer-equipped handsets can be software-upgraded to support the Polaris or NextNav solutions. AT&T contends that only 26% of Android devices “have the capability to be upgraded to support vertical location” and that “a not-insignificant number of Apple devices may also face limitations in receiving updates.”¹¹⁴ CTIA states that NextNav’s comments about the challenges of integrating its proprietary solution into wireless handsets suggest that it is “not currently on a path that will deliver a scalable and consistent solution that will meet the April 2021 deadline.”¹¹⁵

¹¹⁰ T-Mobile Apr. 23, 2020 *Ex Parte* at 3.

¹¹¹ Letter from Joseph P. Marx, Assistant Vice President Federal Regulatory, AT&T, to Marlene H. Dortch, Secretary, FCC, PS Docket No. 07-114, at 1 (filed Apr. 22, 2020) (AT&T Apr. 22, 2020 *Ex Parte*); *see also* CTIA Feb. 21, 2020 Comments at 6 (noting that integrating z-axis technologies into a handset “may also require the consumer to take certain steps, such as opting in to location tracking or downloading a particular app to their devices”).

¹¹² Conversely, it would not be sufficient for the provider merely to make the location application available to customers in an app store.

¹¹³ In other words, handsets that fall into this category will not be counted against the CMRS provider in determining compliance with the deployment benchmarks herein. The location solution must also comply with the privacy protections applicable to 911 location information.

¹¹⁴ AT&T Apr. 22, 2020 *Ex Parte* at 1-2.

¹¹⁵ CTIA Mar. 20, 2020 Reply Comments at 5 & n.15 (noting that NextNav commented that ““a number of manufacturers of handsets and chipsets have resisted incorporating new location technology approaches into their products””); *see also* T-Mobile Feb. 21, 2020 Comments at 6-7 (noting that even though handsets with barometric

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41. We do not share these concerns. First, the record indicates that barometric sensor-based solutions, such as those offered by Polaris and NextNav, can be made widely available to consumers.¹¹⁶ Although these solutions will only work with handsets equipped with barometric sensors, we have previously noted that most smartphones in the market are so equipped.¹¹⁷ Second, Polaris contends that its software can be widely deployed as part of an OS upgrade or a carrier upgrade,¹¹⁸ and NextNav states that software updates for its solution can be uploaded to most z-axis capable handsets that were previously purchased.¹¹⁹

42. Most newer handset models can receive such upgrades because they have not reached end-of-life status. Accordingly, they should be considered z-axis capable under our rules. In addition, CMRS providers can deploy software upgrades by means of over-the-top apps as well as operating system or firmware upgrades. In light of this, we require that CMRS providers using any z-axis option must affirmatively “push” the z-axis technology to all existing z-axis capable handset models on the provider’s network that can receive it, and that CMRS providers must continue to support the z-axis technology on these handsets thereafter. A CMRS provider using the handset-based deployment option must make the software available to existing z-axis capable handsets nationwide; a provider using a CMA-based deployment option must make it available to all z-axis capable handsets in the CMA. For all new z-axis capable handsets marketed to consumers, the technology must be pre-installed.

43. Verizon and AT&T ask the Commission to take regulatory action directed at device manufacturers to require their cooperation with wireless providers to meet the z-axis deadlines.¹²⁰ We

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pressure sensors can technically be modified to support vertical location via firmware or software, this “does not mean that such a device can support a z-axis solution that is compliant with the Commission’s rules”).

¹¹⁶ See Polaris May 27, 2020 Petition at 5-6 (stating that the software necessary to run its z-axis solution “can be part of an OS upgrade or even carrier upgrade, and not a Polaris Wireless application that consumers need to download on their own”); NextNav May 26, 2020 *Ex Parte* at 2 (“Some handset manufacturers are already incorporating NextNav’s royalty-free calibration software in upcoming handset models. The inclusion of NextNav’s software in the handset build provides the added benefit to manufacturers of reducing the time, cost and complexity of calibrating the sensor during the manufacturing process.”).

¹¹⁷ *Fifth Report and Order*, 34 FCC Rcd at 11604, para. 23 & n.100 (noting that since 2014, the iPhone 6 and later models have had a barometer, while Samsung Galaxy smartphones have had barometers since 2011) (citing Kaveh Waddell, *How Phones can Help Predict Thunderstorms* (Aug. 11, 2016), <https://www.theatlantic.com/technology/archive/2016/08/how-phones-can-help-predict-thunderstorms/495389/>); *Fourth Report and Order*, 30 FCC Rcd at 1299, para. 107 & n.269 (noting that new units per year in 2014 were more than eight times the 82 million new units per year in 2012); *Third Further Notice*, 29 FCC Rcd at 2424-25, para. 134 & n.272 (noting that several device vendors were starting to include barometric pressure sensors in their handsets).

¹¹⁸ Polaris May 27, 2020 Petition at 5-6.

¹¹⁹ NextNav Feb. 21, 2020 Comments at ii.

¹²⁰ Letter from Robert G. Morse, Associate General Counsel, Federal Regulatory and Legal Affairs, Verizon, to Marlene H. Dortch, Secretary, FCC, PS Docket No. 07-114, at 2-3 (filed July 7, 2020) (Verizon July 7, 2020 *Ex* (continued....))

continue to believe that the flexibility, technology neutrality, and privacy protections afforded by our rules will enable CMRS providers to negotiate requirements with such third parties and establish contractual timelines that will enable timely deployment of z-axis solutions.¹²¹ We expect device manufacturers and others to cooperate and work in good faith with CMRS providers to expedite these efforts as needed to meet the upcoming deadlines. Moreover, as we stated in the *Fifth Report and Order*, we will closely monitor the roll-out of z-axis capable devices to the American public and will “take all appropriate action against any party that obstructs the effective deployment of such technologies in a timely manner.”¹²²

44. Finally, we decline to adopt AT&T’s suggestion that we measure the deployment of technology to z-axis capable handsets based on the percentage of new handset models offered for sale.¹²³ Such an approach would provide vertical location technology only to handsets newly introduced to the market, leaving the entire base of legacy handsets without this potentially lifesaving technology.

4. Deployment Timeline for Non-Nationwide Providers

45. Under our existing rules, non-nationwide CMRS providers serving any of the top 25 or 50 CMAs have an additional year to meet each of the vertical location benchmarks specified in the rules.¹²⁴ Accordingly, these non-nationwide providers will have an additional year to implement the nationwide deployment requirement we adopt in this order. However, the current vertical location requirements do not extend to non-nationwide CMRS providers that do not serve any of the top 50 CMAs. In the *Fifth Further Notice*, we noted that CCA has urged the Commission to “implement a glide path for non-nationwide carriers to comply with any adopted timeframes, particularly if these carriers operate outside of the FNPRM’s proposed benchmark of the top 50 markets.”¹²⁵ We also sought comment on appropriate timelines for non-nationwide CMRS providers to comply with additional z-axis deployment options, such as nationwide deployment or deployment on the basis of building type.¹²⁶

46. In its comments, CCA notes that many non-nationwide providers are dependent on vendors to update network capabilities that support location accuracy services, and delays by such

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Parte); Letter from Joseph P. Marx, Assistant Vice President Federal Regulatory, AT&T, to Marlene H. Dortch, Secretary, FCC, PS Docket No. 07-114, at 2 (filed July 9, 2020).

¹²¹ See *Fifth Report and Order*, 34 FCC Rcd at 11607, para. 30.

¹²² *Id.* at 34 FCC Rcd at 11605, para. 25.

¹²³ See AT&T Feb. 21, 2020 Comments at 8; see also AT&T Mar. 20, 2020 Reply Comments at 2 (“A benchmark based on handsets activated versus handsets in the market is appropriate, as consumers have trended toward keeping their phones for longer period[s] of time.”); Verizon Feb. 21, 2020 Comments at 4 (proposing a schedule for the introduction of “new handset activations”).

¹²⁴ 47 CFR § 9.10(i)(2)(ii)(E).

¹²⁵ *Fifth Further Notice*, 34 FCC Rcd at 11624, para. 77 (quoting CCA May 20, 2019 Comments at 5).

¹²⁶ *Id.* at 11624, para. 77.

vendors may be outside of a carrier's control.¹²⁷ CCA also notes that many non-nationwide providers are not privy to the test bed process and the technologies that are deemed viable; "[o]nly once solutions are certified out of the test bed do carriers undergo their own interoperability testing, a process that could take many months."¹²⁸ CCA asserts that its small and rural carrier members have "finite resources,"¹²⁹ and cautions that "technical and marketplace barriers may delay small and rural carrier deployment beyond a year."¹³⁰ However, NENA contends that non-nationwide providers should not be given additional implementation time beyond the one-year period afforded by the current rules.¹³¹

47. Consistent with our objectives in this proceeding, we conclude that the benefits of improved vertical location accuracy should be available to customers of all CMRS providers, including non-nationwide providers serving areas outside the major population centers. In light of our decision to require nationwide CMRS providers to provide nationwide z-axis location by April 2025, we afford non-nationwide carriers an additional year, i.e., until April 2026, to provide z-axis location throughout their service areas. Accordingly, non-nationwide providers that do not serve any of the top 50 CMAs must also support z-axis location throughout their network footprint by April 2026. Given the constraints and technical challenges non-nationwide CMRS providers may face in selecting and deploying z-axis technologies, we find that allowing these providers an additional year beyond the 2025 nationwide deployment date for nationwide carriers is appropriate. This will afford non-nationwide CMRS providers operating outside the top 50 CMAs more than five years to comply with our vertical location requirements.¹³² In addition, like all other CMRS providers already subject to vertical location requirements, these providers also must comply with applicable requirements for compliance certifications, privacy and security protections, provision of confidence/uncertainty data, and live call data reporting.

B. Dispatchable Location without the National Emergency Address Database

48. The Commission's current dispatchable location rules specify that CMRS providers must use the National Emergency Address Database as the source of dispatchable location reference points to meet CMA-based vertical location requirements.¹³³ In the *Fifth Further Notice*, we noted the significant

¹²⁷ CCA Feb. 21, 2020 Comments at 3.

¹²⁸ *Id.* at 2.

¹²⁹ *Id.* at 3.

¹³⁰ *Id.* at 2.

¹³¹ NENA Feb. 21, 2020 Comments at 11.

¹³² In addition, upon a sufficient showing the Commission may grant relief pursuant to the waiver standard in its rules. See 47 CFR §§ 1.3 and 1.925.

¹³³ 47 CFR § 9.10(i)(2)(ii)(C)(I) ("In each CMA where dispatchable location is used: nationwide CMRS providers must ensure that the [National Emergency Address Database] is populated with a sufficient number of total dispatchable location reference points to equal 25 percent of the CMA population.").

challenges facing the National Emergency Address Database and proposed to expand the rules to allow CMRS providers to use non-National Emergency Address Database based dispatchable location solutions to meet these requirements, provided that such solutions afforded equivalent privacy and security protections to consumers.¹³⁴ We observed that our proposal was consistent with the flexible and technology-neutral approach to dispatchable location we adopted for non-CMRS providers in the Kari's Law/RAY BAUM'S Act proceeding.¹³⁵

49. As proposed, we revise the rules to allow CMRS providers to deploy dispatchable location solutions that do not rely on the National Emergency Address Database, which was formally terminated shortly after the *Fifth Further Notice*.¹³⁶ Given the National Emergency Address Database's demise, commenters uniformly support this change.¹³⁷ Commenters also affirm that a diverse array of

¹³⁴ *Fifth Further Notice*, 34 FCC Rcd at 11625-26, 11632-33, paras. 79-83, Appx. B.

¹³⁵ *Id.* at 11626, para. 81; *Implementing Kari's Law and Section 506 of RAY BAUM'S Act; Inquiry Concerning 911 Access, Routing, and Location in Enterprise Communications Systems; Amending the Definition of Interconnected VoIP Service in Section 9.3 of the Commission's Rules*, PS Docket Nos. 18-261 and 17-239, GN Docket No. 11-117, Report and Order, 34 FCC Rcd 6607 (2019) (*Kari's Law/RAY BAUM'S Act Report and Order*). To address concerns about relying on database location solutions, such as the National Emergency Address Database, in the Kari's Law/RAY BAUM'S Act proceeding, we adopted a more flexible approach that requires non-CMRS providers to provide dispatchable location if technically feasible. *See generally Fifth Further Notice*, 34 FCC Rcd at 11625-26, paras. 79-83 (describing challenges raised by commenters to relying on the National Emergency Address Database to implement dispatchable location, including concerns raised by cable operators about the ability to populate the National Emergency Address Database with data and potential concerns about disclosure of consumer information, as well as public safety commenter concerns about the accuracy and completeness of National Emergency Address Database data). In the *Fifth Further Notice*, we also asked, "How would such [alternative] sources meet the validation criteria in the definition of dispatchable location applicable to CMRS providers?" *Fifth Further Notice*, 34 FCC Rcd at 11626, para. 82.

¹³⁶ On February 14, 2020, the NEAD, LLC informed us that the National Emergency Address Database Platform had ceased operation and was "no longer available to support wireless providers' provision of dispatchable location information." Letter from Thomas C. Power, Secretary, and Thomas K. Sawanobori, Vice President, NEAD, LLC, to Marlene H. Dortch, Secretary, FCC, PS Docket No. 07-114, at 1 (filed Feb. 14, 2020). Although we delete the reference to the NEAD in the rules, we retain the metric for measuring a carrier's deployment of dispatchable location reference points. Specifically, for any CMRS provider that relies on dispatchable location to meet the April 2021 or 2023 benchmarks in a CMA, we continue to require the provider to provision a total number of dispatchable location reference points (e.g., WiFi access points or Bluetooth beacons) equal to 25% of the CMA population. Reference point data may be stored in any database so long as the database meets the privacy and security requirements adopted in the *Fifth Report and Order*. *See Fifth Report & Order*, 34 FCC Rcd at 11615, para. 50.

¹³⁷ *See, e.g.*, APCO Mar. 20, 2020 Reply Comments at 3 ("While the location accuracy rules need to de-couple dispatchable location from the [National Emergency Address Database], carriers should not delay efforts to leverage a variety of technologies to provide the most actionable information possible with 9-1-1 calls."); AT&T Feb. 21, 2020 Comments at 10 (urging that "the Commission's rules should allow carriers to continue exploring dispatchable location solutions that rely on data sources other than the [National Emergency Address Database]"); CTIA Feb. 21, 2020 Comments at 11-12 (recommending that "[t]he Commission should pursue the same technology-neutral

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technological approaches could be used to provide dispatchable location. CTIA states that “location solution providers are developing a variety of technology approaches to derive address-based information, such as reverse geocoding, device contextual information, and mapping locations within large buildings or other structures such as airports or shopping malls.”¹³⁸ Verizon states that it has begun delivering dispatchable location to PSAPs for 911 calls from certain devices when the information can be determined reliably, and that it plans to incorporate dispatchable location capabilities into 5G home voice products.¹³⁹ AT&T and Google suggest that dispatchable location solutions may be technically feasible if carriers can leverage other data sources, including handset-based approaches.¹⁴⁰

50. The *Fifth Further Notice* also sought comment on alternative approaches to dispatchable location, including whether to mandate the provision of both dispatchable location and vertical location data for 911 calls originating from multi-story buildings.¹⁴¹ Some public safety commenters support

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approach consistent with the action it adopted for other providers in the Kari’s Law and RAY BAUM’S Act proceeding where the Commission required voice service providers that are not wireless providers to provide dispatchable location through any available and technically feasible means”); IAFF Mar. 20, 2020 Reply Comments at 4 (stating that IAFF “continues to support efforts to develop alternative dispatchable location solutions, particularly those that may provide an exact floor label along with altitude information”); iCERT Feb. 21, 2020 Comments at 4 (stating that “flexibility should also guide the Commission as it considers changes to its rules related to the provision of a dispatchable location”); NextNav Feb. 21, 2020 Comments at ii (stating that “[t]he Commission should continue to improve its vertical location rules by migrating to a z-axis metric of 2 meters, which is widely supported by public safety and could assist in the ultimate transition to dispatchable location solutions”); T-Mobile Feb. 21, 2020 Comments at 18 (“Regardless of the source, reliable dispatchable location information, if available, should continue to be embraced as an alternative to geodetic location estimates for compliance purposes and can be an important option for first responders.”); Verizon Feb. 21, 2020 Comments at 6 (stating that “[d]ispatchable location should remain an important part of the Commission’s rules”).

¹³⁸ CTIA Feb. 21, 2020 Comments at 11.

¹³⁹ Verizon Feb. 21, 2020 Comments at 7-8. Verizon is providing dispatchable location for certain 911 calls using Voice over Wi-Fi and indoor Distributed Antenna System (DAS) configurations. *Id.*

¹⁴⁰ See, e.g., AT&T Feb. 21, 2020 Comments at 2, 6-8, 11 (recommending that “[t]he Commission should also take steps to facilitate innovation in handset-based solutions, which hold promise for advancing the evolution to dispatchable location”). Google states that multiple positioning methods are available today to provide valuable location data in diverse environments and cites Android’s Emergency Location Service, Apple’s Hybridized Emergency Location, and Precision Broadband’s proposed fixed broadband alternative, which “relies on internet service provider interfaces to provide dispatchable location.” Google Feb. 21, 2020 Comments at 10. According to Google, “[t]he Commission’s rules should allow for any or all of these resources to be leveraged to direct first responders in emergencies.” *Id.*; see also Google Mar. 20, 2020 Reply Comments at 10 (stating that “any updates to the Commission’s rules for generating dispatchable location should maximize flexibility, technological neutrality, and innovation, including in handset-based approaches”).

¹⁴¹ *Fifth Further Notice*, 34 FCC Rcd at 11622-23, 11626, paras. 73, 83. We sought comment on the possible costs and benefits associated with dispatchable location alternatives to the National Emergency Address Database. For example, we asked for comment on the costs and benefits associated with Precision Broadband’s multi-faceted proposal to require the reporting of both (1) dispatchable location and (2) z-axis information in the top 50 Cellular Market Areas. *Id.* at 11626, para. 83. In comments responsive to the *Fourth Further Notice*, Precision Broadband suggested potential data points for delivering dispatchable location including “(1) WiFi access points and Bluetooth beacons in the [National Emergency Address Database]; (2) unique fixed broadband connections identified by

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revising the current rules—which give CMRS providers the option of providing either dispatchable location or z-axis information—to require provision of dispatchable location for a minimum percentage of 911 calls.¹⁴² On the other hand, CMRS providers express concerns about requiring dispatchable location, arguing that many challenges remain and that solutions are still in early stages of development.¹⁴³ However, there is broad support for treating dispatchable location as the preferred indoor location solution as it becomes technically feasible.¹⁴⁴ IAFF states that it “continues to support efforts to develop alternative dispatchable location solutions, particularly those that may provide an exact floor label along with altitude information.”¹⁴⁵ Verizon states that “nothing should stop service providers today from generating and delivering dispatchable location information to PSAPs when

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Internet Service Provider (ISP)- provisioned customer premise gateways such as cable modems, DSL modems, fiber-to-the-premise devices (Optical Network Terminals or connected routers), and fixed wireless connected modems or routers; (3) locations created from crowd-sourced technology; and (4) locations identified in multi-story building blueprints that can be used to provide reference data capable of converting a vertical z-axis measurement into an actual floor level.” *Fifth Further Notice*, 34 FCC Rcd at 11626-27, para. 83 n.286 (citing and quoting Precision Broadband June 7, 2019 Reply Comments at 7).

¹⁴² See, e.g., APCO Feb. 21, 2020 Comments at 6 (“Carriers should eventually be required to provide dispatchable location information for specific minimum percentages of indoor calls nationwide.”); Letter from Jeffrey S. Cohen, Chief Counsel, and Mark Reddish, Senior Counsel, APCO, to Marlene H. Dortch, Secretary, FCC, PS Docket No. 07-114, at 2 n. 2 (filed July 7, 2020); Letter from Richard Napolitano, Commanding Officer Communications Division and Deputy Chief, New York City Police Department, to Marlene H. Dortch, Secretary, FCC, PS Docket No. 07-114, at 1 (filed July 10, 2020); NPSTC July 8, 2020 *Ex Parte* at 3-4.

¹⁴³ AT&T Mar. 20, 2020 Reply Comments at 6-7 (emphasizing that dispatchable location approaches are not mature enough for public safety use and advising the Commission to refrain from adopting a new dispatchable location requirement); CTIA Mar. 20, 2020 Reply Comments at 16 (stating that “[t]he FCC should reject proposals that would deviate from last year’s *Report and Order* implementing Kari’s Law and Section 506 of RAY BAUM’S Act to pursue technology neutral dispatchable location policy for non CMRS-providers and it should refrain from proposals that do not advance dispatchable location”); Letter from Robert G. Morse, Associate General Counsel, Federal Regulatory and Legal Affairs, Verizon, to Marlene H. Dortch, Secretary, FCC, PS Docket No. 07-114, at 1 (filed May 1, 2020) (noting that Verizon’s dispatchable location efforts reflect limited use); T-Mobile Feb. 21, 2020 Comments at 19 (stating that “[p]ut simply, there exists no system today or in the foreseeable future that could deliver on such a mandate”).

¹⁴⁴ See, e.g., Letter from Karima Holmes, Director, District of Columbia Office of Unified Communications, to Marlene H. Dortch, Secretary, FCC, PS Docket No. 07-114 (filed Oct. 24, 2019) (“A dispatchable location as defined by the FCC is what we need as emergency communications professionals to properly operate. My agency processes 1.2 million 9-1-1 calls per year, with approximately 80% originating from cell phones.”); Letter from Richard Napolitano, Commanding Officer Communications Division and Deputy Chief, New York City Police Department, to Marlene H. Dortch, Secretary, FCC, PS Docket No. 07-114, at 1 (filed Nov. 12, 2019) (“A ‘dispatchable location,’ as defined by the FCC, remains the gold standard from an operational perspective.”).

