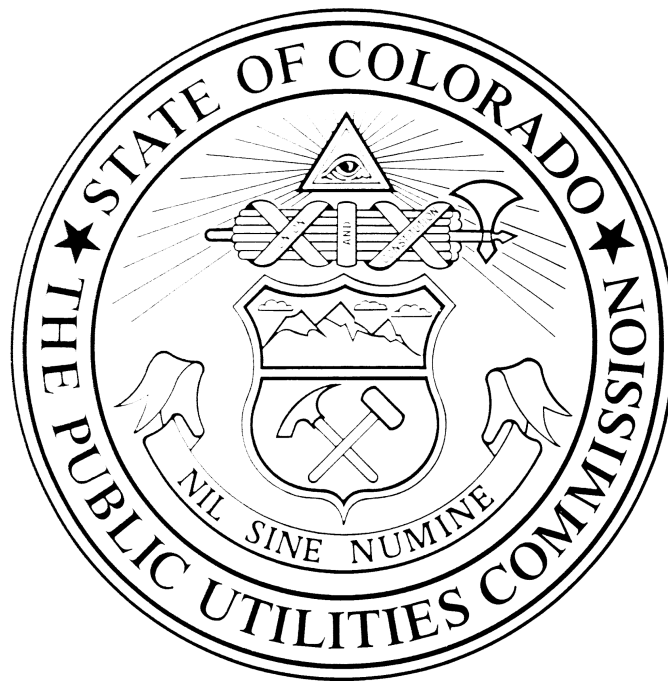


**Report on the State of 9-1-1 Services in Colorado
2021-2022**



Prepared by:

The Colorado Public Utilities Commission Staff

September 14, 2022



COLORADO

**Department of
Regulatory Agencies**

Public Utilities Commission

Eric Blank, Chairman
John C. Gavan, Commissioner
Megan Gilman, Commissioner
Doug Dean, Director

Patty Salazar, Executive Director
Jared Polis, Governor

September 14, 2022

The General Assembly
State Capitol Building
Denver, Colorado 80203

Dear Members of the Colorado General Assembly:

The purpose of the attached report is to fulfill the requirements of § 40-2-131, C.R.S., which requires the Commission to produce a State of 9-1-1 report for the members of the General Assembly, covering seven specific topic areas.¹ Statute also requires that the Commission present the report to the Senate Committee on Business, Labor, and Technology, or its successor committee, and the House of Committee on Business Affairs and Labor or its successor committee, on or before February 1.

Additionally, the statute requires that the report be developed in consultation with Public Safety Answering Points (PSAPs), 9-1-1 governing bodies, and statewide organizations that represent public safety. For a description of how this consultation was obtained, and how input from the stakeholders was incorporated into this report, see Appendix B.

9-1-1 technology is complex, as are the funding and governance issues that are involved in the provision of 9-1-1 service to the public. This complexity has resulted in jargon and acronyms that can make it difficult to follow for newcomers to the topic. The reader is encouraged to consult the glossary (Appendix A) as necessary.

The Commission is pleased to present this fifth edition of its State of 9-1-1 Report to the members of the General Assembly, and looks forward to presenting this material and providing the members with a deeper understanding of this critical service. 9-1-1 is the first service to be accessed by members of the public in an emergency, and it must be a strong first link in the public safety chain. The Commission looks forward to working with the members of the General Assembly in ensuring that Colorado has the most robust, effective, and efficient 9-1-1 system possible.

¹ § 40-2-131(1)(a)-(g), C.R.S.





