**6712-01**

**FEDERAL COMMUNICATIONS COMMISSION**

**47 CFR Part 9**

**[PS Docket No. 07-114; FCC 20-98; FRS 16998]**

**Wireless E911 Location Accuracy Requirements**

**AGENCY:** Federal Communications Commission.

**ACTION:** Final rule.

**SUMMARY:** In this document, the Federal Communications Commission (the FCC or Commission) builds upon the Commission's efforts to improve its wireless Enhanced 911 (E911) location accuracy rules by enabling 911 call centers and first responders to more accurately identify the floor level for wireless 911 calls made from multi-story buildings. The *Sixth Report and Order and Order on Reconsideration* affirms the April 3, 2021, and April 3, 2023, z-axis location accuracy requirements for nationwide wireless providers and rejects an untimely proposal to weaken these requirements; allows wireless providers to deploy technologies that focus on multi-story buildings, where vertical location information is most vital to first responders, and handset-based deployment solutions that meet the z-axis metric; requires nationwide wireless providers to deploy z-axis technology nationwide by April 3, 2025 (non-nationwide wireless providers would have an additional year to deploy z-axis technology throughout their service areas (i.e., April 3, 2026)); and requires wireless providers, beginning January 6, 2022, to provide dispatchable location with wireless 911 calls when it is technically feasible to do so. Finally, we deny a Petition for Reconsideration of the Fifth Report and Order.

**DATES:** *Effective date*: **[INSERT DATE 30 DAYS AFTER DATE OF PUBLICATION IN THE FEDERAL REGISTER]**

*Compliance date*: Compliance will not be required for § 9.10(i)(4)(iv) and (v), (j)(4) ,and (k) until the Commission publishes a document in the **Federal Register** announcing the compliance date.

**ADDRESSES:** The complete text of this document is available for inspection and copying during normal business hours in the FCC Reference Information Center, Portals II, 445 12th Street SW, Room CY-A257, Washington, DC 20554. Effective March 19, 2020, and until further notice, the Commission no longer accepts any hand or messenger delivered filings. This is a temporary measure taken to help protect the health and safety of individuals, and to mitigate the transmission of COVID-19. See *FCC Announces Closure of FCC Headquarters Open Window and Change in Hand-Delivery Policy*, Public Notice, DA 20-304 (March 19, 2020). https://www.fcc.gov/document/fcc-closes-headquarters-open-window-and-changes-hand-delivery-policy. During the time the Commission's building is closed to the general public and until further notice.

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**SUPPLEMENTARY INFORMATION:** This is a summary of the Commission's *Sixth Report and Order and Order on Reconsideration*, FCC 20-98, adopted on July 16, 2020, and released on July 17, 2020. The complete text of this document is available for inspection and copying during normal business hours in the FCC Reference Information Center, Portals II, 445 12th Street SW,

Room CY-A257, Washington, DC 20554. To request materials in accessible formats for people with disabilities (braille, large print, electronic files, audio format), send an email to FCC504@fcc.gov or call the Consumer & Governmental Affairs Bureau at (202) 418-0530 (voice), (202) 418-0432 (TTY). The complete text of the order also is available on the Commission's website at http://www.fcc.gov.

**Synopsis**

## I. INTRODUCTION

1. The Sixth Report and Order and Order on Reconsideration 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. 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

2. 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. We concluded that implementing the 3-meter metric within the existing compliance timeline was technically feasible and would yield significant public safety benefits. We required CMRS providers to deliver z-axis information to PSAPs in Height Above Ellipsoid and to provide floor level information when available. Deployment must be consistent with the configuration used in the test bed, and CMRS providers must comply with requirements for confidence and uncertainty data, compliance certifications, and live call data reporting. Finally, we amended our rules 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.

3. 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. 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. 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.

4. In response to the *Fifth Further Notice*, we received 20 comments and 12 reply comments, 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. 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. CTIA, AT&T, and T-Mobile filed oppositions to the BRETSA Petition, and BRETSA filed a reply to oppositions.

5. 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. Stage Za testing evaluated Google's Android-based Emergency Location Service. 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." 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.

6. 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.

## III. SIXTH REPORT AND ORDER

7. 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, 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.

8. 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.*

9. 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 Further Notice*. 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

10. 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. 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.

#### 1. Alternative Means to Demonstrate Compliance within a CMA

11. Deployment within a CMA is established by deploying the technology to cover 80% of the CMA population. 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. 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. 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.

12. *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. IAFF states that first responders need vertical location information for tall structures, which are not limited to the top CMA population centers. 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." 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. 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 economically efficient, and it redirects the placement of z-axis infrastructure to those locations where it is truly needed.

13. 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. 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. 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. 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.

14. *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).[1]

[1] 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 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

(continued….)

15. 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. 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. 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." 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. Google's comments suggest that Google will continue to refine its z-axis solution, 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. 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

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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.

in the market are equipped with such sensors. Moreover, data show that as of 2019, 81% of Americans owned a smartphone.