¹⁴⁵ IAFF Mar. 20, 2020 Reply Comments at 4; see also IAFF Feb. 21, 2020 Comments at 3 (expressing support for “the development of any technology that provides a useful tool for first responders in locating wireless callers to 911”).

feasible.”¹⁴⁶ APCO also advocates requiring provision of dispatchable location “when technically feasible.”¹⁴⁷

51. Dispatchable location is already being provided for some number of 911 calls, and dispatchable location solutions are likely to become increasingly available with the rollout of 5G networks and improved indoor mapping of large buildings and other structures. As these solutions are developed and deployed, we believe it is appropriate to designate dispatchable location as the preferred approach for any indoor wireless 911 call where providing dispatchable location is technically feasible and cost-effective.¹⁴⁸ This is consistent with the core goals of this proceeding and with our approach to dispatchable location for non-CMRS services pursuant to Section 506 of RAY BAUM’S Act.¹⁴⁹

52. In the *Kari’s Law/RAY BAUM’S Act Report and Order*, we adopted location accuracy rules for mobile text, multi-line telephone systems (MLTS), interconnected Voice over Internet Protocol (VoIP), Telecommunications Relay Services (TRS), mobile text, and fixed telephony, which require the provision of dispatchable location if it is technically feasible to do so (and alternative location information if it is not).¹⁵⁰ We also noted that for purposes of this requirement, dispatchable location solutions must be cost-effective.¹⁵¹ For non-fixed services, the requirements adopted in the *Kari’s*

¹⁴⁶ Verizon Feb. 21, 2020 Comments at 7.

¹⁴⁷ APCO Feb. 21, 2020 Comments at 6.

¹⁴⁸ Under our current rules, however, CMRS providers must validate any dispatchable location technology intended for indoor location accuracy through the test bed process. 47 CFR § 9.10(i)(3).

¹⁴⁹ RAY BAUM’S Act § 506(a) (directing the Commission to consider adopting rules “to ensure that the dispatchable location is conveyed with a 9-1-1 call, regardless of the technological platform used”); *Kari’s Law/RAY BAUM’S Act Report and Order*, 34 FCC Rcd at 6663, 6670-72, paras. 155 & n.426, 174, 178 (describing location information requirements if they were technically feasible and cost-effective, with different alternatives available depending on the type of service, and stating that “[i]f [the Commission] receive[s] a complaint or petition that a provider is not providing dispatchable location and the provider asserts that doing so is not technically feasible or cost-effective, the provider must show that its assertion has an objective and reasonable basis in light of the state of technology at the time the assertion is made”).

¹⁵⁰ 47 CFR § 9.10(q)(10)(v) (no later than January 6, 2022, covered text providers must provide dispatchable location information with all 911 text messages routed to a PSAP, if technically feasible; “otherwise, either end-user manual provision of location information, or enhanced location information, which may be coordinate-based, consisting of the best available location that can be obtained from any available technology or combination of technologies at reasonable cost”); *id.* § 9.11(b)(4)(ii) (requiring providers of non-fixed interconnected VoIP service to provide dispatchable location, if technically feasible); *id.* § 9.14(d)(4)(ii) (requiring providers of non-fixed Video Relay Services (VRS) and Internet Protocol (IP) Relay services to provide dispatchable location information, if technically feasible); *id.* § 9.16(b)(3)(iii) (no later than January 6, 2022, an off-premises device associated with a multi-line telephone system shall provide dispatchable location, if technically feasible; “otherwise, it shall provide dispatchable location based on end user manual update, or enhanced location information, which may be coordinate-based, consisting of the best available location that can be obtained from any available technology or combination of technologies at reasonable cost”).

¹⁵¹ *Kari’s Law and RAY BAUM’S Act Report and Order*, 34 FCC Rcd at 6663, para. 155 (noting that dispatchable location is not required unless it is feasible and cost-effective); *see also id.* at 6663, para. 155 n.426 (noting that if the Commission receives a complaint or petition alleging that a provider is not providing dispatchable location and

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Law/RAY BAUM'S Act Report and Order will take effect on January 6, 2022. We adopt the same approach and effective date here. Accordingly, as of January 6, 2022, all CMRS providers will be required to provide dispatchable location for individual 911 calls if it is technically feasible and cost-effective for them to do so.¹⁵²

53. Given this requirement, we decline to adopt minimum percentage thresholds for dispatchable location 911 calls or to require provision of dispatchable location for 911 calls originating from multi-story buildings. We agree with CMRS providers that such particularized requirements that go beyond what is technically feasible and cost-effective are not warranted given that development of dispatchable location solutions is still in early stages.

54. *Privacy and Security.* In the *Fifth Report and Order*, we adopted privacy and security requirements for z-axis location information.¹⁵³ We made explicit that CMRS providers and the location vendors upon which they rely may only use 911 location information for 911 purposes, except with prior express consent or as required by law.¹⁵⁴ We also expanded the rules requiring CMRS providers to maintain the privacy and security of data stored in the National Emergency Address Database to apply to any stored data used for 911 location purposes. We concluded that “all 911 location data should be treated consistently from a privacy and security perspective.”¹⁵⁵

55. In the *Fifth Further Notice*, as part of our proposal to allow CMRS providers to deploy non-National Emergency Address Database based dispatchable location solutions, we proposed that any dispatchable location alternative should include equivalent privacy and security safeguards to those applied to the National Emergency Address Database.¹⁵⁶ Apple and NextNav support our proposal, and no commenter opposes it.¹⁵⁷

56. We adopt our proposal to require CMRS providers to implement privacy and security safeguards to non-National Emergency Address Database dispatchable location technologies equivalent

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the provider asserts that doing so is not technically feasible or cost-effective, the provider must show that its assertion has an objective and reasonable basis in light of the state of technology at the time the assertion is made).

¹⁵² As a result of the demise of the National Emergency Address Database and the rule changes adopted in this *Sixth Report and Order*, we find good cause to update Section 9.10(i)(2)(ii). Specifically, we revise and streamline the organizational structure of the rule to clearly reflect the vertical location compliance timelines and expanded z-axis and dispatchable location deployment options. *See infra* Appx. A. As part of this restructuring of the rule, we reiterate that CMRS providers must continue to comply with the testing and live call data reporting requirements in the rules.

¹⁵³ *Fifth Report and Order*, 34 FCC Rcd at 11615-16, paras. 50-51.

¹⁵⁴ *Id.* at 11615, para. 50; 47 CFR § 9.10(i)(4)(v).

¹⁵⁵ *Fifth Report and Order*, 34 FCC Rcd at 11615-16, para. 51.

¹⁵⁶ *Fifth Further Notice*, 34 FCC Rcd at 11626, para. 82.

¹⁵⁷ Apple Feb. 21, 2020 Comments at 1; NextNav Mar. 20, 2020 Reply Comments at 24-25.

to those that applied to the National Emergency Address Database. In approving the privacy and security plan in 2017, the Commission found that the proposed plan included “sufficient provisions to safeguard the privacy, security, and resiliency of the [National Emergency Address Database] when it is launched.”¹⁵⁸ To ensure compliance, CMRS providers must certify that neither they nor any third party they rely on to obtain dispatchable location information for 911 purposes will use such information for any non-911 purpose, except with prior express consent or as required by law.¹⁵⁹

57. We decline to adopt additional restrictions proposed by Apple, which we conclude are unnecessary.¹⁶⁰ In the *Fifth Report and Order*, we declined to adopt a similar prohibition on data-sharing because we regarded it as “needlessly prescriptive, since the broader privacy protections apply to any data that is shared.”¹⁶¹ Here again, we conclude that the broad privacy protections we have adopted are sufficient to address Apple’s concerns without the need for additional highly prescriptive technical requirements. The protections we adopt require CMRS providers to safeguard the privacy and security of emergency location data throughout all elements of their systems for determining 911 location and delivering location information to PSAPs.¹⁶² Similarly, CMRS providers who work with third-party vendors are responsible for ensuring that those vendors take appropriate measures to address privacy and security concerns.¹⁶³

58. T-Mobile and CTIA raise concerns that different z-axis solutions might carry different levels of risk to consumer privacy and that consumers might disable location technology on their phones for privacy reasons.¹⁶⁴ The privacy protections we have adopted in this proceeding fully address CMRS providers’ obligation to protect consumer privacy while also enabling location-accurate E911

¹⁵⁸ *Wireless E911 Location Accuracy Requirements*, PS Docket No. 07-114, Memorandum Opinion and Order, 32 FCC Rcd 9699, 9704, para. 15 (2017) (approving privacy and security plan for the National Emergency Address Database). See NEAD, LLC, AT&T, T-Mobile USA, Sprint Corporation, and Verizon, NEAD Privacy and Security Plan, PS Docket No. 07-114 (filed Feb. 3, 2017), <https://ecfsapi.fcc.gov/file/1020387572432/170203%20NEAD%20Privacy%20and%20Security%20Plan.pdf>.

¹⁵⁹ In light of the demise of the National Emergency Address Database, we revise the privacy and security certification requirements in Section 9.10(i)(4)(iv) and (v) to remove the reference to the National Emergency Address Database and incorporate the functional requirements of the privacy and security plan into the rules going forward. See *infra* Appx. A.

¹⁶⁰ Apple Feb. 21, 2020 Comments at 2-4. NextNav argues that these additional requirements are unnecessary and unduly prescriptive. NextNav Mar. 20, 2020 Reply Comments at 24-26 (opposing Apple’s request for the adoption of “even more aggressive rules that would apparently be applicable to alternative dispatchable location technologies. On its face, Apple’s proposal would not apply to NextNav’s coordinate-based technology. Nevertheless, NextNav supports a technology neutral approach with respect to all aspects of the Commission’s wireless location accuracy rules, including with respect to data privacy and security.”) (footnote omitted).

¹⁶¹ *Fifth Report and Order*, 34 FCC Rcd at 11615, para. 50 & n.196.

¹⁶² See *infra* Appx. A; 47 CFR § 9.10(i)(4)(iv)-(v).

¹⁶³ *Id.*

¹⁶⁴ T Mobile July 9, 2020 *Ex Parte* at 9; CTIA July 9, 2020 *Ex Parte* at 3.

technologies, and apply uniformly to all z-axis solutions.¹⁶⁵ CMRS providers should fully disclose and explain these privacy protections to consumers so that consumers can make fully informed decisions where consent is required.

59. *Confidence and Uncertainty.* In the *Fifth Report and Order*, we extended the confidence and uncertainty requirements previously adopted for x/y location data to also apply to dispatchable location, z-axis data, and floor level information under Section 9.10(j) of the rules.¹⁶⁶ Thus, as with horizontal confidence and uncertainty data, CMRS providers must report vertical confidence and uncertainty data using a confidence level of 90%.¹⁶⁷ In the *Fifth Further Notice*, we sought input on how to account for uncertainty in dispatchable location data for a broad range of emerging solutions and on whether we should extend confidence and uncertainty requirements to alternative dispatchable location mechanisms, and, if so, what the required confidence and uncertainty percentage should be.¹⁶⁸

60. Commenters generally support having dispatchable location information accompanied by a confidence and uncertainty value of some kind to help PSAPs evaluate the reliability of the location data.¹⁶⁹ No commenters disagree with this approach. However, commenters also note that determining a dispatchable location confidence and uncertainty value is complex because dispatchable location, unlike geodetic location, involves the provision of a civic address rather than a measurement.¹⁷⁰ NENA notes that there are no established conventions for calculating or communicating the uncertainty associated with dispatchable location.¹⁷¹ Apple submits that location systems cannot accurately express uncertainty in terms of civic address ranges because address ranges—even when available—are not

¹⁶⁵ *Fifth Report and Order*, 34 FCC Rcd at 11615-16, paras. 50-51.

¹⁶⁶ 47 CFR § 9.10(j)(4). *Fifth Report and Order*, 34 FCC Rcd at 11612, 11630-31, paras. 40-41, Appx. A (amending the rules to extend confidence and uncertainty requirements to vertical location information equivalent to requirements applicable to horizontal location, thus ensuring that PSAPs receive consistent confidence and uncertainty data). Confidence and uncertainty data reflect the degree of certainty that a 911 caller is within a specified radius of the location provided by the CMRS provider.

¹⁶⁷ 47 CFR § 9.10(j)(1).

¹⁶⁸ *Fifth Further Notice*, 34 FCC Rcd at 11625, para. 79.

¹⁶⁹ See, e.g., NENA Feb. 21, 2020 Comments at 2-3 (agreeing that a standardized confidence level would provide important, useful information to PSAPs in interpreting the quality of dispatchable location information); NextNav Feb. 21, 2020 Comments at iv (“Finally, the resulting location data (be it an altitude, dispatchable location, or floor label) must be reported to public safety with a confidence and uncertainty threshold of 90 percent.”).

¹⁷⁰ AT&T Feb. 21, 2020 Comments at 11 (stating that “[b]ecause civic address is not a unit of measure, it is unclear how uncertainty information best can be conveyed in the dispatchable location context”).

¹⁷¹ NENA Feb. 21, 2020 Comments at 3 (“Because existing conventions for communicating a dispatchable location do not, at present, include any measure of C/U [confidence and uncertainty], NENA is concerned about negative outcomes should mobile handsets deliver only an address, or deliver only an estimated floor level without the handset’s corresponding z-axis measurement.”).

standardized, and do not convey information about actual distances or other spatial relations between addresses.¹⁷²

61. Although several commenters suggest that confidence and uncertainty values could be developed for dispatchable location,¹⁷³ the record indicates that no standard currently exists, and additional work is needed to develop a standardized approach. We therefore defer consideration of this issue to a future proceeding. We also encourage carriers, public safety organizations, and other interested parties to create standards for conveying uncertainty for dispatchable location in a manner that is more useful for first responders.¹⁷⁴

62. In the interim, we revise Section 9.10(j)(4) to make explicit that when CMRS providers provide dispatchable location or floor level information in addition to z-axis information, they must provide confidence and uncertainty data for the z-axis location. In addition, we amend Section 9.10(k), which requires that “CMRS providers must also record the confidence and uncertainty data that they provide.”¹⁷⁵ Currently Section 9.10(k) omits confidence and uncertainty requirements for vertical location provided pursuant to Section 9.10(j)(4). Accordingly, to eliminate a potential gap in the rule, we amend Section 9.10(k) to reference paragraph (j)(4) to ensure that CMRS providers supply confidence and uncertainty data for dispatchable location and floor level information upon request from a PSAP and that they retain this information for a period of two years.¹⁷⁶

C. Compliance Testing and Certification

63. Under our existing rules, all CMRS providers will be required to certify that the indoor location technology (or technologies) that they use to meet the compliance deadlines have been

¹⁷² Apple Feb. 21, 2020 Comments at 9-10.

¹⁷³ AT&T Feb. 21, 2020 Comments at 11 (stating that “[o]ne possibility is to express uncertainty values as the radius in meters”); Apple Comments at 9-10 (proposing that confidence and uncertainty data identify a “dispatchable search area”).

¹⁷⁴ See, e.g., Apple Feb. 21, 2020 Comments at 10-11 (recommending “that the Commission work with relevant stakeholders to establish a non-quantized uncertainty standard. Doing so will provide first responders with a more understandable and operationally useful picture of the area a responder may need to search once he or she arrives at the caller’s estimated location.”); IAFC *et al.* July 9, 2020 *Ex Parte* at 1-2 (stating that a “standardized approach for DL confidence and uncertainty levels is essential,” that “it is critical that standards for DL confidence and uncertainty levels do not confuse or weaken the definition of dispatchable location,” and that “public safety can be an informed participant in the DL standards-development process,” and requesting “the FCC’s assistance in participating in a standards-development process for dispatchable location confidence and uncertainty” and that dispatchable location “test results are issued publicly before the solutions can be used to comply with FCC rules”).

¹⁷⁵ 47 CFR § 9.10(k).

¹⁷⁶ See *infra* Appx. A.

deployed consistently with the manner in which they have been tested in the test bed.¹⁷⁷ APCO contends that this certification requirement is “unclear” and insufficient to ensure that z-axis technologies will deliver the same degree of accuracy in the live 911 environment that they deliver in the test bed.¹⁷⁸ APCO argues that CMRS providers should be required to certify that their testing has accounted for multiple factors that could affect performance during live 911 calls, such as handset capabilities,¹⁷⁹ handset behavior,¹⁸⁰ morphology, and weather conditions.¹⁸¹

64. We believe the current testing and certification process is sufficient to ensure that z-axis technologies will deliver the same level of accuracy for live 911 calls that they deliver in the test bed. For each of the upcoming z-axis deployment deadlines, beginning with April 2021, the rules require CMRS providers to “certify that the indoor location technology (or technologies) used in their networks are deployed consistently with the manner in which they have been tested in the test bed.”¹⁸² The rules further require this certification to be based on representative and robust compliance testing of each technology’s performance in a variety of real world environments and conditions.¹⁸³ Specifically, compliance testing must: (1) include testing in representative indoor environments, including dense urban, urban, suburban, and rural morphologies; (2) test for location accuracy (ground truth), latency, and reliability (yield); and (3) evaluate each test call as independent from prior calls and as based on the first location delivered after the call is initiated.¹⁸⁴

¹⁷⁷ *Fifth Report and Order*, 34 FCC Rcd at 11612-13, para. 43 & n.172 (citing 47 CFR § 9.10(i)(2)(iii), (i)(2)(iii)(C) and stating that non-nationwide providers will have an additional year to make each certification).

¹⁷⁸ APCO Feb. 7, 2020 Petition at 2-8.

¹⁷⁹ APCO Feb. 7, 2020 Petition at 3-5.

¹⁸⁰ APCO Feb. 7, 2020 Petition at 5 (recommending that we “must clarify that when carriers certify that they have deployed technology consistent with the manner in which it was tested, they are taking into account consistency in any handset constraints that could impact location accuracy. The test bed can evaluate technologies in different stages of development (e.g. production-ready, proof-of-concept, in-use). The Commission must clarify that carriers may only use test bed results for compliance purposes if the testing was of a fully integrated solution that will perform in the real world the same way it did in the test bed.”).

¹⁸¹ APCO Feb. 7, 2020 Petition at 6 (stating that “[w]hile the Commission determined that insufficient cold weather testing was not an adequate reason to delay adoption of a z-axis metric, it should clarify that such testing remains necessary to ensure real-world performance will be consistent with test bed performance”) (footnote omitted).

¹⁸² 47 CFR § 9.10(i)(2)(iii)(A).

¹⁸³ See *Fourth Report and Order*, 30 FCC Rcd at 1307-08, paras. 126-130 & n.325; 47 CFR § 9.10(i)(3), (i)(2)(iii).

¹⁸⁴ See *Fourth Report and Order*, 30 FCC Rcd at 1307-08, paras. 127-29 & n.325; 47 CFR § 9.10(i)(3)(i). APCO expresses concern that CMRS providers could deploy z-axis technology “that only complies with the z-axis metric for a single device or cherry-picked subset of devices.” APCO July 7, 2020 *Ex Parte* at 5. We do not agree. Testing a single device or a small subset of devices that are not representative of the z-axis capable devices used on the CMRS provider’s network would be inconsistent with the requirement that CMRS providers deploy location technology consistently with the manner in which it has been tested. Moreover, if live call data or other objective evidence indicates that a CMRS provider is delivering inaccurate z-axis information for live 911 calls, PSAPs have recourse under Section 9.10(i)(2)(iv) to seek enforcement, so long as the PSAP has implemented policies that are
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65. Because the current testing and certification requirements take a wide variety of real-world conditions into account, we decline to require CMRS providers to test for or certify to additional factors such as those proposed by APCO. We recognize that the performance of location technology during individual 911 calls may be affected by specific characteristics of the handset being used or the local environment when and where the call is made. However, incorporating all of these additional variables into our testing and certification requirements would be neither practical nor cost-effective.

66. Although we decline to modify our testing and certification requirements for the upcoming vertical location deployment deadlines, we encourage CMRS providers to conduct additional periodic testing of z-axis technologies once they have been deployed.¹⁸⁵ In addition, we note that our rules, testing and certification create only a presumption of compliance with location accuracy requirements standards, and this presumption “can be rebutted with live call data or other objective measurements showing lack of compliance.”¹⁸⁶

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designed to obtain all location information made available by the provider when initiating and delivering 911 calls to the PSAP.

¹⁸⁵ *Fourth Report and Order*, 30 FCC Rcd at 1332, para. 196 (finding that CMRS providers “conducting periodic testing continues to be appropriate to ensure compliance with outdoor location accuracy parameters”); *Fourth Report and Order*, 30 FCC Rcd at 1332-33, para. 197 (“While we do not codify any particular approach, we find that the ongoing maintenance testing framework set forth in the CSRIC III WG3 and CSRIC IV WG1 recommendations provides a reasonable and adequate basis for ensuring continued compliance with our E911 location accuracy requirements. We urge CMRS providers to undertake periodic testing to ensure continued compliance accordingly.”); *Amending the Definition of Interconnected VoIP Service in Section 9.3 of the Commission’s Rules; Wireless E911 Location Accuracy Requirements; E911 Requirements for IP-Enabled Service Providers*, GN Docket No. 11-117, PS Docket No. 07-114, and WC Docket No. 05-196, Notice of Proposed Rulemaking, Third Report and Order, and Second Further Notice of Proposed Rulemaking, 26 FCC Rcd 10074, 10088, para. 34 (2011) (*Third Report and Order*) (stating that “requiring CMRS providers to periodically test their outdoor location accuracy . . . is important to ensure that . . . location accuracy requirements are being met” and that “[t]he lack of available data has also made it difficult to assess the effects of emerging technologies on location accuracy results”).