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Executive Summary

Key Points:

- *The migration of Colorado's Public Safety Answering Points (PSAPs) from the legacy 9-1-1 network to an Emergency Services IP Network (ESInet) is essentially complete.*
- *The ESInet Users Group is continuing to plan for future deployment of Next Generation 9-1-1 (NG9-1-1) services.*
- *The Commission is currently engaged in a rulemaking process to create a mechanism for improvement of 9-1-1 network resiliency.*
- *Colorado's existing local 9-1-1 funding mechanisms are sufficient for most 9-1-1 related costs in the state, and these funding mechanisms were significantly improved through the passage of HB 20-1293.¹ However, some statewide costs are left without a funding mechanism to pay for them. Two potential solutions are provided, one of which may require legislative action.*

The state of 9-1-1 services in Colorado continues to be in transition. While the capabilities of the 9-1-1 system lag behind the functionality available to the public through commercial telecommunications services, Colorado has taken the first step towards modernizing its 9-1-1 capabilities. All but two of Colorado's Public Safety Answering Points (PSAPs) have been migrated off of the legacy E9-1-1 network and onto an Emergency Services IP Network (ESInet). While this is only the first step toward full implementation of Next Generation 9-1-1 (NG9-1-1), it is an essential one that sets the foundation for future advancements.

In the meantime, Colorado's local 9-1-1 governing bodies through the ESInet Users Group have begun discussing future steps with Colorado's Basic Emergency Service Provider (BESP), Lumen Technologies. One tool to help guide this transition is a Next Generation 9-1-1 Strategic Plan, which will help solidify the future development of the ESInet into an NG9-1-1 system. A first edition of this document was approved by a stakeholder group formed by the Commission in August, and will be updated annually.²

The Commission is continuing to address issues related to reliability and resiliency in the portion of the 9-1-1 call flow that is regulated by the Commission, referred to as Basic Emergency Service. A rulemaking is currently underway that is intended to leverage the state 9-1-1 surcharge to fund improvements to this portion of the network.

The passage of HB 20-1293 has facilitated the first steps toward Next Generation 9-1-1 deployment through the creation of a state 9-1-1 surcharge to reimburse 9-1-1 governing bodies for the increased costs of 9-1-1 call delivery on an Emergency Services IP Network (ESInet), and freed up local funds for use on costs within the PSAP, such as equipment,

¹ The costs that may be funded with the state 9-1-1 surcharge, the prepaid wireless 9-1-1 charge, and local emergency telephone charges may be found in § 29-11-104, C.R.S.

² https://docs.google.com/document/d/1SbsHfCjbJ_aKAkD8IfGZqRRz6-44-ZBu35BW1DZmXCw

training, and personnel.³ However, 9-1-1 Funding in Colorado remains entirely local. All surcharge funds are either remitted by telecommunications service providers directly to Colorado's 58 local 9-1-1 governing bodies, or they are remitted to the state which then distributes the funds to the governing bodies. For most costs related to the provision of 9-1-1 service in the state, including implementation of NG9-1-1 services, this is sufficient. Some of these costs may be integrated into the existing ESInet tariff on file with the Commission from Lumen Technologies, and those costs may be reimbursed to the governing bodies through adjustment of the state 9-1-1 surcharge rate, adjusted annually by the Commission. Other costs will be borne by the local 9-1-1 governing bodies themselves, and those costs may be recovered through adjustment of local emergency telephone charge rates.

However, other costs related to a robust, ubiquitous 9-1-1 service and full implementation of NG9-1-1 are harder to pay for through local funds. A discussion of these items and potential solutions can be found in [Section 5](#), but examples of statewide expenses that currently have no funding mechanism include a statewide training program for the public safety telecommunicators who take 9-1-1 calls from the public, universal provision of pre-arrival instructions for medical calls, ensuring there is sufficient cybersecurity support for all PSAPs in the state, and other items of critical importance to the future of 9-1-1 service in Colorado.