16. 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-axis-only handset marketplace." We note that CMRS providers must certify their compliance with the vertical location accuracy requirements within 60 days after each benchmark, 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

17. 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.

18. Commenters generally support deploying z-axis technology on a nationwide basis. APCO suggests expanding the requirements in the rules beyond the top 50 CMAs, and NENA states that "the ultimate goal is accurate z-axis location information for the entire country." 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." 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 information." 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.

19. 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)." 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." 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."

20. We agree with commenters who contend that our deployment requirements should ultimately ensure that vertical location information meeting our accuracy standards is provided nationwide. 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 accurate location information so that they receive the support they need in times of emergency." 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.

21. Accordingly, we require nationwide CMRS providers to deploy z-axis location technology or dispatchable location to all CMAs nationwide by April 2025.[2] 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. 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.

22. 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 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*. 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. T-Mobile asserts that under this alternative, z-axis technology would be available "across the country on nearly all devices"

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[2] 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.

by April 2021. Verizon and AT&T also support a schedule for introducing z-axis capable devices nationwide.

23. 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. 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*. 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 phased-in approach starting with a less rigorous metric is therefore warranted. 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.

24. 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*. It also sought comment

on tightening the 3-meter standard over time, e.g., to 2 meters or 1 meter. 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. 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 to meet the April 2021 benchmark. 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."

25. 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. 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.

26. 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." 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 safety and must be discarded." 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.

27. 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. 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. 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. 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. As the wireless providers acknowledged in the Amended Roadmap, 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.

28. 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. We find these arguments unpersuasive. NextNav argues that the CMRS providers underestimate the availability of barometer-equipped handsets and contends that its software "can be uploaded/pushed to capable devices without user opt-in." 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. Moreover, even if we assume that the NextNav and Polaris solutions would only benefit consumers in major markets who 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.

29. 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. First, despite our request in the *Fifth Further Notice* for commenters to provide data on costs and benefits for alternative solutions, 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. 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

30. 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." We further used this definition as the basis for our deployment 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."

31. 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.

32. 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. 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. 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.

33. Polaris asks the Commission to confirm that for barometric-based location solutions, only devices with barometric sensors can be considered z-axis capable. 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, 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.

34. T-Mobile questions whether CMRS providers can rely on third-party apps to deliver location software upgrades. 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.

35. 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. 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.[3] 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.[4] 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.

36. 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." 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."

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

[4] 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.

37. 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. 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. Second, Polaris contends that its software can be widely deployed as part of an OS upgrade or a carrier upgrade, and NextNav states that software updates for its solution can be uploaded to most z-axis capable handsets that were previously purchased.

38. 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.

39. 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. We 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. 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."

40. 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. 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

41. 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. 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." 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.

42. 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 vendors may be outside of a carrier's control. 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." CCA asserts that its small and rural carrier members have "finite resources," and cautions that "technical and marketplace barriers may delay small and rural carrier deployment beyond a year." However, NENA contends that non-nationwide providers should not be given additional implementation time beyond the one-year period afforded by the current rules.

43. 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. 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

44. 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. In the *Fifth Further Notice*, we noted the significant 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. 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.

45. 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*.[5] Given the National Emergency Address Database's demise, commenters uniformly support this change. Commenters also

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[5] 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." 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*.

affirm that a diverse array of 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." 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. AT&T and Google suggest that dispatchable location solutions may be technically feasible if carriers can leverage other data sources, including handset-based approaches.

46. 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. Some public safety commenters support 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. 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. However, there is broad support for treating dispatchable location as the preferred indoor location solution as it becomes technically feasible. 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." Verizon states that "nothing should stop service providers today from generating and delivering dispatchable location information to PSAPs

when feasible." APCO also advocates requiring provision of dispatchable location "when technically feasible."

47. 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.[6] 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.

48. 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). We also noted that for purposes of this requirement, dispatchable location solutions must be cost-effective. For non-fixed services, the requirements adopted in the *Kari's 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.[7]

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[6] 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).

[7] 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

(continued….)

49. 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.

50. *Privacy and Security*. In the *Fifth Report and Order*, we adopted privacy and security requirements for z-axis location information. 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. 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."

51. 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. Apple and NextNav support our proposal, and no commenter opposes it.

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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.

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

53. We decline to adopt additional restrictions proposed by Apple, which we conclude are unnecessary. 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." 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. 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.

54. 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. The privacy protections we have adopted in

this proceeding fully address CMRS providers' obligation to protect consumer privacy while also enabling location-accurate E911 technologies, and apply uniformly to all z-axis solutions. CMRS providers should fully disclose and explain these privacy protections to consumers so that consumers can make fully informed decisions where consent is required.

55. *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. Thus, as with horizontal confidence and uncertainty data, CMRS providers must report vertical confidence and uncertainty data using a confidence level of 90%. 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.