¹⁸⁶ *Fourth Report and Order*, 30 FCC Rcd at 1313, para. 147; see 47 CFR § 9.10(i)(3), (i)(2)(iii). APCO asks the Commission to clarify when may PSAPs seek enforcement of the rules and what steps device manufacturers, operating system providers, and others must take to ensure z-axis technologies perform as expected. APCO Feb. 7, 2020 Petition at 8-9. In addition, APCO asks whether device manufacturers and operating system providers will be subject to enforcement action if they refuse to permit z-axis technologies from engaging in battery-intensive processes that interfere with a consumer’s user experience “or for any other reason?” APCO Feb. 7, 2020 Petition at 9. We will address any enforcement issues on a case-by-case basis as they arise, and we find that it would be premature to provide guidance on possible enforcement actions under hypothetical facts at this time. Finally, the rules address when PSAPs can seek enforcement of the location accuracy rules. 47 CFR § 9.10(i)(2)(iv) (“PSAPs may seek Commission enforcement within their geographic service area of the requirements of paragraphs (i)(2)(i) and (ii) of this section, but only so long as they have implemented policies that are designed to obtain all location information made available by CMRS providers when initiating and delivering 911 calls to the PSAP.”).

D. Continuing to Improve the Z-Axis Metric

67. In the *Fifth Further Notice*, we sought comment on possible measures to improve the quality and usefulness of vertical location information over time. Specifically, we sought comment on whether and over what time period it would be technologically feasible to achieve a 2-meter metric,¹⁸⁷ whether to enhance the vertical location accuracy testing process,¹⁸⁸ and the long-term feasibility of providing floor level information to PSAPs, either by converting Height Above Ellipsoid data to a precise floor level or determining floor level independently of Height Above Ellipsoid.¹⁸⁹ Commenters responding to these issues generally agree on the importance of continuing to seek improvements in the quality and usefulness of vertical location information, but there is considerable disagreement on when and how such improvements should be implemented.

68. Some commenters support adopting a sub-3-meter metric, based primarily on NextNav’s Stage Z test results and previous field trials.¹⁹⁰ However, others contend that the current state of technology does not support tightening the metric.¹⁹¹ iCERT states that “establishment of a more stringent requirement, without the benefit of technical data to support it, would be arbitrary both in terms of the level of accuracy achievable and the timeframe in which it could be achieved.”¹⁹² In addition, in terms of prioritizing resources, CTIA argues that CMRS providers and their vendors should be allowed to focus on implementing the 3-meter metric in the near term before a stricter metric is considered.¹⁹³

69. The record reflects similar disagreement over whether to enhance the testing process. Some commenters call for expanding testing by CMRS providers to include specific scenarios that may be faced by first responders, such as locating 911 callers in buildings when the power is out.¹⁹⁴

¹⁸⁷ *Fifth Further Notice*, 34 FCC Rcd at 11620, para. 63.

¹⁸⁸ *Id.* at 11620, para. 65.

¹⁸⁹ *Id.* at 11621-22, paras. 66-69.

¹⁹⁰ See, e.g., BRETSA May 17, 2019 Comments at 4; IAFF Feb. 21, 2020 Comments at 1-2; IAFC Feb. 21, 2020 Comments at 2-3; NENA Mar. 20, 2020 Reply Comments at 2; NPSTC Mar. 20, 2020 Reply Comments at 4-5; NPSTC July 8, 2020 *Ex Parte* at 3.

¹⁹¹ AT&T Feb. 21, 2020 Comments at 4; T-Mobile Feb. 21, 2020 Comments at 4-5; Verizon Feb. 21, 2020 Comments at 6.

¹⁹² iCERT Feb. 21, 2020 Comments at 3.

¹⁹³ CTIA Mar. 20, 2020 Reply Comments at 11-12.

¹⁹⁴ IAFF Mar. 20, 2020 Reply Comments at 4-5 (arguing that “solutions that fail to operate during power outages are largely useless to fire fighters because building utilities are often secured or lost during a major emergency”); APCO Feb. 21, 2020 Comments at 2 (“APCO supports requiring more granular and actionable information, comprehensive testing that reflects performance in emergency response scenarios, and a framework that ensures every 9-1-1 call will be delivered with the location information needed to find the caller.”); BRETSA Feb. 21, 2020 Comments at 2 (“Knowledge of the accuracy of BPS elevation will allow First Responders to develop search

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However, CTIA submits that simulating a power outage or similar emergency scenario in the test bed poses significant practical and cost challenges because the test bed relies on testing in buildings that are occupied and in use.¹⁹⁵ CTIA argues that testing of various first responder scenarios would be better addressed by the public safety community.¹⁹⁶ NENA agrees that there are significant challenges associated with testing of first responder scenarios and suggests that stakeholders work with ATIS to develop standards for the test bed.¹⁹⁷

70. Commenters also disagree about the feasibility, costs, and timeframes associated with converting Height Above Ellipsoid to floor level.¹⁹⁸ ATIS ESIF states that there are “significant”

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strategies while limiting the search area, when a caller must be found. The Commission should thus require wireless providers conduct proof-of-performance testing in each of the top 50 markets to benchmark the BPS elevation accuracy which can be expected in that market.”) (footnote omitted). APCO and BRETSA make similar arguments in their clarification and reconsideration petitions. APCO contends that additional testing or retesting may be needed in order for carriers to certify that their location technology deployments accurately reflect what was demonstrated in a test bed. APCO Feb. 7, 2020 Petition at 2-8. BRETSA calls for nationwide CMRS providers to conduct proof-of-performance testing in each of the top 50 CMAs, and to assist PSAPs in conducting verification tests of location accuracy performance, such as in correlating elevation data to building floor numbers. BRETSA Dec. 26, 2019 Petition at 2, 7.

¹⁹⁵ CTIA Feb. 21, 2020 Comments at 10 (stating that “the Test Bed is not equipped for testing in buildings under power-outage conditions”).

¹⁹⁶ CTIA Feb. 21, 2020 Comments at 11 (stating that “[t]he FCC should refrain from expanding the role of the Test Bed in this way, but encourage the public safety community to further explore how these important first responder scenarios impact wireless 9-1-1 calls”).

¹⁹⁷ NENA Feb. 21, 2020 Comments at 9-10.

¹⁹⁸ APCO Feb. 21, 2020 Comments at 3 (stating that “ECCs should not bear responsibility for translating [Height Above Ellipsoid] data into more useful information”); Motorola Mar. 21, 2020 Reply Comments at 2 (stressing that CMRS providers, not PSAPs, should be responsible for converting Height Above Ellipsoid to coordinates, as PSAPs doing so would represent an “unreasonable and unnecessary” burden on public safety); Texas 9-1-1 Entities Feb. 21, 2020 Comments at 4; NASNA Feb. 21, 2020 Comments at 3-4 (“To the [NASNA] members’ collective knowledge, there appear[] to be only limited available integrated products or tools at this time or scheduled for release before April 2021 that would effectively turn z-coordinate and z-uncertainty into something useful and helpful to the PSAPs. But whether this status will change within one year before April 2021, or whether it will not change for [the] next five years appears uncertain.”); NENA Mar. 20, 2020 Reply Comments at 3 (claiming that the “future of public safety-grade 3D mapping” is so close that the Commission could “reasonably require CMRS providers to sponsor large-scale, ‘entry-level’ Above Ground Level . . . conversion solutions for public safety”); AT&T Feb. 21, 2020 Comments at 4 (commenting that there are “no existing methods to translate” Height Above Ellipsoid “directly to a floor level”); T-Mobile Feb. 21, 2020 Comments at 8-11 (commenting that carriers should only be responsible for providing Height Above Ellipsoid, and that “affordable technology already exists to convert [Height Above Ellipsoid] to height above ground level,” but at the PSAP level); Google Feb. 21, 2020 Comments at 4 (arguing that “[t]he solution, of course, is to transmit an accurate floor label directly to the PSAP.

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challenges with converting altitude to floor level.¹⁹⁹ CTIA, NextNav, and Polaris express skepticism that Height Above Ellipsoid can be converted to floor level in the near future.²⁰⁰ ESRI proposes development of a national 3D basemap, which it contends could support a standardized, cost-effective conversion of Height Above Ellipsoid to floor level.²⁰¹ However, such a basemap does not currently exist, and it is uncertain how quickly one could be developed or how much it would cost.

71. Given the continuing lack of consensus in the record, we believe it is premature at this time to adopt new requirements or deadlines with respect to tightening the 3-meter metric, expanded testing, or floor level identification. We also agree with CTIA that at least between now and the April 2021 deadline for initial implementation of the 3-meter standard, CMRS providers and their vendors should be allowed to focus their efforts on that implementation.²⁰² Nonetheless, we encourage and

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But the *2019 Order/FNPRM* likely will slow the development of technologies to do this. . . . Google, for instance, has significantly shifted resources away from work on floor labels in the wake of the *2019 Order/FNPRM*, likely lengthening our time horizon for introducing new floor label technologies.”); NPSTC July 8, 2020 *Ex Parte* at 3 (urging the Commission to “take further steps to require the wireless industry to identify and implement location technologies that reliably provide the floor label”).

¹⁹⁹ ATIS Feb. 21, 2020 Comments at 3 (“In the *Fifth FNPRM*, the Commission acknowledges the challenges associated with converting z-axis information to a floor level, some of which were described [] in ATIS ESIF’s comments to the *Fourth FNPRM*.”) (footnote omitted). APCO requests clarification that under the existing rules, floor level information can be derived by means other than first obtaining an estimated Height Above Ellipsoid and then converting the Height Above Ellipsoid to a floor level. APCO Feb. 7, 2020 Petition at 9-10; APCO July 7, 2020 *Ex Parte* at 5-6. We clarify that in complying with the requirement that floor level information be provided when available, CMRS providers are not limited to translating floor level from Height Above Ellipsoid but may derive floor level information from any source, including carrier-provisioned WiFi and in-home products, new 5G technologies, or other sources.

²⁰⁰ CTIA Feb. 21, 2020 Comments at 8 (stating that “[t]he record contains no evidence that there is a canonical database of buildings that wireless providers can use to consistently convert such information to accurately produce floor level information”); NextNav Feb. 21, 2020 Comments at 22-23 (“NextNav has been experimenting with various indoor mapping approaches to convert altitude data into floor level information. Although such mapping approaches could potentially work, the number of tall buildings that have been accurately mapped internally is vastly insufficient to present a solution that could be counted upon in the near term for public safety.”); Polaris Feb. 21, 2020 Comments at 3 (stating that Polaris has “developed a method to convert z-axis measurements to floor level that is currently in initial field trials. While not imparting specific building knowledge (e.g., starting floor number, no floor 13), this capability could serve as useful on its own or as an interim step by providing coarse yet beneficial contextual information to help narrow a first responder’s search within a high rise building.”).

²⁰¹ ESRI Mar. 20, 2020 Reply Comments at 1-5.

²⁰² NASNA states that the 911 system should be allowed to “catch its breath” during the next six months while states and PSAPs continue to implement Next Generation 911 and technology upgrades that will be needed to best utilize z-axis information. Letter from Harriett Rennie Brown, Executive Director, NASNA, to Marlene H. Dortch, Secretary, FCC, PS Docket No. 07-114, at 1 (filed June 25, 2020). We believe that focusing on implementation of near-term requirements while deferring consideration of further rule changes will provide this opportunity. We also note that while CMRS providers are subject to requirements and deadlines for developing and deploying z-axis technology, there is no required timeframe for states or PSAPs to implement Next Generation 911 or other technology upgrades.

expect industry to continue to work with public safety on developing standards and solutions for improving indoor location. IAFC, IAFF, IACP, NSA, and NASEMSO ask the Commission to biannually evaluate the state of vertical location technology and consider narrowing the metric when it is technically feasible to do so.²⁰³ We direct the Public Safety and Homeland Security Bureau to evaluate the state of vertical location technology in July 2022 and to report to the Commission the results of that evaluation.²⁰⁴ We also direct the Public Safety and Homeland Security Bureau to consider whether to refer these technical issues to an appropriate federal advisory committee, such as CSRIC, and the appropriate timetables for an advisory committee to submit recommendations.²⁰⁵

E. Summary of Costs and Benefits

72. We believe our previous cost benefit assessment remains valid although we find that, with increased flexibility on options to supply vertical location and the amount of time between now and when these benchmarks must be met, some carriers might be able to meet the requirements at a lower cost than if we did not adopt the revisions herein. As we affirmed in the *Fourth Further Notice*, the new vertical information—together with the refinement of existing horizontal information—has the potential of saving “approximately 10,120 lives annually at a value of \$9.1 million per statistical life, for an annual benefit of approximately \$92 billion or \$291 per wireless subscriber.”²⁰⁶ Due to U.S. Department of Transportation updates for value of a statistical life, we presently estimate this annual benefit floor at \$97 billion.²⁰⁷ In the *Fifth Report and Order*, we observed that adding vertical location information plays a major role in achieving the \$97 billion benefit.²⁰⁸ We also stressed the unquantifiable benefits of reductions in human suffering and property loss.²⁰⁹ In the *Fifth Further Notice*, we sought comment on costs and benefits associated with top 50 CMAs and a possible nationwide deployment of z-axis technology, which would effectively result in a nationwide x, y and z location accuracy standard.²¹⁰ We also sought comment on our proposal to broaden the focus of our

²⁰³ IAFC *et al.* July 9, 2020 *Ex Parte* at 2.

²⁰⁴ The Bureau should also recommend whether further evaluation would likely be helpful in 2024.

²⁰⁵ See, e.g., NextNav Feb. 21, 2020 Comments at 22 (advising that we task CSRIC “with investigating the options to convert altitude data into floor level identification”); Texas 9-1-1 Entities Feb. 21, 2020 Comments Attach. at 8 (listing “high-level initial starting point of potentially reasonable and feasible next steps for public safety entity preliminary consideration, discussion, and brainstorming” regarding conversion of z-coordinate and z-uncertainty information).

²⁰⁶ *Fourth Further Notice*, 34 FCC Rcd at 1662-63, para. 30 & n.77.

²⁰⁷ *Fifth Report and Order*, 34 FCC Rcd at 11618-19, paras. 57 & n.219, 60.

²⁰⁸ *Id.* In the *Fifth Report and Order*, we determined that the benefit floor would be \$97 billion which is a nationwide figure. Here, we determine that the benefit floor estimate is unaffected by the flexible options adopted in this Order.

²⁰⁹ *Id.* at 11619, para. 60.

²¹⁰ *Fifth Further Notice*, 34 FCC Rcd at 11624-25, para. 78.

dispatchable location requirements to encourage emerging technologies that do not rely on the National Emergency Address Database.²¹¹ We received no explicit input on the costs or benefits associated with our proposals in the *Fifth Further Notice*. Because we are not changing the April 3, 2021, and April 3, 2023, deployment benchmarks established in the *Fourth Report and Order* and reaffirmed in the *Fifth Report and Order*, we do not anticipate any changes in our previous cost/benefit analysis with respect to those benchmarks.²¹² We did, however, receive comment on the need for increasing flexible options for z-axis and dispatchable location technologies, and mandating vertical location information and the feasibility of doing so nationwide.

73. *Flexible Options.* We adopt our proposal to provide CMRS providers additional flexibility by allowing CMRS providers the option of deploying z-axis technology to cover 80% of the buildings that exceed three stories in a given CMA or leveraging handset-based solutions. The added flexibility associated with these options will reduce costs on CMRS providers without reducing the benefits of improved vertical location accuracy. Comments reflect a correlation between population density and concentration of buildings taller than three stories and that providing the flexibility to cover 80% of tall buildings in the top 50 CMAs would achieve significant public benefits.²¹³ We anticipate that network-based deployment would at least initially start from areas that have the highest concentration of buildings taller than three stories.²¹⁴ NextNav indicates that it will deploy its solution in 105 CMAs.²¹⁵ Most, if not all the infrastructure needed for z-axis deployment will be used for deploying the multi-story option. Some of the costs will involve the deployment of infrastructure,²¹⁶ and additional weather

²¹¹ *Id.* at 11625, para. 79.

²¹² See *Fifth Report and Order*, 34 FCC Rcd at 11616-19, paras. 53-60.

²¹³ See, e.g., NextNav Feb. 21, 2020 Comments at 10-11 (noting that the placement of tall buildings remains relatively centralized in an identifiable number of geographic locations in each CMA and that this permits coverage that greatly exceeds 80% of tall buildings in each CMA without the construction of a “sprawling vertical location network primarily covering single-family homes”).

²¹⁴ See, e.g., NextNav Feb. 21, 2020 Comments at 16-17 (describing the advantages of “Managed Infrastructure Solutions” that can be constructed to address the critical vertical location needs in cities, office parks, theme parks, college campuses, and industrial centers where tall structures are prevalent, but noting “negligible benefit” of vertical location information in single family homes and low-rise strip malls); Polaris Feb. 21, 2020 Comments at 4 (“Providing 3m accuracy to large geographic areas without multistory buildings simply to satisfy a population requirement unnecessarily adds cost without providing value. On a similar basis, deploying barometric-based z-axis technology beyond the Top 50 CMAs is functionally possible, yet any accuracy metric should be focused on higher value concentrations of multistory buildings.”).

²¹⁵ Letter from Bruce Cox, Senior Director Regulatory & Public Safety, NextNav, LLC, to Marlene H. Dortch, Secretary, FCC, PS Docket No. 07-114, at 1 (filed May 8, 2020).

²¹⁶ See, e.g., Press Release, NextNav, NextNav Raises \$120 Million in Latest Round of Funding to Launch Phased 3D Geolocation Services Across U.S. (Jan. 15, 2020), <https://www.nextnav.com/news/nextnav-raises-120-million-latest-round-funding-launch-phased-3d-geolocation-services-across-us> (“NextNav is using this round of capital to

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stations, used to calibrate handset barometric sensors,²¹⁷ and may involve incurring the cost of 3D mapping to determine multi-story building locations. Thus, this option will enable CMRS providers to focus resources in those areas where 911 calls from multi-story buildings are most likely to occur and improved vertical location accuracy will benefit wireless 911 callers in indoor environments. Second, affording nationwide CMRS providers the option of meeting vertical location accuracy requirements by deploying handset-based solutions implies that z-axis technology would be available to 80% of the population of a CMA and thus meet our deployment metrics. This option would not reduce the benefits of improved vertical location accuracy so long as handset-solutions meet the 3-meter accuracy standard for 80% of calls made from z-axis capable devices as demonstrated in the test bed. In addition, proponents of a nationwide handset deployment stress that device-based, commercial solutions can calculate z-axis location on the device without the deployment or maintenance of new infrastructure.

74. *Nationwide Z-Axis Technology Deployment.* Mandating a nationwide z-axis deployment will benefit Americans outside of the top 50 CMAs without significantly increasing costs for CMRS providers. The *Fifth Report and Order* estimated an approximate annual cost ceiling of \$36 million, based on a \$0.12 yearly cost per handset, at 300 million handsets presently in use.²¹⁸ These 2019 figures are nationwide figures, not extrapolated for the top 25 or 50 CMAs, and thus also stand for the nationwide handset deployment requirement in 2025. We also defined z-axis capability in the *Fifth Report and Order* to exclude handsets that require a hardware upgrade. Because the 2025 nationwide z-axis deployment is six years from that 2019 analysis, we can reasonably infer that software update costs will be lower by that April 2025 benchmark, albeit at an unquantifiable amount. Most of the upgradable handsets are located in the top 50 CMAs, and will thus have been updated at that time (in 2023), and providers will have refined the necessary software at scale. Hence, we can reasonably infer that costs to update handset software will be the same for subscribers both inside and outside the top 25 and 50 CMAs. Further, because CMRS providers seek to leverage commercial, device-based location solutions for meeting their E911 vertical location accuracy obligations, we expect the costs associated with a nationwide handset deployment to be minimal. For example, Google states that it “makes [Emergency Location Service] available for *free* to emergency services dispatchers, carriers, and other partners in the emergency services space.”²¹⁹ Accordingly, we do not anticipate any changes in our cost/benefit analysis for nationwide CMRS providers opting for handset-based deployment.

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deploy its geolocation platform known as Metropolitan Beacon System (‘MBS’) in a phased manner starting with its precise ‘altitude determination’ capability (‘Z service’) enabling ‘floor level’ determination in major urban markets across the U.S.”).

²¹⁷ See, e.g., Polaris Apr. 9, 2020 *Ex Parte* at 2 (noting “[i]mplementation also requires deployment of weather stations,” and investment/contracting is needed to deploy additional weather stations); Google Feb. 21, 2020 Comments at 6 (“any barometric sensor-based location technology would presumably vary with the concentration of weather stations available for calibration” (quoting APCO Feb. 7, 2019 Petition at 6)).

²¹⁸ *Fifth Report and Order*, 34 FCC Rcd at 11619, para. 60 & n.232.

²¹⁹ Google May 20, 2019 Comments at 3.

75. Assuming the figures above, we can infer that costs will be lower for non-nationwide providers. The brunt of implementation and deployment costs will be borne by the nationwide CMRS providers. CTIA notes that non-nationwide providers “will likely follow the nationwide wireless providers’ assessment of a scalable solution resulting from the Test Bed.”²²⁰ As CCA puts it, “[m]any non-nationwide carriers are . . . at the mercy of what is discovered in the test bed.”²²¹ CCA states that “upgrading equipment to meet heightened standards is a costly endeavor,”²²² and that “[u]nlike nationwide carriers, many CCA members are dependent on vendors to update network capabilities that support location accuracy services.”²²³ In terms of handset-based deployment, however, we anticipate most of the upgrades will have been developed by the nationwide CMRS providers, although some independent interoperability testing and handset procurement may be necessary “depending on the nature of the solution.”²²⁴ For the multi-story deployment option, as IAFF notes, tall structures are present in environments inside and outside the top CMAs.²²⁵ However, tall structures are presumably not as prevalent in environments outside the top population centers. As a result, this may help defray some, if not all, 3D mapping costs, as we believe non-nationwide CMRS providers are most likely to know where tall structures are located inside their service areas without the need for mapping. Accordingly, we can reasonably infer that the implementation costs in areas outside the top 50 CMAs are not as high as inside those areas. In addition, non-nationwide CMRS providers outside the top 50 CMAs have approximately six years as of the adoption of this *Sixth Report and Order* to prepare for deployment, which will mean the costs of deploying either the handset or multi-story based options will likely be less. We stress that the \$97 billion nationwide benefit floor in lives saved will far eclipse any cost incurred by non-nationwide providers.