The Commission has three recommendations for the legislature to consider:

- **The legislature should consider legislation to create a 9-1-1 services enterprise, based on draft legislation being proposed by the Commission's 9-1-1 Advisory Task Force.** The draft legislation could potentially provide the state-level funding mechanism for statewide costs related to 9-1-1 discussed above and in more detail in [Section 5](#). Alternatively, the costs discussed will continue to go unfunded, having an adverse impact on the consistency of the level of service provided to callers by PSAPs in different regions of the state.
- **The legislature should consider working with 9-1-1 stakeholders to develop minimum operational standards for PSAPs.** This could include minimum training standards for public safety telecommunicators, standard goals for call answering times, standards regarding the use of emergency medical dispatch protocols and the provision of medical pre-arrival instructions, the use of foreign language interpretation services for 9-1-1 callers who do not speak English, and other standards that may enhance the basic level of 9-1-1 service offered statewide.⁴ The Commission plans on pursuing the creation of voluntary standards for PSAPs in the state, but only the legislature can enact mandatory minimum standards for 9-1-1 service delivery.
- **The legislature should consider whether a percentage-based prepaid wireless 9-1-1 charge might be more appropriate and equitable than a flat per-transaction rate.**

³ For more information regarding the impact of HB 20-1293, see [Section 7](#).

⁴ See [Section 5](#) for more detail regarding this recommendation.

The passage of HB 20-1293 changed the prepaid wireless 9-1-1 charge from a percentage to a flat rate per transaction. While this change has generated a significant amount of funding for Colorado's 9-1-1 governing bodies, the Commission has concerns that it may be disproportionately impacting lower-income consumers who, due to economic circumstances, may be forced to purchase prepaid wireless telecommunications services more frequently than customers with higher income levels. While it is not the Commission's intent to reduce the overall revenue being generated by this surcharge, the Commission believes that a percentage-based rate, higher than the one that previously existed, may be more equitable.⁵

⁵ See [Section 7](#) for more discussion on this topic.

1. Commission Activity Regarding 9-1-1 Service

Commission Activity During the 2021-2022 Fiscal Year

During the 2021-2022 Fiscal Year, the Commission undertook the following activity regarding 9-1-1 service:

- Received two applications for an increase in the local emergency telephone charge (ETC), filed by the Washington-Yuma Counties E-911 Emergency Telephone Service Authority Board⁶ and the Phillips County 9-1-1 Emergency Telephone Service Authority. The Application filed by Phillips County for an ETC rate of \$2.30 per line per month was granted.⁷
- Conducted a proceeding to set the state 9-1-1 surcharge rate, the threshold for Commission approval required for emergency telephone charge rates, the prepaid wireless 9-1-1 charge rate, and distribution formulas for the state 9-1-1 surcharge and prepaid wireless 9-1-1 charge, by October 1, 2021, as required by § 29-11-102.3 and 102.5, C.R.S.
- Received and approved one application for an increase in the number of concurrent sessions for which a 9-1-1 governing body may receive reimbursement through the state 9-1-1 surcharge, from the Adams County E-911 Authority.⁸
- Issued a Notice of Proposed Rulemaking “to improve the Commission’s rules regarding Basic Emergency Service network reliability and to prescribe a tariff-based mechanism for funding Basic Emergency Service network improvements.”⁹ This rulemaking is ongoing with a final public comment hearing scheduled for October 13, 2022.
- Filed one set of comments with the Federal Communications Commission in support of a Petition from the National Association of State 9-1-1 Administrators.¹⁰
- Facilitated six meetings of the Commission’s 9-1-1 Advisory Task Force, created pursuant to 4 CCR 723-1-2145.¹¹ Beginning in 2022, staff is also arranging “lunch-and-learn” webinars for local 9-1-1 stakeholders between the meetings of the Task Force. Three of these webinars are provided in the first half of the year.
- Continued facilitation of the ESInet Users Group, a committee of the 9-1-1 Advisory Task Force, created by order of the Commission approving the implementation of an Emergency Services IP network (ESInet).¹²
- Oversaw the continued migration of the state’s Public Safety Answering Points (PSAPs)

⁶ See Proceeding No. [21A-0451T](#).

⁷ See Proceeding No. [21A-0426T](#).