56. 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. 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. NENA notes that there are no established conventions for calculating or communicating the uncertainty associated with dispatchable location. Apple submits that location systems cannot accurately express uncertainty in terms of civic address ranges because address ranges—even when available—are not standardized, and do not convey information about actual distances or other spatial relations between addresses.

57. Although several commenters suggest that confidence and uncertainty values could be developed for dispatchable location, 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.

58. 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." 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.

### C. Compliance Testing and Certification

59. 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 deployed consistently with the manner in which they have been tested in the test bed. 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. 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, handset behavior, morphology, and weather conditions.

60. 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." 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. 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.[8]

61. 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

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

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.

62. 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. 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."[9]

### D. Continuing to Improve the Z-Axis Metric

63. 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, whether to enhance the vertical location accuracy testing process, 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. Commenters responding to these issues generally agree on the importance of

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[9] 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. 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?" 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.

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.

64. Some commenters support adopting a sub-3-meter metric, based primarily on NextNav's Stage Z test results and previous field trials. However, others contend that the current state of technology does not support tightening the metric. 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." 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.

65. 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. 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. CTIA argues that testing of various first responder scenarios would be better addressed by the public safety community. 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.

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

"significant" challenges with converting altitude to floor level.[10] CTIA, NextNav, and Polaris express skepticism that Height Above Ellipsoid can be converted to floor level in the near future. 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. However, such a basemap does not currently exist, and it is uncertain how quickly one could be developed or how much it would cost.

67. 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. Nonetheless, we encourage and 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. 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.[11] We also direct the Public Safety and Homeland Security Bureau to consider

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[10] 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. 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.

[11] The Bureau should also recommend whether further evaluation would likely be helpful in 2024.

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.

### E. Summary of Costs and Benefits

68. 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." Due to U.S. Department of Transportation updates for value of a statistical life, we presently estimate this annual benefit floor at $97 billion. In the *Fifth Report and Order*, we observed that adding vertical location information plays a major role in achieving the $97 billion benefit.[12] We also stressed the unquantifiable benefits of reductions in human suffering and property loss. 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. We also sought comment on our proposal to broaden the focus of our dispatchable location requirements to encourage emerging technologies that do not rely on the National Emergency Address Database. We received no explicit input on the costs or

[12] 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.

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. 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.

69. **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. We anticipate that network-based deployment would at least initially start from areas that have the highest concentration of buildings taller than three stories. NextNav indicates that it will deploy its solution in 105 CMAs. 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, and additional weather stations, used to calibrate handset barometric sensors, 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.

70. **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. 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." Accordingly, we do not anticipate any changes in our cost/benefit analysis for nationwide CMRS providers opting for handset-based deployment.

71. 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." As CCA puts it, "[m]any non-nationwide carriers are . . . at the mercy of what is discovered in the test bed." CCA states that "upgrading equipment to meet heightened standards is a costly endeavor," and that "[u]nlike nationwide carriers, many CCA members are dependent on vendors to update network capabilities that support location accuracy services." 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." For the multi-story deployment option, as IAFF notes, tall structures are present in environments inside and outside the top CMAs. 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

72. In this Order on Reconsideration, the Commission denies a petition for reconsideration requested by BRETSA. BRETSA seeks reconsideration of certain aspects of the *Fifth Report and Order*, contending that the order (1) was 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.

## V. PROCEDURAL MATTERS

73. **Final Regulatory Flexibility Act Analysis.** The Regulatory Flexibility Act of 1980, as amended (RFA), 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." 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. As required by the RFA, an Initial Regulatory Flexibility Analysis (IRFA) was incorporated in the *Fifth Further Notice of Proposed Rulemaking* released in November 2019 in this proceeding (85 FR 2683, January 16, 2020). The Commission sought written public comment on the proposals in the *Fifth FNPRM,* including comments on the IRFA. No comments were filed addressing the IRFA. This FRFA conforms to the RFA. The Commission will send a copy of the *Sixth Report and*

*Order and Order on Reconsideration,* including the FRFA, to the Chief Counsel for Advocacy of the Small Business Administration.

74. **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). OMB, the general public, and other Federal agencies will be invited to comment on the new or modified information collection requirements contained in this proceeding. 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, 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. 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 of the *Sixth Report and Order and Order on Reconsideration*.

75. **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).

## VI. ORDERING CLAUSES

76. 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.

77. 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.

78. 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.

79. 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).

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

81. IT IS FURTHERED 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.

82. 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.

**List of Subjects in 47 CFR Part 9**

Communications common carriers

- Communications common carriers
- Communications equipment
- Radio Federal Communications Commission

FEDERAL COMMUNICATIONS COMMISSION

Marlene Dortch,

Secretary.

## 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) and (v), (j)(4), (k), and (s) to read as follows:

**§ 9.10 911 Service.**

* * * * *

(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) 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) * * *

(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)(iv) and (v), (j)(4), (k), and (q)(10)(v) of this section contain information-collection and recordkeeping requirements. Compliance with paragraphs (i)(2)(ii)(C) and (D), (i)(4)(iv) and (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.

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