IV. ORDER ON RECONSIDERATION

76. In the *Fifth Report and Order*, we declined to require live call proof-of-performance testing in each CMA as BRETSA suggested in comments.²²⁶ We also established Height Above Ellipsoid rather than Height Above Mean Sea Level as the baseline measurement for z-axis location information, and we did not require CMRS providers to convert Height Above Ellipsoid to floor level.²²⁷ BRETSA seeks reconsideration of these aspects of the *Fifth Report and Order*, contending that the order (1) was

²²⁰ CTIA Feb. 21, 2020 Comments at 6.

²²¹ CCA Feb. 21, 2020 Comments at 2.

²²² *Id.* at 3.

²²³ *Id.*

²²⁴ CTIA Feb. 21, 2020 Comments at 6; *see also* CCA Feb. 21, 2020 Comments at 2 (noting interoperability testing process).

²²⁵ IAFF Feb. 21, 2020 Comments at 3.

²²⁶ *Fifth Report and Order*, 34 FCC Rcd at 11613, para. 45.

²²⁷ *Fifth Report and Order*, 34 FCC Rcd at 11610-11, paras. 37-38.

arbitrary and capricious and an abuse of discretion because the Commission declined to adopt proof-of-performance testing and (2) did not address BRETSA's proposal that wireless carriers develop procedures for public safety agencies and others to correlate Height Above Mean Sea Level to floor level.²²⁸ We deny BRETSA's Petition.

77. *Proof of Performance.* In the *Fifth Report and Order*, we addressed BRETSA's proposal to adopt proof-of-performance testing at "limited" locations in each of the top 50 CMAs in which CMRS providers will be required to provide z-axis location data. We concluded that BRETSA's proposal would be impractical, burdensome, and contrary to the purpose of a representative test bed program.²²⁹ Section 9.10(i)(3) of the rules requires that CMRS providers "validate technologies intended for indoor location, including dispatchable location technologies and technologies that deliver horizontal and/or vertical coordinates, through an independently administered and transparent test bed process, in order for such technologies to be presumed to comply with the location accuracy requirements."²³⁰ BRETSA asserts that "[t]he test bed concept assumes that results achieved in the Test Bed will be realized in any other market in which the Z-axis location technology is installed and configured in the same way it was installed in the Test Bed."²³¹ BRETSA asserts "[t]his assumption must be validated."²³² BRETSA further submits that "[i]t is inappropriate for the Commission to reject a new proposal as inconsistent with a prior Commission decision, when the accuracy of the assumptions underlying the prior decision have been drawn into question by the very parties implementing that decision."²³³ CTIA and T-Mobile argue that BRETSA misconstrues the record.²³⁴

²²⁸ BRETSA Dec. 26, 2019 Petition at 1-4 (seeking reconsideration of our decision declining to adopt proof-of-performance testing at limited locations in the 50 markets in which carriers will be required to provide z-axis location data and asserting that we failed to address BRETSA's comment that "the Commission should require wireless providers to publish procedures for First Responders to conduct tests of vertical location accuracy, and provide any required assistance in such tests").

²²⁹ *Fifth Report and Order*, 34 FCC Rcd at 11613, para. 45.

²³⁰ 47 CFR § 9.10(i)(3)(i).

²³¹ BRETSA Apr. 6, 2020 Reply to Opposition at 7.

²³² *Id.*

²³³ BRETSA Dec. 26, 2019 Petition at 2. BRETSA quotes the statement of CTIA in the August 3, 2018 cover letter submitting the Stage Z Test Report that "[c]omprehensive testing of Z-axis solutions in all regions and morphologies is necessary to confirm performance in live 9-1-1 calling environments." BRETSA Dec. 26, 2019 Petition at 4; BRETSA Apr. 6, 2020 Reply to Opposition at 7; Letter from Scott K. Bergmann, Senior Vice President Regulatory Affairs, CTIA, *et al.*, to Marlene H. Dortch, Secretary, FCC, PS Docket No. 07-114, at 2 (filed Aug. 3, 2018). BRETSA explains that it quotes "CTIA's statement only for the proposition stated: that additional testing is required. The CTIA statement supports BRETSA's position that Proof testing should be conducted to demonstrate actual Z-axis data accuracy achieved and any bias in results in each of the top 50 markets in which the technology is required to be deployed, to inform First Responder search strategies to expedite location of callers in their jurisdictions." BRETSA Apr. 6, 2020 Reply to Opposition at 7.

²³⁴ CTIA Mar. 25, 2020 Opposition at 4 (arguing that "BRETSA misconstrues wireless provider statements that further testing of certain vertical location solutions is necessary in additional morphologies and in a production

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78. The additional testing proposed by BRETSA is unnecessary. Fundamentally, BRETSA misconstrues the record, the purpose of the test bed, and our compliance testing framework more generally. In the *Fourth Further Notice* and *Fifth Report and Order*, we focused on whether to establish a z-axis metric based on the Stage Z testing conducted in the industry test bed in 2018, rather than delaying a decision on the metric in favor of additional testing.²³⁵ In comments responding to the *Fourth Further Notice*, BRETSA proposed adopting proof-of-performance testing rather than relying on the test bed process to evaluate compliance.²³⁶ In declining BRETSA's proposal, we observed that when the Commission established the requirements for the test bed, it found the test bed program to be "the most practical and cost-effective method for testing compliance with indoor location accuracy requirements."²³⁷ We explained that "the purpose of the test bed program is to provide a reliable mechanism for validating the performance of indoor location technologies without the need for the provider to conduct indoor testing in all locations where the technology is actually deployed, which would be impractical and highly burdensome."²³⁸ The rules also provide that "[a] CMRS provider must

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environment as calling into question the FCC's decision to rely on the Test Bed"); T-Mobile Mar. 25, 2020 Opposition at 4-5 n.16 (arguing that "CTIA was *not* suggesting that testing beyond the test bed would be appropriate, but that complete testing pursuant to the test bed methodology would be necessary to confirm the technical feasibility of proposed z-axis solutions").

²³⁵ The rules required nationwide CMRS providers to propose a z-axis metric supported by a test report by August 3, 2018. 47 CFR § 9.10(i)(2)(ii)(B) ("Nationwide CMRS providers shall develop one or more z-axis accuracy metrics validated by an independently administered and transparent test bed process as described in paragraph (i)(3)(i) of this section, and shall submit the proposed metric or metrics, supported by a report of the results of such development and testing, to the Commission for approval."). The nationwide CMRS providers proposed a 5-meter z-axis standard for 80% of fixes of devices with barometers based on the Stage Z Report. In noting that additional testing would "confirm performance," however, the CMRS providers were not seeking to impose additional testing requirements for proof of compliance. Rather, they were noting that additional testing could validate emerging z-axis technologies. In the *Fourth Further Notice*, we proposed to adopt a 3-meter z-axis metric instead of deferring the matter for further testing to validate the z-axis metric as CMRS providers suggested. *Fourth Further Notice*, 34 FCC Rcd at 1658, para. 20.

²³⁶ In comments, BRETSA proposed that "[t]o determine whether wireless providers are meeting the vertical location accuracy standard, and provide First Responders data requiring the actual accuracy obtainable, the Commission should require wireless providers conduct proofs-of-performance in a specified (limited) number, location and types of structures in each market in which they are required to provide vertical location data." BRETSA May 17, 2019 Comments at 5. BRETSA proposed that "[r]ather than relying solely upon test-bed performance and certification that a technology has been installed in a market consistent with test-bed installation[,] wireless providers should be required to complete prescribed proof-of-performance testing to determine and demonstrate the accuracy of vertical locations actually achieved." BRETSA June 18, 2019 Reply Comments at 2.

²³⁷ *Fifth Report and Order*, 34 FCC Rcd at 11613, para. 45 (quoting *Fourth Report and Order*, 30 FCC Rcd at 1305, para. 121).

²³⁸ *Fifth Report and Order*, 34 FCC Rcd at 11613, para. 45. In the *Third Further Notice*, the Commission proposed that "CMRS providers would demonstrate compliance with indoor location accuracy requirements through participation in an independently administered test bed program modeled on the indoor test bed administered by the Communications Security, Reliability, and Interoperability Council (CSRIC), but providers would have the option

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update certification whenever it introduces a new technology into its network or otherwise modifies its network, such that previous performance in the test bed would no longer be consistent with the technology's modified deployment."²³⁹

79. We also conclude that proof-of-performance testing is unnecessary because the test bed program and associated compliance certification requirements only create the presumption that a technology complies with our location accuracy rules. If a PSAP believes that a carrier's accuracy performance fails to meet the requisite standard in a particular market, it can rebut that presumption with live call data, locally generated test data, or other objective evidence. Moreover, carriers must record and retain live 911 call data, including positioning method and confidence and uncertainty data for each call, and provide this data to PSAPs upon request. PSAPs that have implemented policies that are designed to obtain all location information made available by CMRS providers when initiating and delivering 911 calls to the PSAP may also seek enforcement of the rules in their geographic area.²⁴⁰ Thus, the existing testing, certification, live call data reporting, and enforcement framework provides what BRETSA seeks—a method to validate test bed performance, albeit by a different mechanism.

80. *Information Sharing.* We deny BRETSA's claim that we failed to address requiring that "wireless carriers cooperate with public safety stakeholder accuracy testing and correlation of test

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to demonstrate compliance through alternative means so long as they provide the same level of test result reliability." *Third Further Notice*, 29 FCC Rcd at 2376, para. 3. The Commission proposed "that a test bed approach, representative of real-life call scenarios, would be the most practical and cost-effective method for testing compliance with indoor location accuracy requirements." *Id.* at 2407, para. 84. The Commission proposed that certification under the test bed "would provide a safe harbor to demonstrate that the CMRS provider meets the indoor location accuracy requirement[.] Under our safe harbor proposal, a technology that meets the location requirements in the test bed, upon certification by the CMRS provider that it has been deployed in a manner consistent with the test bed parameters, would be presumed to comply with the Commission's rules, without the need for the provider to conduct indoor testing in all locations where the technology is actually deployed." *Id.* at 2407, para. 85. In the *Fourth Report and Order*, the Commission required the test bed program to "conform to certain minimal requirements in order for test results derived from the test bed to be considered valid for compliance purposes," including that it "shall reflect a representative sampling of the different real world environments in which CMRS providers will be required to deliver indoor location information." *Fourth Report and Order*, 30 FCC Rcd at 1307, paras. 127-28.

²³⁹ 47 CFR § 9.10(i)(2)(iii)(A).

²⁴⁰ 47 CFR § 9.10(i)(2)(iv) ("PSAPs may seek Commission enforcement within their geographic service area of the requirements of paragraphs (i)(2)(i) and (ii) of this section, but only so long as they have implemented policies that are designed to obtain all location information made available by CMRS providers when initiating and delivering 911 calls to the PSAP. Prior to seeking Commission enforcement, a PSAP must provide the CMRS provider with [30] days written notice, and the CMRS provider shall have an opportunity to address the issue informally. If the issue has not been addressed to the PSAP's satisfaction within 90 days, the PSAP may seek enforcement relief.").

results to floor numbers.”²⁴¹ BRETSA reiterates “that the Commission should require wireless providers to publish procedures for First Responders to conduct tests of vertical location accuracy, and provide any required assistance in such tests.”²⁴² BRETSA states that it did not anticipate that it would be necessary for wireless providers to actively participate in BRETSA’s proposed testing process.²⁴³ In its Petition, BRETSA notes “that the information necessary to correlate elevation [Above Mean Sea Level] to floor number of a building will not likely be available to wireless providers, and BRETSA recognizes the burden and impracticality of requiring wireless providers to correlate elevation data with floor numbers for buildings from which 9-1-1 calls are placed.”²⁴⁴ AT&T, CTIA and T-Mobile oppose this aspect of BRETSA’s Petition.²⁴⁵

81. This portion of BRETSA’s reconsideration request arises from the fact that we did not require CMRS providers to assist in correlating height Above Mean Sea Level (or Height Above Ellipsoid) to floor level. In the *Fourth Further Notice*, we sought comment on how CMRS providers should report vertical location information, noting that several measurement methods exist.²⁴⁶ Specifically, we sought comment on whether reporting vertical location information as height above ground level would be

²⁴¹ BRETSA Dec. 26, 2019 Petition at 7.

²⁴² BRETSA Dec. 26, 2019 Petition at 2-3. “As BRETSA suggested in its Reply Comments, fn. 18 at 9, the wireless providers should also provide assistance in the form of (i) an alternate number than 9-1-1 for test calls and calls to correlate provided elevations [Above Mean Sea Level] to floor levels, if possible, in order to avoid tying up 9-1-1 lines, (ii) user and agency codes for use in making the test calls, and (iii) a web interface to retrieve test results. BRETSA also suggested equivalent support x,y and dispatchable address locations.” BRETSA Dec. 26, 2019 Petition at 9. BRETSA also “questions whether a smartphone application could be developed and provided by the wireless carriers for testing/correlation purposes, which could guide a user through the testing or correlation process with minimal training, and transmit data to a carrier to populate the relevant databases without the need for the user to place test calls to 9-1-1 or an alternative number.” BRETSA Dec. 26, 2019 Petition at 9-10.

²⁴³ BRETSA Dec. 26, 2019 Petition at 3. In comments responding to the *Fourth Further Notice*, BRETSA proposed that we “should require wireless providers to publish procedures for First Responders to conduct tests of vertical location accuracy, and provide any required assistance in such tests, in *all* markets in which vertical location technology is available. Testing methodology and procedures should not require active participation of wireless or location provider personnel, to simplify the scheduling and completion of such testing.” BRETSA May 17, 2019 Comments at 7.

²⁴⁴ BRETSA Dec. 26, 2019 Petition at 3 (footnote omitted). In its Petition, BRETSA states “that such correlation will likely fall upon, and require a community effort by, local governments and public safety agencies. BRETSA discussed data sources for local governments and public safety agencies to gather information on ground level [Above Mean Sea Level] at a building location, and floor level elevation [Above Mean Sea Level] or [Above Ground Level] in order to correlate Z-axis location information with floor numbers.” BRETSA Dec. 26, 2019 Petition at 3 (citing BRETSA May 17, 2019 Comments at 7-8).

²⁴⁵ AT&T Mar. 25, 2020 Opposition at 4-6; CTIA Mar. 25, 2020 Opposition at 5-7; T-Mobile Mar. 25, 2020 Opposition at 6-8.

²⁴⁶ *Fourth Further Notice*, 34 FCC Rcd at 1655-56, para. 14.

preferable to reporting Height Above Mean Sea Level, and whether to require CMRS providers to use one measurement standard exclusively.²⁴⁷

82. In the *Fifth Report and Order*, we required CMRS providers to deliver z-axis information in Height Above Ellipsoid, but we did not require CMRS providers to translate from Height Above Ellipsoid to other formats.²⁴⁸ Instead, we concluded that “translation mechanisms can be developed using [Height Above Ellipsoid] as a baseline reference, and that for the time being we should afford industry and public safety flexibility to develop solutions that are cost-effective for both sides.”²⁴⁹ To the extent that BRETSA seeks reconsideration of this decision, it has failed to present any new facts or issues that support reconsideration. The record reflects that a number of parties are currently exploring approaches for converting Height Above Ellipsoid to floor level. We expect that CMRS providers will participate in this effort and will work with all stakeholders, including standards making bodies, to promote the widespread and rapid availability of technologies and testing procedures that can consistently and reliably produce floor level accuracy. Although we decline to reconsider our decision, we will continue to monitor developments on this issue.

V. PROCEDURAL MATTERS

83. *Regulatory Flexibility Act Analysis.* The Regulatory Flexibility Act of 1980, as amended (RFA),²⁵⁰ requires that an agency prepare a regulatory flexibility analysis for notice and comment rulemakings, unless the agency certifies that “the rule will not, if promulgated, have a significant economic impact on a substantial number of small entities.”²⁵¹ Accordingly, the Commission has prepared a Final Regulatory Flexibility Analysis (FRFA) concerning the potential impact of rule and policy changes adopted in the *Sixth Report and Order* on small entities. The FRFA is set forth in Appendix B.

84. *Paperwork Reduction Act Analysis.* The requirements in sections 9.10(i)(4)(iv), 9.10(i)(4)(v), 9.10(j)(4) and 9.10(k), constitute modified information collections. They will be submitted to the Office of Management and Budget (OMB) for review under section 3507(d) of the Paperwork Reduction Act of 1995 (PRA).²⁵² OMB, the general public, and other Federal agencies are invited to comment on the new or modified information collection requirements contained in this proceeding.

²⁴⁷ *Id.*

²⁴⁸ *Fifth Report and Order*, 34 FCC Rcd at 11611, para. 38. We declined to require CMRS providers to report floor level where it is not technically feasible to do so and instead required that they deliver z-axis information in Height Above Ellipsoid. *Fifth Report and Order*, 34 FCC Rcd at 11610-11, para. 37. We also stated that “in cases where the carrier has reliable information about the caller’s floor level, they should provide it.” *Fifth Report and Order*, 34 FCC Rcd at 11610-11, para. 37.

²⁴⁹ *Fifth Report and Order*, 34 FCC Rcd at 11611, para. 38 (footnote omitted).

²⁵⁰ 5 U.S.C. § 601 *et seq.*

²⁵¹ 5 U.S.C. § 605(b).

²⁵² 44 U.S.C. § 3507(d).

This document will be submitted to OMB for review under section 3507(d) of the PRA. In addition, we note that, pursuant to the Small Business Paperwork Relief Act of 2002,²⁵³ we previously sought, but did not receive, specific comment on how the Commission might further reduce the information collection burden for small business concerns with fewer than 25 employees. The Commission does not believe that the new or modified information collection requirements in sections 9.10(i)(4)(iv), 9.10(i)(4)(v), 9.10(j)(4) and 9.10(k), will be unduly burdensome on small businesses.²⁵⁴ Applying these new or modified information collections will promote 911 service and emergency response, to the benefit of all size governmental jurisdictions, businesses, equipment manufacturers, and business associations by providing greater confidence in 911 location accuracy and greater consistency between the Commission's horizontal and vertical location rules. We describe impacts that might affect small businesses, which includes most businesses with fewer than 25 employees, in the FRFA in Appendix B.

85. *Congressional Review Act.* The Commission has determined, and the Administrator of the Office of Information and Regulatory Affairs, Office of Management and Budget, concurs, that this rule is "non-major" under the Congressional Review Act, 5 U.S.C. § 804(2). The Commission will send a copy of this *Sixth Report and Order and Order on Reconsideration* to Congress and the Government Accountability Office pursuant to 5 U.S.C. § 801(a)(1)(A).

86. *Further Information.* For further information, contact Brenda Boykin, Attorney-Advisor, Policy and Licensing Division, Public Safety and Homeland Security Bureau, (202) 418-2062 or via e-mail at Brenda.Boykin@fcc.gov and John A. Evanoff, Deputy Chief, Policy and Licensing Division, Public Safety and Homeland Security Bureau, (202) 418-0848 or via e-mail at John.Evanoff@fcc.gov.

VI. ORDERING CLAUSES

87. Accordingly, IT IS ORDERED, pursuant to Sections 1, 2, 4(i), 7, 10, 201, 214, 222, 251(e), 301, 302, 303, 307, 309, 316, and 332, of the Communications Act of 1934, 47 U.S.C. §§ 151, 152(a), 154(i), 157, 160, 201, 214, 222, 251(e), 301, 302, 303, 307, 309, 316, 332; the Wireless Communications and Public Safety Act of 1999, Pub. L. No. 106-81, 47 U.S.C. §§ 615, 615a, 615b; Section 506 of the Repack Airwaves Yielding Better Access for Users of Modern Services Act of 2018, 47 U.S.C. § 615 note; and Section 106 of the Twenty-First Century Communications and Video Accessibility Act of 2010, Pub. L. No. 111-260, 47 U.S.C. § 615c, that this *Sixth Report and Order and Order on Reconsideration*, is hereby ADOPTED.

²⁵³ Pub. L. No. 107-198, 116 Stat. 729 (2002) (codified at 44 U.S.C. § 3506(c)(4)).

²⁵⁴ The Commission anticipates the burden and cost levels of these requirements to be similar to the existing collections which OMB approved under OMB Control No. 3060-1210, ICR Reference No: 201801-3060-010. See generally Exec. Office of the President, Office of Info. & Regulatory Affairs, View ICR – OIRA Conclusion, https://www.reginfo.gov/public/do/PRAViewICR?ref_nbr=201801-3060-010 (OIRA review for Wireless E911 Location Accuracy Requirements, OMB Control No. 3060-1210). The Commission seeks comment on these costs in its upcoming Paperwork Reduction Act comment periods.

88. IT IS FURTHER ORDERED that the amendments of the Commission's rules as set forth in Appendix A ARE ADOPTED, effective thirty days from the date of publication in the Federal Register. Sections 9.10(i)(4)(iv), 9.10(i)(4)(v), 9.10(j)(4) and 9.10(k) contain new or modified information collection requirements that require OMB review under the PRA. The Commission directs the Public Safety and Homeland Security Bureau (Bureau) to announce the effective date of those information collections in a document published in the Federal Register after the Commission receives OMB approval, and directs the Bureau to cause section 9.10(s) to be revised accordingly.