⁸ See Proceeding No. [22A-0195T](#).

⁹ See Proceeding No. [22R-0122T](#).

¹⁰ The Commission’s comments to the FCC may be viewed at <https://drive.google.com/drive/folders/1nBCw5l6RF1b2bdOkEW5mGnpWX56KQCqa>

¹¹ The Commission’s authority for creating the Task Force derives from its oversight of Basic Emergency Service. See § 40-15-201 (2), C.R.S. See the Task Force’s website at <https://sites.google.com/state.co.us/9-1-1-advisory-task-force/home>.

¹² See Decision [R18-1063T](#).

- to the ESInet, a process which is complete with the exception of two military PSAPs.¹³
- Filed an annual report to the Federal Communications Commission pursuant to the New and Emerging Technologies 911 Improvement Act of 2008 (NET 911 Act).¹⁴
- Participated in an annual data collection effort conducted by the National 9-1-1 Program.¹⁵
- Concluded administration of a grant program to the local 9-1-1 governing bodies to reimburse them for tariffed non-recurring costs and project management fees.
- Developed a draft NG9-1-1 Strategic Plan, which was approved by the ESInet Users Group in August of 2022.
- Worked extensively with the 988 program manager with the Colorado Department of Human Services to establish a relationship between 988 and 9-1-1 and ensure a smooth implementation of 988 services. This involvement included participating in a “policy academy” hosted by the federal Substance Abuse and Mental Health Services Administration (SAMHSA) to help prepare stakeholders in and outside of 9-1-1 for 988 implementation. These efforts are ongoing.
- Continued our partnership with the Colorado 9-1-1 Resource Center, a non-profit organization that provides information and support services for local 9-1-1 governing bodies and PSAPs in the state, to conduct roundtable discussions and provide information to local 9-1-1 officials regarding COVID-19 response.¹⁶

In addition to the activity of the Commission listed above, Commission staff was also very engaged in state-wide and national activities regarding 9-1-1 service, including:

- Serving as an officer on the board of the Colorado 9-1-1 Resource Center and the National Association of State 9-1-1 Administrators.
- Served as co-chair of the technology committee for the Colorado joint chapter of the National Emergency Number Association and the Association of Public Safety Telecommunications Officials, Intl.
- Leading several committees of the Commission’s 9-1-1 Advisory Task Force, including the Agenda Committee, Outage Committee, and Reports Committee.
- Participated in meetings of the Colorado Homeland Security Advisory Committee’s Public Safety Communications Subcommittee.
- Served on the 9-1-1 Fee Diversion Strike Force created by the FCC.
- Participated in the working groups of Transform911, an initiative of the University of Chicago Health Lab.¹⁷

Commission staff assigned to 9-1-1 related matters for the 2021-2022 fiscal year primarily consisted of the following:

¹³ The two remaining PSAPs in Colorado to be migrated to the ESInet are the ones operated at the Cheyenne Mountain Complex and the one operated by the Schriever Space Force Base. Lumen has reported that it continues to make progress in the migration of the PSAP at Cheyenne Mountain, but that Schriever SFB is not actively cooperating in the migration of its PSAP.

¹⁴ See <https://www.fcc.gov/general/911-fee-reports>

¹⁵ See <https://resourcecenter.911.gov/code/9-1-1ProfileDatabase.aspx>

¹⁶ See <https://sites.google.com/state.co.us/colorado911program/covid-19-resources>

¹⁷ See transform911.org for more information

- Daryl Branson, state 9-1-1 program manager
- Holly Bise, state relay administrator
- Jolene Sena, surcharge administrator

Ms. Bise and Ms. Sena both have other duties not related to the 9-1-1 program. Between the three positions, there are roughly 2.0 FTE working on 9-1-1 issues, specifically.