89. IT IS FURTHER ORDERED that the Commission's Consumer and Governmental Affairs Bureau, Reference Information Center, SHALL SEND a copy of this *Sixth Report and Order and Order on Reconsideration*, including the Final Regulatory Flexibility Analysis, to the Chief Counsel for Advocacy of the Small Business Administration.

90. IT IS FURTHER ORDERED that the Commission's Consumer and Governmental Affairs Bureau, Reference Information Center, SHALL SEND a copy of this *Sixth Report and Order and Order on Reconsideration*, including the Final Regulatory Flexibility Analysis, to Congress and the Government Accountability Office pursuant to the Congressional Review Act, *see* 5 U.S.C. § 801(a)(1)(A).

91. IT IS FURTHER ORDERED that the Association of Public-Safety Communications Officials-International, Inc. Petition for Clarification is GRANTED to the extent described herein.

92. IT IS FURTHER ORDERED that, pursuant to Sections 4(i), and 405 of the Communications Act of 1934, as amended, 47 U.S.C. §§ 154(i) and 405, and Section 1.429 of the Commission's Rules, 47 CFR § 1.429, the Boulder Regional Emergency Telephone Service Authority Petition for Reconsideration is DENIED.

93. IT IS FURTHER ORDERED that, pursuant to Section 4(i) of the Communications Act of 1934, as amended, 47 U.S.C. § 154(i), the Petition for Emergency Declaratory Ruling filed by Polaris Wireless, Inc., on May 27, 2020, is GRANTED to the extent described herein.

FEDERAL COMMUNICATIONS COMMISSION

Marlene H. Dortch

Secretary

APPENDIX A**Final Rules**

For the reasons discussed in the preamble, the Federal Communications Commission amends chapter I of title 47 of the Code of Federal Regulations as follows:

PART 9 – 911 REQUIREMENTS

1. The authority citation for part 9 continues to read as follows:

Authority: 47 U.S.C. 151-154, 152(a), 155(c), 157, 160, 201, 202, 208, 210, 214, 218, 219, 222, 225, 251(e), 255, 301, 302, 303, 307, 308, 309, 310, 316, 319, 332, 403, 405, 605, 610, 615, 615 note, 615a, 615b, 615c, 615a-1, 616, 620, 621, 623, 623 note, 721, and 1471, unless otherwise noted.

2. Section 9.10 is amended by revising paragraphs (i)(2)(ii)(C), (D), and (E), adding paragraphs (i)(2)(ii)(F) through (M), and revising paragraphs (i)(4)(iv), (i)(4)(v), (j)(4), (k), and (s) to read as follows:

§ 9.10 911 Service Requirements.

* * * * *

(i) * * *

(2) * * *

(ii) * * *

(C) By April 3, 2021: In each of the top 25 cellular market areas (CMAs), nationwide CMRS providers shall deploy either dispatchable location or z-axis technology.

(D) By April 3, 2023: In each of the top 50 CMAs, nationwide CMRS providers shall deploy either dispatchable location or z-axis technology.

(E) By April 3, 2025: Nationwide CMRS providers shall deploy on a nationwide basis either dispatchable location or z-axis technology.

(F) Non-nationwide CMRS providers that serve any of the top 25 or 50 CMAs will have an additional year to meet each of the benchmarks in paragraphs (i)(2)(ii)(C) and (D) of this section. All non-nationwide providers will have an additional year to meet the benchmark in paragraph (i)(2)(ii)(E) of this section by deploying either dispatchable location or z-axis technology throughout their network footprint.

(G) By January 6, 2022: All CMRS providers shall provide dispatchable location with wireless E911 calls if it is technically feasible for them to do so.

(H) CMRS providers that deploy z-axis technology must do so consistent with the following z-axis accuracy metric: Within 3 meters above or below (plus or minus 3 meters) the handset for 80% of wireless E911 calls made from the z-axis capable device. CMRS providers must deliver z-axis information in Height Above Ellipsoid. Where available to the CMRS provider, floor level information must be provided in addition to z-axis location information.

- (I) CMRS providers that deploy z-axis technology must do so according to the following options:

(1) In each area where z-axis technology is used, deploy the technology to cover 80 percent of the population or 80 percent of the buildings that exceed three stories; or

(2) Deploy z-axis capable handsets enabled with z-axis technology on a nationwide basis (or throughout the CMRS provider's network footprint, as applicable).

(J) CMRS providers that deploy z-axis technology must comply with the following:

(1) CMRS providers must activate all network infrastructure necessary to support z-axis location by z-axis capable devices throughout the deployment area.

(2) CMRS providers may deploy z-axis technology upgrades by means of over-the-top applications as well as operating system or firmware upgrades. CMRS providers deploying z-axis technology must affirmatively push the z-axis technology to all existing z-axis capable device models on the provider's network that can receive it, and CMRS providers must continue to support the z-axis technology on these devices thereafter.

(3) A CMRS provider using the handset-based deployment option must make the technology available to existing z-axis capable devices nationwide; a CMRS provider using a CMA-based deployment option must make the technology available to all z-axis capable devices in the CMA. For all new z-axis capable devices marketed to consumers, the z-axis technology must be pre-installed.

(4) A CMRS provider will be deemed to have met its z-axis technology deployment obligation so long as it either pre-installs or affirmatively pushes the location technology to end users so that they receive a prompt or other notice informing them that the application or service is available and what they need to do to download and enable the technology on their phone. A CMRS provider will be deemed in compliance with its z-axis deployment obligation if it makes the technology available to the end user in this manner even if the end user declines to use the technology or subsequently disables it.

(K) CMRS providers must validate dispatchable location technologies intended for indoor location in accordance with the provisions of paragraph (i)(3)(i) of this section.

(L) In each CMA where dispatchable location is used, nationwide CMRS providers must ensure that dispatchable location is supported by a sufficient number of total dispatchable location reference points to equal 25 percent of the CMA population.

(M) *Z-axis capable devices.* A z-axis capable device is one that can measure and report vertical location without a hardware upgrade. For z-axis location solutions that rely on barometric pressure sensor information, only devices that have such sensors installed shall be considered z-axis capable. In the case of location solutions that do not require barometric pressure sensor information, both devices with and without barometric sensors shall be considered z-axis capable, provided that they are software-upgradable.

* * * * *

(4) * * *

(i) * * *

(ii) * * *

(iii) * * *

(iv) *Dispatchable location use certification.* Prior to use of dispatchable location information to meet the Commission's 911 horizontal and indoor location accuracy requirements in paragraphs (i)(2)(i) and (ii) of this section, CMRS providers must certify that neither they nor any third party they rely on to obtain dispatchable location information will use dispatchable location information or associated data for any non-911 purpose, except with prior express consent or as otherwise required by law. The certification must state that CMRS providers and any third party they rely on to obtain dispatchable location information will implement measures sufficient to safeguard the privacy and security of dispatchable location information.

(v) *Z-axis use certification.* Prior to use of z-axis information to meet the Commission's 911 vertical location accuracy requirements in paragraph (i)(2)(ii) of this section, CMRS providers must certify that neither they nor any third party they rely on to obtain z-axis information will use z-axis information or associated data for any non-911 purpose, except with prior express consent or as otherwise required by law. The certification must state that CMRS providers and any third party they rely on to obtain z-axis information will implement measures sufficient to safeguard the privacy and security of z-axis location information.

(j) * * *

(4) Upon meeting the timeframes pursuant to paragraph (i)(2)(ii) of this section, CMRS providers shall provide with wireless 911 calls that have a dispatchable location the confidence and uncertainty data for z-axis (vertical) information required under paragraph (j)(1) of this section. Where available to the CMRS provider, CMRS providers shall provide with wireless 911 calls that have floor level information the confidence and uncertainty data for z-axis (vertical) information required under paragraph (j)(1) of this section.

(k) *Provision of live 911 call data for PSAPs.* Notwithstanding other 911 call data collection and reporting requirements in paragraph (i) of this section, CMRS providers must record information on all live 911 calls, including, but not limited to, the positioning source method used to provide a location fix associated with the call. CMRS providers must also record the confidence and uncertainty data that they provide pursuant to paragraphs (j)(1)-(4) of this section. This information must be made available to PSAPs upon request, and shall be retained for a period of two years.

* * * * *

(s) *Compliance date(s)*. Paragraphs (i)(2)(ii)(C) and (D), (i)(4)(v), (j)(4), and (q)(10)(v) of this section contain information-collection and recordkeeping requirements. Compliance with paragraphs (i)(2)(ii)(C) and (D), (i)(4)(v), (j)(4), (k) and (q)(10)(v) will not be required until after approval by the Office of Management and Budget. The Commission will publish a document in the FEDERAL REGISTER announcing compliance dates with those paragraphs and revising this paragraph(s) accordingly.

* * * * *

APPENDIX B

Final Regulatory Flexibility Analysis

1. As required by the Regulatory Flexibility Act of 1980, as amended (RFA),¹ an Initial Regulatory Flexibility Analysis (IRFA) was incorporated in the *Fifth Further Notice of Proposed Rulemaking (Fifth Further Notice)* adopted in November 2019.² The Commission sought written public comment on the proposals in the *Fifth Further Notice* including comment on the IRFA. No comments were filed addressing the IRFA. This present Final Regulatory Flexibility Analysis (FRFA) conforms to the RFA.³

A. Need for, and Objectives of, the *Sixth Report and Order*

2. Today, the majority of calls to 911 come from wireless phones, increasing the likelihood that wireless 911 calls will come from indoor environments where traditional location accuracy technologies often do not work effectively or at all. A significant objective of this proceeding is to close the gap between the performance of 911 calls made from outdoors with similar calls made indoors. In the *Sixth Report and Order*, the Commission adopts measures that will significantly enhance the ability of Public Safety Answering Points (PSAPs) and first responders to accurately identify a wireless 911 caller's location when the caller is indoors, and strengthen existing location accuracy rules to improve location determination for indoor calls. These actions build upon the last significant revision by the Commission of the wireless Enhanced 911 (E911) rules adopted in 2015 and the establishment of a z-axis (vertical) location accuracy metric in 2019, as well as Congress' objective in Section 506 of RAY BAUM'S Act to promote regulatory parity in the provisioning of dispatchable location. We also clarify aspects of the *Fifth Report and Order* in response to a Petition for Clarification seeking to promote transparency and wireless carrier accountability, deny a Petition for Reconsideration of certain portions of the *Fifth Report and Order* regarding performance testing and correlating z-axis information to floor level, and grant a Petition for Emergency Declaratory Ruling to the extent it asks the Commission to reaffirm the deadlines established in the *Fifth Report and Order*.⁴

3. Consistent with the indoor location accuracy framework established in this proceeding, the Commission adopts rules applicable to Commercial Mobile Radio Service (CMRS) providers that are flexible and technologically neutral. The rules allow CMRS providers flexibility to choose the most effective solutions from a range of options for dispatchable location and z-axis technologies. Specifically, the rules allow flexibility in the deployment of new location technology to ensure CMRS

¹ See 5 U.S.C. § 603. The RFA, 5 U.S.C. §§ 601-612, was amended by the Small Business Regulatory Enforcement Fairness Act of 1996 (SBREFA), Pub. L. No. 104-121, Title II, 110 Stat. 857 (1996).

² *Wireless E911 Location Accuracy Requirements*, PS Docket No. 07-114, Fifth Report and Order and Fifth Further Notice of Proposed Rulemaking, 34 FCC Rcd 11592 (2019) (*Fifth Report and Order* or *Fifth Further Notice*), corrected by Erratum (PSHSB Jan. 15, 2020).

³ See 5 U.S.C. § 604.

⁴ *Fifth Report and Order*, 34 FCC Rcd 11592.

providers can meet their commitment to supply vertical location information under the timelines and in the geographic areas established in the *Fourth Report and Order* in this proceeding,⁵ while also affording nationwide CMRS providers the option to deploy z-axis technology on a nationwide basis. Further, the rules require all CMRS providers to provide dispatchable location information with 911 calls, if technically feasible and cost-effective, by January 6, 2022. By April 3, 2025, nationwide CMRS providers must provide z-axis location information on a nationwide basis. Non-nationwide CMRS providers have an additional year—until April 3, 2026—to provide z-axis location information throughout their network area. Ultimately, the amended rules advance the Commission’s objective in this proceeding of ensuring that all Americans using mobile phones—whether they are calling from urban or rural areas, from indoors or outdoors—have technology that is functionally capable of providing accurate location information, so they can receive the support they need in times of emergency.

B. Summary of Significant Issues Raised by Public Comments in Response to the IRFA

4. There were no comments filed that specifically addressed the proposed rules and policies presented in the IRFA.

C. Response to Comments by Chief Counsel for Advocacy of the Small Business Administration

5. Pursuant to the Small Business Jobs Act of 2010, which amended the RFA, the Commission is required to respond to any comments filed by the Chief Counsel for Advocacy of the Small Business Administration (SBA), and to provide a detailed statement of any change made to the proposed rules as a result of those comments.

6. The Chief Counsel did not file any comments in response to the proposed rules in this proceeding.

D. Description and Estimate of the Number of Small Entities to Which the Proposed Rules Will Apply

7. The RFA directs agencies to provide a description of and, where feasible, an estimate of the number of small entities that may be affected by the rules, adopted herein.⁶ The RFA generally defines the term “small entity” as having the same meaning as the terms “small business,” “small organization,” and “small governmental jurisdiction.”⁷ In addition, the term “small business” has the same meaning as the term “small business concern” under the Small Business Act.⁸ A small business

⁵ *Wireless E911 Location Accuracy Requirements*, PS Docket No. 07-114, Fourth Report and Order, 30 FCC Rcd 1259 (2015) (*Fourth Report and Order*), corrected by Erratum (PSHSB Mar. 3, 2015).

⁶ 5 U.S.C. § 604(a)(4).

⁷ 5 U.S.C. § 601(6).

⁸ 5 U.S.C. § 601(3) (incorporating by reference the definition of “small business concern” in Section 3 of the Small Business Act, which is codified at 15 U.S.C. § 632). Pursuant to the RFA, the statutory definition of a small

(continued....)

concern is one which: (1) is independently owned and operated; (2) is not dominant in its field of operation; and (3) satisfies any additional criteria established by the SBA.⁹

8. *Small Businesses, Small Organizations, Small Governmental Jurisdictions.* Our actions, over time, may affect small entities that are not easily categorized at present. We therefore describe here, at the outset, three broad groups of small entities that could be directly affected herein.¹⁰ First, while there are industry specific size standards for small businesses that are used in the regulatory flexibility analysis, according to data from the SBA's Office of Advocacy, in general a small business is an independent business having fewer than 500 employees.¹¹ These types of small businesses represent 99.9% of all businesses in the United States which translates to 28.8 million businesses.¹²

9. Next, the type of small entity described as a "small organization" is generally "any not-for-profit enterprise which is independently owned and operated and is not dominant in its field."¹³ The Internal Revenue Service (IRS) uses a revenue benchmark of \$50,000 or less to delineate its annual electronic filing requirements for small exempt organizations.¹⁴ Nationwide, for tax year 2018, there were approximately 571,709 small exempt organizations in the U.S. reporting revenues of \$50,000 or less according to the registration and tax data for exempt organizations available from the IRS.¹⁵

(Continued from previous page) —————

business applies "unless an agency, after consultation with the Office of Advocacy of the Small Business Administration and after opportunity for public comment, establishes one or more definitions of such term which are appropriate to the activities of the agency and publishes such definition(s) in the Federal Register."

⁹ 15 U.S.C. § 632.

¹⁰ See 5 U.S.C. § 601(3)-(6).

¹¹ See SBA, Office of Advocacy, "What's New With Small Business?", <https://cdn.advocacy.sba.gov/wp-content/uploads/2019/09/23172859/Whats-New-With-Small-Business-2019.pdf> (Sept 2019).

¹² *Id.*

¹³ 5 U.S.C. § 601(4).

¹⁴ The IRS benchmark is similar to the population of less than 50,000 benchmark in 5 U.S.C § 601(5) that is used to define a small governmental jurisdiction. Therefore, the IRS benchmark has been used to estimate the number small organizations in this small entity description. See Annual Electronic Filing Requirement for Small Exempt Organizations — Form 990-N (e-Postcard), "Who must file,"

<https://www.irs.gov/charities-non-profits/annual-electronic-filing-requirement-for-small-exempt-organizations-form-990-n-e-postcard>. We note that the IRS data does not provide information on whether a small exempt organization is independently owned and operated or dominant in its field.

¹⁵ See Exempt Organizations Business Master File Extract (EO BMF), "CSV Files by Region," <https://www.irs.gov/charities-non-profits/exempt-organizations-business-master-file-extract-eo-bmf>. The IRS Exempt Organization Business Master File (EO BMF) Extract provides information on all registered tax-exempt/non-profit organizations. The data utilized for purposes of this description was extracted from the IRS EO BMF data for Region 1-Northeast Area (76,886), Region 2-Mid-Atlantic and Great Lakes Areas (221,121), and Region 3-Gulf Coast and Pacific Coast Areas (273,702) which includes the continental U.S., Alaska, and Hawaii. This data does not include information for Puerto Rico.

10. Finally, the small entity described as a “small governmental jurisdiction” is defined generally as “governments of cities, counties, towns, townships, villages, school districts, or special districts, with a population of less than fifty thousand.”¹⁶ U.S. Census Bureau data from the 2017 Census of Governments¹⁷ indicate that there were 90,075 local governmental jurisdictions consisting of general purpose governments and special purpose governments in the United States.¹⁸ Of this number there were 36,931 general purpose governments (county¹⁹, municipal and town or township²⁰) with populations of less than 50,000 and 12,040 special purpose governments - independent school districts²¹ with enrollment populations of less than 50,000.²² Accordingly, based on the 2017 U.S. Census of Governments data, we estimate that at least 48,971 entities fall into the category of “small governmental jurisdictions.”²³

¹⁶ 5 U.S.C. § 601(5).

¹⁷ See 13 U.S.C. § 161. The Census of Governments survey is conducted every five (5) years compiling data for years ending with “2” and “7”. See also Census of Governments, <https://www.census.gov/programs-surveys/cog/about.html>.

¹⁸ See U.S. Census Bureau, 2017 Census of Governments – Organization Table 2. Local Governments by Type and State: 2017 [CG1700ORG02]. <https://www.census.gov/data/tables/2017/econ/gus/2017-governments.html>. Local governmental jurisdictions are made up of general purpose governments (county, municipal and town or township) and special purpose governments (special districts and independent school districts). See also Table 2. CG1700ORG02 Table Notes_Local Governments by Type and State_2017.

¹⁹ See U.S. Census Bureau, 2017 Census of Governments - Organization, Table 5. County Governments by Population-Size Group and State: 2017 [CG1700ORG05]. <https://www.census.gov/data/tables/2017/econ/gus/2017-governments.html>. There were 2,105 county governments with populations less than 50,000. This category does not include subcounty (municipal and township) governments.

²⁰ See U.S. Census Bureau, 2017 Census of Governments - Organization, Table 6. Subcounty General-Purpose Governments by Population-Size Group and State: 2017 [CG1700ORG06]. <https://www.census.gov/data/tables/2017/econ/gus/2017-governments.html>. There were 18,729 municipal and 16,097 town and township governments with populations less than 50,000.

²¹ See U.S. Census Bureau, 2017 Census of Governments - Organization, Table 10. Elementary and Secondary School Systems by Enrollment-Size Group and State: 2017 [CG1700ORG10]. <https://www.census.gov/data/tables/2017/econ/gus/2017-governments.html>. There were 12,040 independent school districts with enrollment populations less than 50,000. See also Table 4. Special-Purpose Local Governments by State Census Years 1942 to 2017 [CG1700ORG04], CG1700ORG04 Table Notes_Special Purpose Local Governments by State_Census Years 1942 to 2017.

²² While the special purpose governments category also includes local special district governments, the 2017 Census of Governments data does not provide data aggregated based on population size for the special purpose governments category. Therefore, only data from independent school districts is included in the special purpose governments category.

²³ This total is derived from the sum of the number of general purpose governments (county, municipal and town or township) with populations of less than 50,000 (36,931) and the number of special purpose governments - independent school districts with enrollment populations of less than 50,000 (12,040), from the 2017 Census of Governments - Organizations Tables 5, 6, and 10.

1. Telecommunications Service Providers

a. Wireless Telecommunications Providers

11. Pursuant to 47 CFR § 9.10(a), the Commission's 911 service requirements are only applicable to Commercial Mobile Radio Service (CMRS) "[providers], excluding mobile satellite service operators, to the extent that they: (1) Offer real-time, two way switched voice service that is interconnected with the public switched network; and (2) Utilize an in-network switching facility that enables the provider to reuse frequencies and accomplish seamless hand-offs of subscriber calls. These requirements are applicable to entities that offer voice service to consumers by purchasing airtime or capacity at wholesale rates from CMRS licensees."

12. Below, for those services subject to auctions, we note that, as a general matter, the number of winning bidders that qualify as small businesses at the close of an auction does not necessarily represent the number of small businesses currently in service. Also, the Commission does not generally track subsequent business size unless, in the context of assignments or transfers, unjust enrichment issues are implicated.

13. *All Other Telecommunications.* The "All Other Telecommunications" category is comprised of establishments primarily engaged in providing specialized telecommunications services, such as satellite tracking, communications telemetry, and radar station operation.²⁴ This industry also includes establishments primarily engaged in providing satellite terminal stations and associated facilities connected with one or more terrestrial systems and capable of transmitting telecommunications to, and receiving telecommunications from, satellite systems.²⁵ Establishments providing Internet services or voice over Internet protocol (VoIP) services via client-supplied telecommunications connections are also included in this industry.²⁶ The SBA has developed a small business size standard for "All Other Telecommunications", which consists of all such firms with annual receipts of \$35 million or less.²⁷ For this category, U.S. Census Bureau data for 2012 show that there were 1,442 firms that operated for the entire year.²⁸ Of those firms, a total of 1,400 had annual receipts less than \$25 million and 15 firms had annual receipts of \$25 million to \$49,999,999.²⁹ Thus, the

²⁴ See U.S. Census Bureau, *2017 NAICS Definition*, "517919 All Other Telecommunications", <https://www.census.gov/cgi-bin/sssd/naics/naicsrch?input=517919&search=2017+NAICS+Search&search=2017>.

²⁵ *Id.*

²⁶ *Id.*

²⁷ See 13 CFR § 121.201, NAICS Code 517919.

²⁸ See U.S. Census Bureau, *2012 Economic Census of the United States*, Table ID: EC1251SSSZ4, *Information: Subject Series - Estab and Firm Size: Receipts Size of Firms for the U.S.: 2012*, NAICS Code 517919, <https://data.census.gov/cedsci/table?text=EC1251SSSZ4&n=517919&tid=ECNSIZE2012.EC1251SSSZ4&hidePreview=false>.

²⁹ *Id.*

Commission estimates that the majority of “All Other Telecommunications” firms potentially affected by our action can be considered small.

14. *AWS Services (1710–1755 MHz and 2110–2155 MHz bands (AWS-1); 1915–1920 MHz, 1995–2000 MHz, 2020–2025 MHz and 2175–2180 MHz bands (AWS-2); 2155–2175 MHz band (AWS-3)).* For the AWS-1 bands,³⁰ the Commission has defined a “small business” as an entity with average annual gross revenues for the preceding three years not exceeding \$40 million, and a “very small business” as an entity with average annual gross revenues for the preceding three years not exceeding \$15 million. For AWS-2 and AWS-3, although we do not know for certain which entities are likely to apply for these frequencies, we note that the AWS-1 bands are comparable to those used for cellular service and personal communications service. The Commission has not yet adopted size standards for the AWS-2 or AWS-3 bands but proposes to treat both AWS-2 and AWS-3 similarly to broadband PCS service and AWS-1 service due to the comparable capital requirements and other factors, such as issues involved in relocating incumbents and developing markets, technologies, and services.³¹

15. *Competitive Local Exchange Carriers (Competitive LECs), Competitive Access Providers (CAPs), Shared-Tenant Service Providers, and Other Local Service Providers.* Neither the Commission nor the SBA has developed a small business size standard specifically for these service providers. The appropriate NAICS Code category is Wired Telecommunications Carriers³² and under that size standard, such a business is small if it has 1,500 or fewer employees.³³ U.S. Census Bureau data for 2012 indicate that 3,117 firms operated during that year.³⁴ Of that number, 3,083 operated with fewer than 1,000 employees.³⁵ Based on these data, the Commission concludes that the majority of Competitive LECs, CAPs, Shared-Tenant Service Providers, and Other Local Service Providers, are small entities. According to Commission data, 1,442 carriers reported that they were engaged in the provision of either

³⁰ The service is defined in section 90.1301 *et seq.* of the Commission’s Rules, 47 CFR § 90.1301 *et seq.*

³¹ *See Service Rules for Advanced Wireless Services in the 1.7 GHz and 2.1 GHz Bands*, Report and Order, 18 FCC Rcd 25162, Appx. B (2003), *modified by Service Rules for Advanced Wireless Services in the 1.7 GHz and 2.1 GHz Bands*, Order on Reconsideration, 20 FCC Rcd 14058, Appx. C (2005); *Service Rules for Advanced Wireless Services in the 1915–1920 MHz, 1995–2000 MHz, 2020–2025 MHz and 2175–2180 MHz Bands; Service Rules for Advanced Wireless Services in the 1.7 GHz and 2.1 GHz Bands*, Notice of Proposed Rulemaking, 19 FCC Rcd 19263, Appx. B (2005); *Service Rules for Advanced Wireless Services in the 2155–2175 MHz Band*, Notice of Proposed Rulemaking, 22 FCC Rcd 17035, Appx. (2007).

³² *See* U.S. Census Bureau, 2017 NAICS Definition, “517311 Wired Telecommunications Carriers”, <https://www.census.gov/cgi-bin/sssd/naics/naicsrch?code=517311&search=2017>.

³³ *See* 13 CFR § 121.201, NAICS Code 517311 (previously 517110).

³⁴ *See* U.S. Census Bureau, 2012 Economic Census of the United States, Table ID: EC1251SSSZ5, *Information: Subject Series - Estab & Firm Size: Employment Size of Firms for the U.S.: 2012*, NAICS Code 517110, <https://data.census.gov/cedsci/table?text=EC1251SSSZ5&n=517110&tid=ECNSIZE2012.EC1251SSSZ5&hidePreview=false>.

³⁵ *Id.* The largest category provided by the census data is “1000 employees or more” and a more precise estimate for firms with fewer than 1,500 employees is not provided.

competitive local exchange services or competitive access provider services.³⁶ Of these 1,442 carriers, an estimated 1,256 have 1,500 or fewer employees.³⁷ In addition, 17 carriers have reported that they are Shared-Tenant Service Providers, and all 17 are estimated to have 1,500 or fewer employees.³⁸ Also, 72 carriers have reported that they are Other Local Service Providers.³⁹ Of this total, 70 have 1,500 or fewer employees.⁴⁰ Consequently, based on internally researched FCC data, the Commission estimates that most providers of competitive local exchange service, competitive access providers, Shared-Tenant Service Providers, and Other Local Service Providers are small entities.

16. *Incumbent Local Exchange Carriers (Incumbent LECs).* Neither the Commission nor the SBA has developed a small business size standard specifically for incumbent local exchange services. The closest applicable NAICS Code category is Wired Telecommunications Carriers.⁴¹ Under the applicable SBA size standard, such a business is small if it has 1,500 or fewer employees.⁴² U.S. Census Bureau data for 2012 indicate that 3,117 firms operated the entire year.⁴³ Of this total, 3,083 operated with fewer than 1,000 employees.⁴⁴ Consequently, the Commission estimates that most providers of incumbent local exchange service are small businesses that may be affected by our actions. According to Commission data, one thousand three hundred and seven (1,307) Incumbent Local Exchange Carriers reported that they were incumbent local exchange service providers.⁴⁵ Of this total, an estimated 1,006 have 1,500 or fewer employees.⁴⁶ Thus, using the SBA's size standard the majority of incumbent LECs can be considered small entities.

³⁶ See Federal Communications Commission, Wireline Competition Bureau, Industry Analysis and Technology Division, Trends in Telephone Service at Table 5.3 (Sept. 2010) (*Trends in Telephone Service*), https://apps.fcc.gov/edocs_public/attachmatch/DOC-301823A1.pdf.

³⁷ *Id.*

³⁸ *Id.*

³⁹ *Id.*

⁴⁰ *Id.*

⁴¹ See U.S. Census Bureau, 2017 NAICS Definition, "517311 Wired Telecommunications Carriers", <https://www.census.gov/cgi-bin/sssd/naics/naicsrch?code=517311&search=2017>.

⁴² See 13 CFR § 121.201, NAICS Code 517311 (previously 517110).

⁴³ See U.S. Census Bureau, 2012 Economic Census of the United States, Table ID: EC1251SSSZ5, Information: Subject Series - Estab & Firm Size: Employment Size of Firms for the U.S.: 2012, NAICS Code 517110, <https://data.census.gov/cedsci/table?text=EC1251SSSZ5&n=517110&tid=ECNSIZE2012.EC1251SSSZ5&hidePreview=false>.

⁴⁴ *Id.* The largest category provided by the census data is "1000 employees or more" and a more precise estimate for firms with fewer than 1,500 employees is not provided.

⁴⁵ See *Trends in Telephone Service*, Federal Communications Commission, Wireline Competition Bureau, Industry Analysis and Technology Division at Table 5.3 (Sept. 2010) (*Trends in Telephone Service*).

⁴⁶ *Id.*

17. *Narrowband Personal Communications Services.* Two auctions of narrowband personal communications services (PCS) licenses have been conducted. To ensure meaningful participation of small business entities in future auctions, the Commission has adopted a two-tiered small business size standard in the Narrowband PCS Second Report and Order. Through these auctions, the Commission has awarded a total of 41 licenses, out of which 11 were obtained by small businesses.⁴⁷ A “small business” is an entity that, together with affiliates and controlling interests, has average gross revenues for the three preceding years of not more than \$40 million. A “very small business” is an entity that, together with affiliates and controlling interests, has average gross revenues for the three preceding years of not more than \$15 million. The SBA has approved these small business size standards.⁴⁸

18. *Offshore Radiotelephone Service.* This service operates on several UHF television broadcast channels that are not used for television broadcasting in the coastal areas of states bordering the Gulf of Mexico.⁴⁹ The closest applicable SBA size standard is for Wireless Telecommunications Carriers (except Satellite)⁵⁰, which is an entity employing no more than 1,500 persons.⁵¹ U.S. Census Bureau data in this industry for 2012 show that there were 967 firms that operated for the entire year.⁵² Of this total, 955 firms had employment of 999 or fewer employees and 12 had employment of 1000 employees or more.⁵³ Thus, under this SBA category and the associated small business size standard, the majority of Offshore Radiotelephone Service firms can be considered small. There are presently approximately 55 licensees in this service. However, the Commission is unable to estimate at this time the number of licensees that would qualify as small under the SBA’s small business size standard for the category of Wireless Telecommunications Carriers (except Satellite).

19. *Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing.* This industry comprises establishments primarily engaged in manufacturing radio and

⁴⁷ *Amendment of the Commission’s Rules to Establish New Personal Communications Services, Narrowband PCS*, GEN Docket No. 90-314, ET Docket No. 92-100, PP Docket No. 93-253, Second Report and Order and Second Further Notice of Proposed Rulemaking, 15 FCC Rcd 10456 (2000).

⁴⁸ See Letter from Aida Alvarez, Administrator, SBA, to Amy Zoslov, Chief, Auctions and Industry Analysis Division, Wireless Telecommunications Bureau, FCC (filed Dec. 2, 1998) (*Alvarez Letter 1998*).

⁴⁹ This service is governed by Subpart I of Part 22 of the Commission’s Rules. See 47 CFR §§ 22.1001-22.1037.

⁵⁰ See U.S. Census Bureau, *2017 NAICS Definition*, “517312 Wireless Telecommunications Carriers (except Satellite)”, <https://www.census.gov/cgi-bin/sssd/naics/naicsrch?code=517312&search=2017%20NAICS%20Search>.

⁵¹ See 13 CFR § 121.201, NAICS Code 517312 (previously 517210).

⁵² See U.S. Census Bureau, *2012 Economic Census of the United States*, Table ID: EC1251SSSZ5, *Information: Subject Series: Estab and Firm Size: Employment Size of Firms for the U.S.: 2012*, NAICS Code 517210, <https://data.census.gov/cedsci/table?text=EC1251SSSZ5&n=517210&tid=ECNSIZE2012.EC1251SSSZ5&hidePreview=false&vintage=2012>.

⁵³ *Id.* Available census data does not provide a more precise estimate of the number of firms that have employment of 1,500 or fewer employees. The largest category provided is for firms with “1000 employees or more.”

television broadcast and wireless communications equipment.⁵⁴ Examples of products made by these establishments are: transmitting and receiving antennas, cable television equipment, GPS equipment, pagers, cellular phones, mobile communications equipment, and radio and television studio and broadcasting equipment.⁵⁵ The SBA has established a small business size standard for this industry of 1,250 employees or less.⁵⁶ U.S. Census Bureau data for 2012 show that 841 establishments operated in this industry in that year.⁵⁷ Of that number, 828 establishments operated with fewer than 1,000 employees, 7 establishments operated with between 1,000 and 2,499 employees and 6 establishments operated with 2,500 or more employees.⁵⁸ Based on this data, we conclude that a majority of manufacturers in this industry are small.

20. *Rural Radiotelephone Service.* The Commission has not adopted a size standard for small businesses specific to the Rural Radiotelephone Service.⁵⁹ A significant subset of the Rural Radiotelephone Service is the Basic Exchange Telephone Radio System (BETRS).⁶⁰ The closest applicable SBA size standard is for Wireless Telecommunications Carriers (except Satellite)⁶¹, which is an entity employing no more than 1,500 persons.⁶² For this industry, U.S. Census Bureau data for 2012 show that there were 967 firms that operated for the entire year.⁶³ Of this total, 955 firms had employment of 999

⁵⁴ See U.S. Census Bureau, *2017 NAICS Definition, “334220 Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing”*, <https://www.census.gov/cgi-bin/sssd/naics/naicsrch?code=334220&search=2017>.

⁵⁵ *Id.*

⁵⁶ See 13 CFR § 121.201, NAICS Code 334220.

⁵⁷ See U.S. Census Bureau, *2012 Economic Census of the United States*, Table ID: EC1231SG2, *Manufacturing: Summary Series: General Summary: Industry Statistics for Subsectors and Industries by Employment Size: 2012*, NAICS Code 334220, <https://data.census.gov/cedsci/table?text=EC1231SG2&n=334220&tid=ECNSIZE2012.EC1231SG2&hidePreview=false>.

⁵⁸ *Id.* Available U.S. Census Bureau data does not provide a more precise estimate of the number of firms that have employment of 1,500 or fewer employees. The largest category provided is for firms with “1000 employees or more.”

⁵⁹ The service is defined in 47 CFR § 22.99.

⁶⁰ BETRS is defined in 47 CFR §§ 22.757 and 22.759.

⁶¹ See U.S. Census Bureau, *2017 NAICS Definition, “517312 Wireless Telecommunications Carriers (except Satellite)”*, <https://www.census.gov/cgi-bin/sssd/naics/naicsrch?code=517312&search=2017%20NAICS%20Search>.

⁶² See 13 CFR § 121.201, NAICS Code 517312 (previously 517210).

⁶³ See U.S. Census Bureau, *2012 Economic Census of the United States*, Table ID: EC1251SSSZ5, *Information: Subject Series: Estab and Firm Size: Employment Size of Firms for the U.S.: 2012*, NAICS Code 517210, <https://data.census.gov/cedsci/table?text=EC1251SSSZ5&n=517210&tid=ECNSIZE2012.EC1251SSSZ5&hidePreview=false&vintage=2012>.

or fewer employees and 12 had employment of 1000 employees or more.⁶⁴ Thus under this category and the associated size standard, the Commission estimates that the majority of Rural Radiotelephone Services firm are small entities. There are approximately 1,000 licensees in the Rural Radiotelephone Service, and the Commission estimates that there are 1,000 or fewer small entity licensees in the Rural Radiotelephone Service that may be affected by the rules and policies proposed herein.

21. *Wireless Communications Services.* This service can be used for fixed, mobile, radiolocation, and digital audio broadcasting satellite uses. The Commission defined “small business” for the wireless communications services (WCS) auction as an entity with average gross revenues of \$40 million for each of the three preceding years, and a “very small business” as an entity with average gross revenues of \$15 million for each of the three preceding years.⁶⁵ The SBA has approved these small business size standards.⁶⁶ In the Commission’s auction for geographic area licenses in the WCS there were seven winning bidders that qualified as “very small business” entities, and one that qualified as a “small business” entity.

22. *Wireless Telecommunications Carriers (except Satellite).* This industry comprises establishments engaged in operating and maintaining switching and transmission facilities to provide communications via the airwaves. Establishments in this industry have spectrum licenses and provide services using that spectrum, such as cellular services, paging services, wireless internet access, and wireless video services.⁶⁷ The appropriate size standard under SBA rules is that such a business is small if it has 1,500 or fewer employees.⁶⁸ For this industry, U.S. Census Bureau data for 2012 show that there were 967 firms that operated for the entire year.⁶⁹ Of this total, 955 firms employed fewer than 1,000 employees and 12 firms employed of 1000 employees or more.⁷⁰ Thus under this category and the

⁶⁴ *Id.* Available U.S. Census Bureau data does not provide a more precise estimate of the number of firms that have employment of 1,500 or fewer employees. The largest category provided is for firms with “1000 employees or more.”

⁶⁵ *Amendment of the Commission’s Rules to Establish Part 27, the Wireless Communications Service (WCS)*, Report and Order, 12 FCC Rcd 10785, 10879, para. 194 (1997).

⁶⁶ See Letter from Aida Alvarez, Administrator, SBA, to Amy Zoslov, Chief, Auctions and Industry Analysis Division, Wireless Telecommunications Bureau, FCC (filed Dec. 2, 1998) (*Alvarez Letter 1998*).

⁶⁷ See U.S. Census Bureau, *2017 NAICS Definition*, “517312 Wireless Telecommunications Carriers (except Satellite)”, <https://www.census.gov/cgi-bin/sssd/naics/naicsrch?code=517312&search=2017%20NAICS%20Search>.

⁶⁸ See 13 CFR § 121.201, NAICS Code 517312 (previously 517210).

⁶⁹ See U.S. Census Bureau, *2012 Economic Census of the United States*, Table ID: EC1251SSSZ5, *Information: Subject Series: Estab and Firm Size: Employment Size of Firms for the U.S.: 2012*, NAICS Code 517210, <https://data.census.gov/cedsci/table?text=EC1251SSSZ5&n=517210&tid=ECNSIZE2012.EC1251SSSZ5&hidePreview=false&vintage=2012>.

⁷⁰ *Id.* Available U.S. Census Bureau data does not provide a more precise estimate of the number of firms that have employment of 1,500 or fewer employees. The largest category provided is for firms with “1000 employees or more.”

associated size standard, the Commission estimates that the majority of Wireless Telecommunications Carriers (except Satellite) are small entities.

23. *Wireless Telephony.* Wireless telephony includes cellular, personal communications services, and specialized mobile radio telephony carriers. The closest applicable SBA category is Wireless Telecommunications Carriers (except Satellite).⁷¹ Under the SBA small business size standard, a business is small if it has 1,500 or fewer employees.⁷² For this industry, U.S. Census Bureau data for 2012 show that there were 967 firms that operated for the entire year.⁷³ Of this total, 955 firms had fewer than 1,000 employees and 12 firms had 1000 employees or more.⁷⁴ Thus under this category and the associated size standard, the Commission estimates that a majority of these entities can be considered small. According to Commission data, 413 carriers reported that they were engaged in wireless telephony.⁷⁵ Of these, an estimated 261 have 1,500 or fewer employees and 152 have more than 1,500 employees.⁷⁶ Therefore, more than half of these entities can be considered small.

24. *700 MHz Guard Band Licensees.* In 2000, in the *700 MHz Guard Band Order*, the Commission adopted size standards for “small businesses” and “very small businesses” for purposes of determining their eligibility for special provisions such as bidding credits and installment payments.⁷⁷ A

⁷¹ See U.S. Census Bureau, *2017 NAICS Definition*, “517210 Wireless Telecommunications Carriers (except Satellite)”, <https://www.census.gov/cgi-bin/sssd/naics/naicsrch?code=517312&search=2017%20NAICS%20Search>.

⁷² See 13 CFR § 121.201, NAICS Code 517312 (previously 517210).

⁷³ See U.S. Census Bureau, *2012 Economic Census of the United States*, Table ID: EC1251SSSZ5, *Information: Subject Series: Estab and Firm Size: Employment Size of Firms for the U.S.: 2012*, NAICS Code 517210, <https://data.census.gov/cedsci/table?text=EC1251SSSZ5&n=517210&tid=ECNSIZE2012.EC1251SSSZ5&hidePreview=false&vintage=2012>.

⁷⁴ *Id.* Available U.S. Census Bureau data do not provide a more precise estimate of the number of firms that have employment of 1,500 or fewer employees. The largest category provided is for firms with “1000 employees or more.”

⁷⁵ See Federal Communications Commission, Wireline Competition Bureau, Industry Analysis and Technology Division, *Trends in Telephone Service* at Table 5.3 (Sept. 2010) (*Trends in Telephone Service*), https://apps.fcc.gov/edocs_public/attachmatch/DOC-301823A1.pdf.

⁷⁶ *Id.*

⁷⁷ See *Service Rules for the 746–764 MHz Bands, and Revisions to Part 27 of the Commission’s Rules*, Second Report and Order, 15 FCC Rcd 5299 (2000) (*746–764 MHz Band Second Report and Order*). Service rules were amended in 2007, but no changes were made to small business size categories. See *Service Rules for the 698-746, 747-762 and 777-792 MHz Bands*, WT Docket No. 06-150, *Revision of the Commission’s Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems*, CC Docket No. 94-102, *Section 68.4(a) of the Commission’s Rules Governing Hearing Aid-Compatible Telephones*, WT Docket No. 01-309, *Biennial Regulatory Review – Amendment of Parts 1, 22, 24, 27, and 90 to Streamline and Harmonize Various Rules Affecting Wireless Radio Services*, WT Docket 03-264, *Former Nextel Communications, Inc. Upper 700 MHz Guard Band Licenses and Revisions to Part 27 of the Commission’s Rules*, WT Docket No. 06-169, *Implementing a Nationwide, Broadband, Interoperable Public Safety Network in the 700 MHz Band*, PS Docket No. 06-229, *Development of Operational, Technical and Spectrum Requirements for Meeting Federal, State and Local Public Safety*

(continued....)

small business in this service is an entity that, together with its affiliates and controlling principals, has average gross revenues not exceeding \$40 million for the preceding three years.⁷⁸ Additionally, a very small business is an entity that, together with its affiliates and controlling principals, has average gross revenues that are not more than \$15 million for the preceding three years.⁷⁹ SBA approval of these definitions is not required.⁸⁰ An auction of 52 Major Economic Area licenses commenced on September 6, 2000, and closed on September 21, 2000.⁸¹ Of the 104 licenses auctioned, 96 licenses were sold to nine bidders. Five of these bidders were small businesses that won a total of 26 licenses. A second auction of 700 MHz Guard Band licenses commenced on February 13, 2001 and closed on February 21, 2001. All eight of the licenses auctioned were sold to three bidders. One of these bidders was a small business that won a total of two licenses.⁸²

25. *Lower 700 MHz Band Licenses.* The Commission previously adopted criteria for defining three groups of small businesses for purposes of determining their eligibility for special provisions such as bidding credits.⁸³ The Commission defined a “small business” as an entity that, together with its affiliates and controlling principals, has average gross revenues not exceeding \$40 million for the preceding three years.⁸⁴ A “very small business” is defined as an entity that, together with its affiliates and controlling principals, has average gross revenues that are not more than \$15 million for the preceding three years.⁸⁵ Additionally, the lower 700 MHz Service had a third category of small business status for Metropolitan/Rural Service Area (MSA/RSA) licenses—“entrepreneur”—which is defined as an entity that, together with its affiliates and controlling principals, has average gross revenues that are not more than \$3 million for the preceding three years.⁸⁶ The SBA approved these small size standards.⁸⁷

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Communications Requirements Through the Year 2010, WT Docket No. 96-86, Report and Order and Further Notice of Proposed Rulemaking, 22 FCC Rcd 8064 (2007).

⁷⁸ See *id.* at 5343, para. 108.

⁷⁹ See *id.*

⁸⁰ See *id.* at 5343, para. 108 n.246 (for the 746–764 MHz and 776–794 MHz bands, the Commission is exempt from 15 U.S.C. § 632, which requires Federal agencies to obtain SBA approval before adopting small business size standards).

⁸¹ See *700 MHz Guard Bands Auction Closes: Winning Bidders Announced*, Public Notice, 15 FCC Rcd 18026 (WTB 2000).

⁸² See *700 MHz Guard Bands Auction Closes: Winning Bidders Announced*, Public Notice, 16 FCC Rcd 4590 (WTB 2001).

⁸³ See *Reallocation and Service Rules for the 698–746 MHz Spectrum Band (Television Channels 52–59)*, Report and Order, 17 FCC Rcd 1022 (2002) (*Channels 52–59 Report and Order*).

⁸⁴ See *id.* at 1087-88, para. 172.

⁸⁵ See *id.*

⁸⁶ See *id.*, at 1088, para. 173.

An auction of 740 licenses (one license in each of the 734 MSAs/RSAs and one license in each of the six Economic Area Groupings (EAGs)) commenced on August 27, 2002, and closed on September 18, 2002. Of the 740 licenses available for auction, 484 licenses were won by 102 winning bidders. Seventy-two of the winning bidders claimed small business, very small business or entrepreneur status and won a total of 329 licenses.⁸⁸ A second auction commenced on May 28, 2003, closed on June 13, 2003, and included 256 licenses: 5 EAG licenses and 476 Cellular Market Area licenses.⁸⁹ Seventeen winning bidders claimed small or very small business status and won 60 licenses, and nine winning bidders claimed entrepreneur status and won 154 licenses.⁹⁰ On July 26, 2005, the Commission completed an auction of 5 licenses in the Lower 700 MHz band (Auction No. 60). There were three winning bidders for five licenses. All three winning bidders claimed small business status.

26. In 2007, the Commission reexamined its rules governing the 700 MHz band in the *700 MHz Second Report and Order*.⁹¹ An auction of 700 MHz licenses commenced January 24, 2008, and closed on March 18, 2008, which included: 176 Economic Area licenses in the A-Block, 734 Cellular Market Area licenses in the B-Block, and 176 EA licenses in the E-Block.⁹² Twenty winning bidders, claiming small business status (those with attributable average annual gross revenues that exceed \$15 million and do not exceed \$40 million for the preceding three years) won 49 licenses. Thirty-three winning bidders claiming very small business status (those with attributable average annual gross revenues that do not exceed \$15 million for the preceding three years) won 325 licenses.

27. *Upper 700 MHz Band Licenses.* In the *700 MHz Second Report and Order*, the Commission revised its rules regarding Upper 700 MHz licenses.⁹³ On January 24, 2008, the Commission

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⁸⁷ See Letter from Aida Alvarez, Administrator, SBA, to Amy Zoslov, Chief, Auctions and Industry Analysis Division, Wireless Telecommunications Bureau, FCC (filed Dec. 2, 1998) (*Alvarez Letter 1998*).

⁸⁸ See *Lower 700 MHz Band Auction Closes*, Public Notice, 17 FCC Rcd 17272 (WTB 2002).

⁸⁹ See *id.*

⁹⁰ See *id.*

⁹¹ *Service Rules for the 698–746, 747–762 and 777–792 MHz Band; Revision of the Commission’s Rules to Ensure Compatibility with Enhanced 911 Emergency Calling Systems; Section 68.4(a) of the Commission’s Rules Governing Hearing Aid-Compatible Telephones; Biennial Regulatory Review—Amendment of Parts 1, 22, 24, 27, and 90 to Streamline and Harmonize Various Rules Affecting Wireless Radio Services; Former Nextel Communications, Inc. Upper 700 MHz Guard Band Licenses and Revisions to Part 27 of the Commission’s Rules; Implementing a Nationwide, Broadband, Interoperable Public Safety Network in the 700 MHz Band; Development of Operational, Technical and Spectrum Requirements for Meeting Federal, State and Local Public Safety Communications Requirements Through the Year 2010; Declaratory Ruling on Reporting Requirement under Commission’s Part 1 Anti-Collusion Rule*, WT Docket Nos. 07-166, 06-169, 06-150, 03-264, and 96-86, PS Docket No. 06-229, CC Docket No. 94-102, Second Report and Order, 22 FCC Rcd 15289, 15359 n.434 (2007) (*700 MHz Second Report and Order*).

⁹² See *Auction of 700 MHz Band Licenses Closes*, Public Notice, 23 FCC Rcd 4572 (WTB 2008).

⁹³ *700 MHz Second Report and Order*, 22 FCC Rcd 15289.

commenced Auction 73 in which several licenses in the Upper 700 MHz band were available for licensing: 12 Regional Economic Area Grouping licenses in the C Block, and one nationwide license in the D Block.⁹⁴ The auction concluded on March 18, 2008, with 3 winning bidders claiming very small business status (those with attributable average annual gross revenues that do not exceed \$15 million for the preceding three years) and winning five licenses.

28. *Wireless Resellers.* The SBA has not developed a small business size standard specifically for Wireless Resellers. The SBA category of Telecommunications Resellers is the closest NAICS code category for wireless resellers. The Telecommunications Resellers industry comprises establishments engaged in purchasing access and network capacity from owners and operators of telecommunications networks and reselling wired and wireless telecommunications services (except satellite) to businesses and households. Establishments in this industry resell telecommunications; they do not operate transmission facilities and infrastructure. Mobile virtual network operators (MVNOs) are included in this industry.⁹⁵ Under the SBA's size standard, such a business is small if it has 1,500 or fewer employees.⁹⁶ U.S. Census Bureau data for 2012 show that 1,341 firms provided resale services during that year.⁹⁷ Of that number, all operated with fewer than 1,000 employees.⁹⁸ Thus, under this category and the associated small business size standard, the majority of these resellers can be considered small entities.

b. Equipment Manufacturers

29. *Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing.* This industry comprises establishments primarily engaged in manufacturing radio and television broadcast and wireless communications equipment.⁹⁹ Examples of products made by these establishments are: transmitting and receiving antennas, cable television equipment, GPS equipment, pagers, cellular phones, mobile communications equipment, and radio and television studio and broadcasting equipment.¹⁰⁰ The SBA has established a small business size standard for this industry of

⁹⁴ See *Auction of 700 MHz Band Licenses Closes*, Public Notice, 23 FCC Rcd 4572 (WTB 2008).

⁹⁵ See U.S. Census Bureau, *2017 NAICS Definition "517911 Telecommunications Resellers"*, <https://www.census.gov/cgi-bin/sssd/naics/naicsrch?input=517911&search=2017+NAICS+Search&search=2017>.

⁹⁶ See 13 CFR § 121.201, NAICS Code 517911.

⁹⁷ See U.S. Census Bureau, *2012 Economic Census of the United States*, Table ID: EC1251SSSZ5, *Information: Subject Series: Estab and Firm Size: Employment Size of Firms for the U.S.: 2012*, NAICS Code 517911, <https://data.census.gov/cedsci/table?text=EC1251SSSZ5&n=517911&tid=ECNSIZE2012.EC1251SSSZ5&hidePreview=false>.

⁹⁸ *Id.* Available U.S. Census Bureau data does not provide a more precise estimate of the number of firms that have employment of 1,500 or fewer employees. The largest category provided is for firms with "1000 employees or more."

⁹⁹ See U.S. Census Bureau, *2017 NAICS Definition, "334220 Radio and Television Broadcasting and Wireless Communications Equipment Manufacturing"*, <https://www.census.gov/cgi-bin/sssd/naics/naicsrch?code=334220&search=2017>.

¹⁰⁰ *Id.*

1,250 employees or less.¹⁰¹ U.S. Census Bureau data for 2012 show that 841 establishments operated in this industry in that year.¹⁰² Of that number, 828 establishments operated with fewer than 1,000 employees, 7 establishments operated with between 1,000 and 2,499 employees and 6 establishments operated with 2,500 or more employees.¹⁰³ Based on this data, we conclude that a majority of manufacturers in this industry are small.

30. *Semiconductor and Related Device Manufacturing.* This industry comprises establishments primarily engaged in manufacturing semiconductors and related solid state devices.¹⁰⁴ Examples of products made by these establishments are integrated circuits, memory chips, microprocessors, diodes, transistors, solar cells and other optoelectronic devices.¹⁰⁵ The SBA has developed a small business size standard for Semiconductor and Related Device Manufacturing, which consists of all such companies having 1,250 or fewer employees.¹⁰⁶ U.S. Census Bureau data for 2012 show that there were 862 establishments that operated that year.¹⁰⁷ Of this total, 843 operated with fewer than 1,000 employees.¹⁰⁸ Thus, under this size standard, the majority of firms in this industry can be considered small.

E. Description of Projected Reporting, Recordkeeping, and Other Compliance Requirements for Small Entities

31. The *Sixth Report and Order* will impose new and additional reporting, recordkeeping, and other compliance requirements on small entities and other CMRS providers. The adopted rule

¹⁰¹ See 13 CFR § 121.201, NAICS Code 334220.

¹⁰² See U.S. Census Bureau, *2012 Economic Census of the United States*, Table ID: EC1231SG2, *Manufacturing: Summary Series: General Summary: Industry Statistics for Subsectors and Industries by Employment Size: 2012*, NAICS Code 334220, <https://data.census.gov/cedsci/table?text=EC1231SG2&n=334220&tid=ECNSIZE2012.EC1231SG2&hidePreview=false>.

¹⁰³ *Id.* Available U.S. Census Bureau data does not provide a more precise estimate of the number of firms that have employment of 1,500 or fewer employees. The largest category provided is for firms with “1000 employees or more.”

¹⁰⁴ See U.S. Census Bureau, *2017 NAICS Definition*, “334413 Semiconductor and Related Device Manufacturing”, <https://www.census.gov/cgi-bin/sssd/naics/naicsrch?code=334413&search=2017>.

¹⁰⁵ *Id.*

¹⁰⁶ 13 CFR § 121.201, NAICS Code 334413.

¹⁰⁷ U.S. Census Bureau, *2012 Economic Census of the United States*, Table EC1231SG2, *Manufacturing: Summary Series: General Summary: Industry Statistics for Subsectors and Industries by Employment Size: 2012*, NAICS Code 334413, <https://data.census.gov/cedsci/table?text=EC1231SG2&n=334413&tid=ECNSIZE2012.EC1231SG2&hidePreview=false>.

¹⁰⁸ *Id.* Available U.S. Census Bureau data does not provide a more precise estimate of the number of firms that have employment of 1,250 or fewer employees. The largest category provided is for firms with “1000 employees or more.”

changes involving reporting and recordkeeping make explicit that when CMRS providers provide dispatchable location or floor level information in addition to z-axis information, they must also provide confidence and uncertainty data for the z-axis location. The rule changes also require CMRS providers to supply confidence and uncertainty data upon request from a PSAP and to retain this information for two years. In addition, CMRS providers are required to certify that they will not use dispatchable location or associated data for any purpose other than for the purpose of responding to 911 calls, except with written prior consent or as required by law. Below we discuss these obligations as well as additional compliance obligations for CMRS providers.

32. *Z-Axis Deployment.* For measuring compliance, the Commission revised the rules to afford CMRS providers new, flexible options for meeting our vertical location accuracy requirements. CMRS providers may deploy z-axis technology to cover 80% of the population in each Cellular Market Area (CMA) consistent with the rules adopted in 2015. CMRS providers may also deploy z-axis technology to cover 80% of the buildings that exceed three stories in a CMA. In addition, CMRS providers may deploy z-axis capable handsets, enabled with z-axis technology, on a nationwide basis or throughout the CMRS provider's network footprint, as applicable.

33. *Dispatchable Location.* Nationwide CMRS providers must provide dispatchable location with wireless E911 calls by January 6, 2022, if it is technically feasible for them to do so. This rule change will help make dispatchable location information, which is the location accuracy solution preferred by public safety 911 call centers, available with 911 calls nationwide. Given that the National Emergency Address Database platform has ceased operation and is no longer available to support the provision of dispatchable location information, the Commission amended the rules to delete the reference to the NEAD in the rules but to retain the metric for measuring a carrier's deployment of dispatchable location reference points. Specifically, for any CMRS provider that relies on dispatchable location to meet the April 2021 or 2023 benchmarks in a CMA, the Commission continues to require the provider to provision a total number of dispatchable location reference points (e.g., WiFi access points or Bluetooth beacons) equal to 25% of the CMA population. This change will promote flexibility and encourage the development, testing, and deployment of dispatchable location solutions that do not rely on the National Emergency Address Database. The Commission also clarifies that CMRS providers must include with dispatchable location the confidence and uncertainty level for z-axis location information at a 90% confidence threshold.

34. *Timelines.* Under the current vertical location accuracy rules, nationwide CMRS providers electing the z-axis option for meeting vertical accuracy requirements must deploy z-axis technology meeting the 3-meter accuracy standard in each of the top 25 CMAs by April 3, 2021, and in each of the top 50 CMAs by April 3, 2023. Under the amended rules in the *Sixth Report and Order*, CMRS providers that deploy z-axis technology have three options to comply with our April 3, 2021 deployment benchmark: (i) deploying z-axis technology to cover 80% of the CMA population; (ii) demonstrating z-axis deployment to cover 80% of the buildings that exceed three stories in the CMA; or (iii) deploying z-axis capable handsets, enabled with z-axis technology, on a nationwide basis. Nationwide CMRS providers in each of the top 50 CMAs have the same three options for meeting the April 3, 2023 benchmark. Nationwide CMRS providers shall deploy z-axis technology on a nationwide

basis by April 3, 2025. Under the existing rules, non-nationwide CMRS providers that serve any of the top 25 or 50 CMAs have an additional year to meet the April 3, 2021 and April 3, 2023 benchmarks. Non-nationwide CMRS providers operating outside the top 50 CMAs also have an additional year to comply with the April 3, 2025 benchmark and must provide z-axis location information by April 3, 2026. Additionally, all CMRS providers must provide dispatchable location information with 911 calls by January 6, 2022 if it is technically feasible to do so.

35. *Privacy, security, resiliency and certifications.* The Commission revised its privacy and security rules to require that CMRS providers ensure and certify that neither they nor any third party they rely on to obtain dispatchable location or z-axis location information will use such information or any associated data for any non-911 purpose, except with prior express consent or as otherwise required by law. The Commission also revised the existing privacy and security certification requirement to apply to dispatchable location solutions that do not rely on the National Emergency Address Database.

36. *Confidence and Uncertainty.* The Commission amended the rules to require CMRS providers to provide confidence and uncertainty data for z-axis (vertical) information with wireless 911 calls that have dispatchable location or floor level information. Additionally, the Commission amended the rules to require CMRS providers to record the confidence and uncertainty data that they provide, make this information available to PSAPs upon request, and retain the information for a period of two years.

37. While small entities may be required to hire attorneys, engineers, consultants, or other professionals to comply with the rule changes in the *Sixth Report and Order*, the Commission did not receive any input on the cost of compliance for small entities associated with the proposals in the *Fifth Further Notice*. More generally, the Commission did receive comment on the need for increasing flexible options for z-axis and dispatchable location and mandating vertical location information and the feasibility of doing so nationwide. Below we discuss the cost of compliance obligations generally for small entities and other CMRS providers.

38. *Flexible Deployment Options.* The record indicates that it is technically feasible for CMRS providers to deliver z-axis location information. We believe that most, if not all the infrastructure needed for z-axis deployment will be used for deploying the multi-story option. There may, however, be some costs that will involve the deployment of additional weather stations, used to calibrate handset barometric sensors,¹⁰⁹ or to provide 3D mapping for determining multi-story building locations.

¹⁰⁹ See, e.g., Letter from Ian D. Volner and Meryl E. Bartlett, Counsel to Polaris Wireless, Inc., Venable LLP, to Marlene H. Dortch, FCC, PS Docket No. 07-114, at 2 (filed Apr. 9, 2020) (Polaris Apr. 9, 2020 *Ex Parte*) (noting “[i]mplementation also requires deployment of weather stations,” and investment/contracting is needed to deploy additional weather stations); Google Feb. 21, 2020 Comments at 6 (“any barometric sensor-based location technology would presumably vary with the concentration of weather stations available for calibration” (quoting APCO Feb. 7, 2019 Petition at 6)).

39. *Nationwide Deployment.* As we stated in the *Sixth Report and Order*, because the 2025 nationwide deployment is six years from the 2019 analysis done by the Commission, we can reasonably infer that software update costs will be lower at that April 2025 benchmark, albeit at an unquantifiable amount. Most of the upgradable handsets are located in the top 50 CMAs and will have been updated at that time (in 2023), and providers will have refined the necessary software at scale. We can also reasonably infer that costs to update handset software will be the same for subscribers both inside and outside the top 25 and 50 CMAs. Thus, we do not anticipate any changes in our cost/benefit analysis for nationwide CMRS providers.

40. *Dispatchable Location.* The Commission also requires CMRS providers to supply dispatchable location with 911 calls by January 6, 2022, provided that it is technically feasible to do so. The record suggests that CMRS providers have an incentive to provide dispatchable location and that they desire to leverage commercially-available solutions rather than relying on costly, 911-specific solutions, such as the National Emergency Address Database. Consistent our commitment to technology neutrality, we do not mandate any particular solution for implementing the dispatchable location accuracy rules we adopt in the *Sixth Report and Order*. We believe the cost for providing dispatchable location will decline as demand for 5G and new consumer home products grows. Further, by aligning our dispatchable location requirements across a broad swath of technological platforms, we anticipate that costs of providing dispatchable location will rapidly decrease and further improve indoor location accuracy.

41. With regard to small entities, we believe that compliance costs will be lower for non-nationwide providers (which are usually small entities). We believe the brunt of implementation and deployment costs will be borne by the nationwide CMRS providers. We anticipate for handset-based deployment, most of the upgrades will have been developed by the nationwide CMRS providers, although some independent interoperability testing and handset procurement may be necessary. For the multi-story deployment option, tall structures are presumably not as prevalent in environments outside the top population centers. As a result, this may help defray some, if not all, 3D mapping costs, as we believe non-nationwide CMRS providers are most likely to know where tall structures are located inside their service areas without the need for mapping. Thus, we can reasonably infer that the implementation costs for non-nationwide CMRS providers in areas outside the top 50 CMAs are not as high as inside those areas. In addition, non-nationwide CMRS providers outside the top 50 CMAs have approximately six years after the adoption of the *Sixth Report and Order* to prepare for deployment, which, as we mentioned above, will likely mean the costs of deploying either the handset or multi-story based options will be less. We also reiterate from our cost and benefit discussion in the *Sixth Report and Order* that the \$97 billion nationwide benefit floor in lives saved will far eclipse any cost incurred by non-nationwide providers.

F. Steps Taken to Minimize the Significant Economic Impact on Small Entities, and Significant Alternatives Considered

42. The RFA requires an agency to describe any significant, specifically small business, alternatives that it has considered in reaching its approach, which may include the following four

alternatives (among others): (1) the establishment of differing compliance or reporting requirements or timetables that take into account the resources available to small entities; (2) the clarification, consolidation, or simplification of compliance or reporting requirements under the rule for such small entities; (3) the use of performance, rather than design, standards; and (4) an exemption from coverage of the rule, or any part thereof, for such small entities.¹¹⁰

43. The actions we take in the *Sixth Report and Order* adopt our proposals in the *Fifth Further Notice* to expand the options for CMRS providers choosing to deploy z-axis technology to meet the April 2021 and April 2023 compliance benchmarks, with some revisions and clarifications. These actions provide flexibility to small entities and should to some degree lessen the economic impact on them. Our decision not to adopt any additional reporting requirements associated with meeting vertical location accuracy obligations will also minimize the economic impact for small entities by not adding additional administrative reporting costs. In addition, in exploring party proposals for improvements to the z-axis metric, the Commission deferred consideration of several alternatives that may have presented an increased economic impact for small entities, and the Commission declined to adopt a more stringent z-axis metric.

44. As proposed in the *Fifth Further Notice*, for multi-story building deployment, we afford nationwide CMRS providers the option of meeting the April 2021 and 2023 CMA-based coverage deadlines by deploying z-axis technology to cover 80% of the buildings that exceed three stories in the CMA. We conclude that cost-effective mechanisms already exist to identify buildings that exceed three stories for providers that choose this option and that this additional option will give providers valuable flexibility in determining how they meet their obligations. In addition, affording CMRS providers an option based on coverage of tall buildings rather than population in the CMA will encourage providers to invest in z-axis solutions that focus on the areas with the greatest need for vertical location information.

45. For handset-based deployment, as proposed in the *Fifth Further Notice*, we afford nationwide CMRS providers the option of meeting vertical location accuracy requirements by deploying z-axis technology on handsets nationwide. Adoption of a nationwide deployment option will allow CMRS providers to use nascent z-axis technologies that can be widely deployed in consumer handsets through software-based upgrades rather than handset replacement, resulting in cost savings. Indeed, the record in this proceeding indicates that the principal z-axis location solutions available to CMRS providers in the near term can all be delivered via software upgrades to a wide range of legacy handsets.

46. For non-nationwide CMRS providers, which tend to be small entities, the *Sixth Report and Order* provides expanded options for deploying z-axis technologies in the top 50 CMAs under the timelines adopted in 2015 (i.e. April 3, 2022 and April 3, 2024). In addition, non-nationwide CMRS providers have an additional year to comply with the April 3, 2025 vertical location benchmark adopted in this *Sixth Report and Order*.

¹¹⁰ See 5 U.S.C. § 604(a)(6).

47. The *Sixth Report and Order* also expands deployment of vertical location technology requirements to non-nationwide CMRS providers that do not serve any of the top 50 CMAs. We take these steps because we believe that the benefits of improved vertical location accuracy should be available to customers of all CMRS providers, including non-nationwide providers serving areas outside the major population centers. Non-nationwide CMRS providers operating outside the top 50 CMAs will have nearly six years—until April 3, 2026—to support z-axis location throughout their network footprint.

48. Non-nationwide CMRS providers also have until April 3, 2026 to comply with the privacy and security certification, confidence and uncertainty data, and live call data provisions in the rules. The existing rules already require non-nationwide CMRS providers to comply with these requirements in the horizontal location accuracy context. Affording these providers an additional year to comply with these requirements should further minimize the burden on them.

49. In the *Sixth Report and Order*, we revised the rules to allow CMRS providers to deploy dispatchable location solutions that do not rely on the National Emergency Address Database, which was formally terminated shortly after the *Fifth Further Notice*. Thus, small entities and other CMRS providers will be able to leverage commercially-available solutions rather than relying on costly, 911-specific solutions, such as the National Emergency Address Database. We also declined to adopt minimum percentage thresholds for dispatchable location 911 calls or to require provision of dispatchable location for 911 calls originating from multi-story buildings. Further, we require all CMRS providers to supply dispatchable location with indoor wireless 911 calls by January 6, 2022, but only if it is technically feasible and cost-effective for them to do so. This should reduce the burden for all CMRS providers, including those that are small entities.

50. Finally, the Commission deferred consideration of a number of technical issues until further study of the technical feasibility and costs is concluded. The Commission continues to believe that allowing CMRS providers the flexibility to choose a compliant technology solution rather than mandating a one-size-fits-all solution is the best approach to meeting its public safety and location accuracy objectives and should minimize some economic impact for small entities. The Commission's actions also provide CMRS providers a level of certainty which should benefit providers in their selection of a compliant technology solution to meet the April 3, 2021, vertical location accuracy benchmark.

Report to Congress

51. The Commission will send a copy of the *Sixth Report and Order and Order on Reconsideration*, including this FRFA, in a report to Congress pursuant to the Congressional Review Act.¹¹¹ In addition, the Commission will send a copy of *Sixth Report and Order and Order on Reconsideration*, including this FRFA, to the Chief Counsel for Advocacy of the SBA. A copy of the *Sixth*

¹¹¹ See 5 U.S.C. § 801(a)(1)(A).

Report and Order and Order on Reconsideration and FRFA (or summaries thereof) will also be published in the *Federal Register*.¹¹²

¹¹² See 5 U.S.C. § 604(b).

APPENDIX C**List of Commenting Parties****Comments**

Association of Public-Safety Communications Officials-International, Inc. (APCO)

Apple Inc. (Apple)

The Alliance for Telecommunications Industry Solutions (ATIS)

AT&T Services, Inc. (AT&T)

Boulder Regional Emergency Telephone Service Authority (BRETSA)

Competitive Carriers Association (CCA)

CTIA

Google LLC (Google)

International Association of Fire Chiefs (IAFC)

International Association of Fire Fighters (IAFF)

Industry Council for Emergency Response Technologies, Inc. (iCERT)

National Association of State 911 Administrators (NASNA)

NENA: The 9-1-1 Association (NENA)

NextNav, LLC (NextNav)

National Sheriffs' Association (NSA)

Polaris Wireless, Inc. (Polaris)

RapidDeploy, Inc. (RapidDeploy)

Texas 9-1-1 Alliance, the Texas Commission on State Emergency Communications (CSEC), and the
Municipal Emergency Communication Districts Association (Texas 9-1-1 Entities)

T-Mobile USA, Inc. (T-Mobile)

Verizon

Reply Comments

APCO

AT&T

BRETSA

CTIA

Environmental Systems Research Institute, Inc. (ESRI)

Google

IAFC

IAFF

Motorola Solutions, Inc. (Motorola)

National Public Safety Telecommunications Council (NPSTC)

NextNav

T-Mobile

Opposition to BRETSA Petition

AT&T

CTIA

T-Mobile

Reply to Opposition to BRETSA Petition

BRETSA

STATEMENT OF

CHAIRMAN AJIT PAI

Re: *Wireless E911 Location Accuracy Requirements*, PS Docket No. 07-114.

When you call 911, the response time can be the difference between life and death. That makes it crucial for first responders to be able to find you as soon as possible. But discerning your location can be challenging if you're in a multistory building.

That's why last year, a bipartisan majority of the Commission adopted rules to require wireless carriers to meet a vertical location-accuracy metric, or "z-axis" metric. This metric established requirements that are achievable and will provide first responders with valuable, life-saving information—specifically, identifying a location of plus or minus three meters for 80% of indoor wireless 911 calls in the top 25 markets by April 3, 2021 and in the top 50 markets by April 3, 2023. These rules were supported by an impressive coalition of public safety organizations, including the International Association of Fire Chiefs, the International Association of Fire Fighters, and the National Emergency Numbering Association, the only professional organization in this country focused solely on the needs of 911.

Today, we build upon last year's effort. For example, we look beyond the top 50 markets and require nationwide wireless providers to deploy z-axis location technology or dispatchable location to all Cellular Market Areas nationwide by April 2025. Non-nationwide providers will be given an extra year to meet this requirement. This will ensure that consumers and emergency personnel in both rural and urban America—and not just our nation's larger metropolitan areas—will have the benefit of vertical location accuracy by a date certain.

We also afford wireless carriers more options for complying with our rules. For example, we allow CMRS providers to deploy technologies that focus on multi-story buildings, where vertical location information is most vital to first responders. We decide that providers may satisfy the vertical location accuracy metric by deploying z-axis capable handsets nationwide. And we clarify that providers may combine handset-based technologies with other z-axis technologies to meet the nationwide benchmarks—so long as these technologies are validated by testing to meet the accuracy requirements.

Additionally, we take steps to encourage the deployment of dispatchable location solutions without relying on the now-terminated National Emergency Address Database. Consistent with our dispatchable location rules for other types of providers adopted in the Kari's Law proceeding, we require wireless carriers to make dispatchable location for wireless 911 calls available, beginning January 6, 2022, if technically and economically feasible.

As was the case with last year's Order, our action today is strongly supported by a broad coalition of public safety groups, including the International Association of Fire Chiefs, International Association of Fire Fighters, International Association of Chiefs of Police, National Sheriffs' Association, and the National Association of State EMS Officials. These organizations say that this Order "will significantly improve emergency responders' ability to locate wireless 9-1-1 callers in the United States" and "recognizes the urgency for strong vertical location accuracy rules that ensure that public safety can rely on location information provided by wireless carriers to better save lives across the nation."

Of course, much work will remain after today. So wireless carriers, the public safety community, z-axis solution providers, device manufacturers, and others will have to work together in good faith to get the job done—and done on time. We owe it to the Americans who rely on their mobile phones to call 911 in an emergency. And we owe it to the first responders who often risk their own lives to answer those calls.

This item is an important milestone in our ongoing efforts to protect the safety of the American people. For their dedication in helping us reach this point, I want to express my gratitude to Brenda Boykin, Emily Caditz, Dr. Kenneth Carlberg, Rochelle Cohen, Jill Coogan, John Evanoff, Christopher Fedeli, Lisa Fowlkes, David Furth, Erika Olsen, Dr. Rasoul Safavian, and Michael Wilhelm from the Public Safety and Homeland Security Bureau; Chana Wilkerson and Sanford Williams from the Office of Communications Business Opportunities; Alex Espinoza, Kenneth Lynch, Chuck Needy, and Emily Talaga from the Office of Economics and Analytics; Michael Carlson, David Horowitz, Bill Richardson, and Anjali Singh from the Office of General Counsel; and Nicole Ongele from the Office of Managing Director.

STATEMENT OF
COMMISSIONER MICHAEL O'RIELLY

Re: *Wireless E911 Location Accuracy Requirements*, PS Docket No. 07-114.

This is the sixth z-axis-related item that I have voted on since joining the Commission. I apologize in advance to those who may experience a bit of *déjà vu* as you hear my words today. In all seriousness, I continue to be fully supportive of our ultimate goal: providing first responders the pin-point location information they need to find and provide aid to Americans in peril. These professionals are there to assist us in the worst of times, when every second counts, and the location data provided to them is crucial, especially in urban centers. From manufacturers and wireless providers to fire departments and localities, to all of the associations representing the various interested parties, there is a common goal to develop a solution to provide the best information as quickly as possible. But, ultimately, the location provided must absolutely be correct and reliable if we are going to reach this goal.

While equipment and wireless providers are making great strides with z-axis technologies, the technology still is not commercially deployed and proven. Promising results have been achieved in a test bed environment, but there are no real-world operations yet. And while meeting deadlines and benchmarks is still a work in progress, nonetheless, today we double down and require z-axis nationwide availability by 2025, as if the ultimate remedy requires just one more mandate.

We now have wireless providers and manufacturers expressing concerns about the direction in which we are headed. We cannot just dismiss the merits of their arguments by attacking their motives or hiding behind Commission procedure. These are the very companies that we are going to rely on to make this technology work, and they seem to have serious doubts. The handset-based solutions that will facilitate nationwide deployment are currently less accurate than the network-based systems this Commission has been considering for years. I am concerned that the Phase II history is repeating itself, heading us towards a deluge of waivers. And, the handset-based technology may not be ready in time to meet the earliest deadlines, forcing providers to switch z-axis solutions midstream. That seems neither effective nor cost-efficient, and we know who will end up paying for this: the American consumer. One way or another, these costs will be passed on in the form of higher bills or reduced functionality.

And, of course, our cost-benefit analysis never considered such duplication of efforts. In fact, the CBA relies on the same old, tired, and inaccurate analysis we have used for years.

Thankfully, today's item does provide more flexibility, such as allowing providers to comply by deploying z-axis technology on handsets, covering 80 percent of a Cellular Market Area's multi-story buildings, and providing dispatchable location – which is still the ultimate goal – without the National Emergency Address Database, or NEAD. Further, I am pleased that we have withheld from making other premature rule changes. The goal should be to get what is already required actually working and helping people before shifting the goalposts any further.

I approve, with the same reservations I have had since 2014.

STATEMENT OF
COMMISSIONER BRENDAN CARR

Re: *Wireless E911 Location Accuracy Requirements*, PS Docket No. 07-114.

Nearly a quarter of a billion 9-1-1 calls are dialed each year. If you assume an even distribution, that works out to the average American making an emergency call every 16 months. And although we learned as kids when, and how, and for what purposes to dial 9-1-1, those calls never are easy. A fire, a break-in, a sick family member—they can rattle even cool-headed people. In those crisis moments, getting one’s bearings and telling the operator where help is needed can be difficult.

So I think I can speak for all of us—public safety advocates, the wireless industry, and each of my fellow commissioners—when I say we need tech’s help to improve 9-1-1 response. Since at least 2015, the Commission has been tightening our mandate that wireless phones transmit to 9-1-1 operators certain location information that can be tied to an address or place on a map. It has taken longer to arrive at a height information requirement, with our first deadline coming next April. But we’re getting there with barometers and software that leverages device signals.

This is not an achievement of government mandates but of technologists and entrepreneurs focused on solving the problem. Already two companies have demonstrated how using air pressure can accurately project the height of a call’s origin. Google is making progress with a different approach, and Apple will demonstrate its solution in the test bed this fall. We are grateful for these companies’ efforts and confident that their solutions will save lives.

I thank the Public Safety and Homeland Security Bureau for its continued focus on this important issue. The item has my support.

**STATEMENT OF
COMMISSIONER JESSICA ROSENWORCEL,
APPROVING IN PART, DISSENTING IN PART**

Re: *Wireless E911 Location Accuracy*, PS Docket No. 07-114, Sixth Report and Order and
Order on Reconsideration (July 16, 2020)

The first telephone number I taught my children was 911. It is a number that every one of us knows by heart but every one of us hopes that we will never use. As the old saying goes, you may only call 911 once in your life, but it will be the most important call you ever make.

And when you do make that call, on the other end of the line is a 911 operator. They are the starting point for all emergency response. Because when the unthinkable occurs, it is a 911 professional taking down the details and organizing how first responders will come to your aid. The most important detail, of course, is knowing exactly where you are.

There was a time, not that long ago, when location information was easy to know. When 911 calls were just on wired networks, a street address accompanied every call. But today four out of five 911 calls come from wireless phones. So for years this agency has been trying to come up with a way to ensure that every wireless call features precise location information so that in crisis first responders can find you, no matter who you are, or where you live.

Here's what I believe. Our 911 system should be simple to use. It should provide 911 operators with actionable information. And that information should be useful for public safety officials who help keep us safe.

These are not abstract principles. They are the ideas that have come up over and over again in discussions at the more than two dozen 911 call centers I have visited from California, to Colorado, Alaska to Alabama, Vermont to Virginia and many more places in between. I believe they should inform everything we do with 911.

That brings me to today's effort. In this decision, the Federal Communications Commission makes its sixth attempt to refine what information will be transmitted about the location of a wireless caller dialing 911. In particular, the agency adjusts rules it fashioned nine months ago regarding the vertical location information that accompanies a wireless 911 call from a multi-story building.

So let me begin by recognizing the good in this order. Nine months ago, the FCC adopted policies to improve wireless location information for 911 calls that would only apply in the 50 largest metropolitan areas. I called for us to go further and make these rules apply nationwide. As I said at the time, there are office parks, townhomes, and other multi-story structures in rural areas, too. Moreover, there is nothing simple or just about limiting actionable information to our biggest cities. So I am pleased today that we recognize that a uniform, national policy is the way to go. I thank my colleagues for seeing the light and changing course.

While we get this right, in other ways I fear today's decision misses the mark. It makes complex what should be simple when we call 911. It makes location information available but not in any format that is actionable for 911 operators. And it makes it too hard for public safety officials to use the information that is provided. Let me explain.

First, we need a 911 system that works simply for all, all of the time. Today, no matter who you are or where you live, you can call 911. The location information that accompanies your call doesn't distinguish between device or service plan. This is the way it should be. 911 is uniformly available for everyone. But with today's decision we choose another course. That's because we adopt an approach that requires 911 opt-in. Every wireless consumer will only get full location information sent with their emergency calls if they perform a specific software update on their device or respond to a notice from their carrier regarding an application that may be available. Let's be honest, in the best case a whole lot of people are going to miss this one, never download it or respond to the fine print in a service notice. Plus, there are low-cost phones on the market that lack the sensor technology necessary to make this even work. As a result, the record suggests we might only get vertical location information with as few as two percent of calls to 911. That should set off alarm bells. Moreover, this is fundamentally at odds with how 911 has previously been provisioned in this country. Our tradition is to make it simple and democratic; possible for everyone to reach 911 everywhere. But now full location information only accompanies your call if you opt-in to this new system or have the right phone. That's not an outcome I can accept.

Second, we need to provide 911 operators actionable location information. Nine months ago, the FCC adopted a standard for wireless carriers providing vertical location information using a z-axis solution. Specifically, the agency required that wireless carriers offer public safety an indoor caller's vertical location measured plus or minus three meters height above ellipsoid. At the time, I observed that this measurement system does not produce actionable data that a 911 operator can easily use. That's because when calls come tumbling in to 911 in a crisis, this system produces a string of numbers representing raw data measuring vertical location from the center of the earth's mass. There's no floor number in a building. There's no measurement from street level. There is just a series of numbers that offer remarkably little to a 911 operator who has just seconds to organize public safety response. To make this data truly actionable, it needs to be calibrated, translated, and reworked into something meaningful.

As a result, stakeholders asked the FCC for clarification about how this measurement will even work. Last week, Richard Napolitano, the commanding officer in charge of public safety communications in New York weighed in. He warned that '[w]hen a call is placed to 911 and the location is not attainable, for example when the caller is a child or having severe difficulty breathing, 911 operators cannot rely on a HAE-based location provided by the carrier for the needed urgent response. In cases such as these, the HAE technology may lead to loss of life.'

Let's be honest. If we can't get this right for New York—one of the cities where the case for vertical location is the clearest—it calls into question what we are doing in the first place.

Then remember that there are over 6000 public safety answering points nationwide. There are more than 100,000 911 professionals who work in them, day-in, and day-out taking every call with steely calm. They've been told they need to upgrade their systems to next generation 911. This is going to cost over \$12 billion. No one knows where this funding is going to come from and yet we have tacked on a brand-new obligation for 911 centers to take raw height above ellipsoid data and hope and pray they will be able to translate it into something actionable.

Third, we need to listen to public safety officials calling for useful information. Nine months ago, we acknowledged a hard truth. We recognized that a vertical location measurement of plus or minus three meters may not be good enough for police, firefighters, and emergency medical personnel

trying to locate a 911 caller in crisis. As I said when it was first introduced: “We should choose standards that without fail provide floor level accuracy. When police or firefighters show up in an emergency, the last thing they should have to do is take out a measuring tape. They need a standard that tells them precisely where you are.” So nine months ago we sought comment on how to improve the plus or minus three meter margin of error. But instead of acting on this today, we kick the can down the road and put off review of this standard until 2022. Why not do it right here, right now? After all, the International Association of Fire Chiefs, International Association of Firefighters, International Association of Chiefs of Police, National Sheriffs’ Association, and National Association of State EMS Officials have all asked the agency to narrow this standard or at a minimum reassess it twice a year. I think we should have taken on this task today.

In the end, I appreciate that the FCC is making an effort to tackle what is ultimately a challenging technical problem. I thank the Chairman for that. But I think we need to work harder to reduce the risk and uncertainty we’re adding to this process. In a world with pandemics, natural disasters, and so many other threats, we need to make it simple to use 911 for everyone. There are no easy answers here but sticking to the principles I outlined would help get us where we need to go.

For this reason, I support our decision to extend 911 wireless location accuracy rules nationwide. But I think the opt-in approach to 911 we adopt is neither simple nor fair. It will leave behind too many people who call 911 in crisis. Moreover, our continuing reliance on raw height above ellipsoid data fails to offer 911 operators the real world, actionable information they need to keep us safe. Finally, I think we should do more to provide useful information for public safety officials than the plus or minus three-meter standard we stick to here. For these reasons I approve in part, and dissent in part.

STATEMENT OF
COMMISSIONER GEOFFREY STARKS

Re: *Wireless E911 Location Accuracy Requirements*, PS Docket No. 07-114

Calls to 911 are often a matter of life or death. When seconds count, emergency responders may need to quickly find a caller who cannot provide their precise location to dispatchers. As the Commission has repeatedly affirmed, knowing a caller's vertical, or "z-axis," location may be critical in those situations, particularly in dense areas with lots of multistory buildings. Today's decision is an important step toward ensuring that first responders will have z-axis information when they need it.

While precise location information is critical to an effective emergency response, it can also be dangerous in the wrong hands. Over the last year, I have been pleased that my colleagues and I could work together to create robust privacy safeguards for this sensitive location data. We have developed a regulatory framework for z-axis and dispatchable location data that prevents abuse by wireless carriers as well as their third-party vendors. The Notices of Apparent Liability we approved earlier this year against AT&T, Verizon, Sprint, and T-Mobile for misuse of customer location data should make clear that we will hold wireless carriers responsible if they fail to ensure that the vendors they choose comply with our privacy rules and adopt appropriate safeguards.

Though I support today's action, I also recognize that there is much more to do. Based on the record in this proceeding, I am confident that technological developments will soon enable us to tighten the requirement beyond plus or minus three meters. I will continue to encourage industry to step on the gas in working towards even more accurate solutions—and encourage the Commission to soon require even more precise z-axis location information. We must remain focused on the ultimate goal: getting first responders to the precise location where they are needed.

I will also continue to highlight the importance of technology-neutral solutions. The progress many innovators have made using barometric pressure sensors is impressive, and those sensors will become more ubiquitous as costs continue to decrease. But we must recognize that not all devices, particularly the less expensive devices often offered by Lifeline providers, contain barometric pressure sensors. As the item explains, there are technologies on the horizon that can provide z-axis information even for these less expensive devices. The Commission should encourage the development of those solutions, because a speedy response in an emergency should not be luxury. If, after the initial April 2021 deadline, it appears that Lifeline subscribers are not benefitting from our z-axis rules, the Commission must consider additional rules to close that gap. As I have long said, lifesaving technology needs to be available to everyone.

I thank the Public Safety and Homeland Security Bureau staff for their work on this safety-critical item.