Commission Activity Planned for the 2022-2023 Fiscal Year

In 2019, the Commission initiated a working group to examine issues related to 9-1-1 network reliability, and those meetings have concluded.¹⁸ In its order closing the proceeding, the Commission directed Commission staff to prepare a notice of proposed rulemaking (NOPR) to modify the Commission's current 9-1-1 reliability rules to incorporate the findings of the working group. The NOPR was issued on March 9, 2022.¹⁹ Following a review of comments perceived in the proceeding, the Administrative Law Judge assigned to the proceeding ordered stakeholders to engage in a workshop process to develop consensus rules, and those workshops are ongoing. A final public comment hearing is scheduled for October 13, 2022.

Following the conclusion of this rulemaking, Staff intends to open a miscellaneous proceeding to catalog best practices and voluntary standards for Public Safety Answering Points. This is intended to be a stakeholder-driven process whereby members of the 9-1-1 stakeholder community in Colorado may collaborate to develop best practices and voluntary standards to improve consistency of 9-1-1 service provision throughout the state.

As stated earlier, Commission staff has been working with the 988 program manager, part of the Behavioral Health Administration under the CDHS, to facilitate implementation of 988 in the state, particularly as it relates to how 988 and 9-1-1 will interact. This is an ongoing effort, and the Commission's 9-1-1 program manager is currently working with the 988 program manager to organize ongoing meetings of a 911/988 integration working group. One of the first tasks of this working group will be to help develop model policy or procedural flowcharts for when 9-1-1 calls can or should be transferred between the two services.

The Commission is also anticipating that the state's current Basic Emergency Service Provider (BESP), Lumen Technologies, may file an advice letter and tariff pages to provide additional services for PSAPs that are connected to the Emergency Services IP Network (ESInet), which delivers 9-1-1 calls to the state's 86 PSAPs. Additional services and features that have been requested by the ESInet Users Group include call metrics reporting, text-to-911 support, and GIS tools in preparation for geospatial routing.

It is also anticipated that the Federal Communications Commission may begin providing states access to its Network Outage Reporting System (NORS) beginning as early as September of this year. An aggregation of the data available in this system for Colorado may prove useful in determining trends in outages that could help inform future editions of this report.

¹⁸ See Proceeding [19M-0026T](#) and Decision [C21-0036](#).

¹⁹ See Proceeding No. [22R-0122T](#).

Commission staff will review the data from NORS when and if it becomes available to determine the best use of the information for the state.

Commission staff will be completing annual reporting requests from the Federal Communications Commission and the National 9-1-1 Program. Staff will also continue to administer the Commission's 9-1-1 Advisory Task Force and facilitate its meetings and agendas, pursuant to 4 CCR 723-2-2145(a), as well to facilitate the meetings of the ESInet Users Group, which is chaired by Tina Powell with the Weld County Regional Communications Center. Staff will continue to participate in the national organizations of the National Emergency Number Association (NENA), the Association of Public Safety Communications Officials, Intl, (APCO), the National Association of State 9-1-1 Administrators (NASNA) and the National Association of Regulatory Utility Commissioners (NARUC).

2. The Current 9-1-1 Service Environment

Structure

9-1-1 service in Colorado exists in three domains, represented in Figure 2.1, below.

1. **The Originating Service Domain:** When a caller dials 9-1-1, the call is initially handled by the caller's telephone service provider, which delivers the call to the Basic Emergency Service Provider (BESP). The call may pass through one or more intermediate providers before reaching the BESP.
2. **The Basic Emergency Service Domain:** 9-1-1 calls are aggregated by the BESP from all of the Originating Service Providers (OSPs) and their intermediates and routed to a demarcation point for the appropriate Public Safety Answering Point (PSAP). Being the portion of the call flow handled by the BESP, this is the portion of the 9-1-1 call flow described in the Commission's definition of Basic Emergency Service.
3. **The Local Domain:** Once received from the BESP, 9-1-1 calls are then the responsibility of the local agencies, including the PSAP.

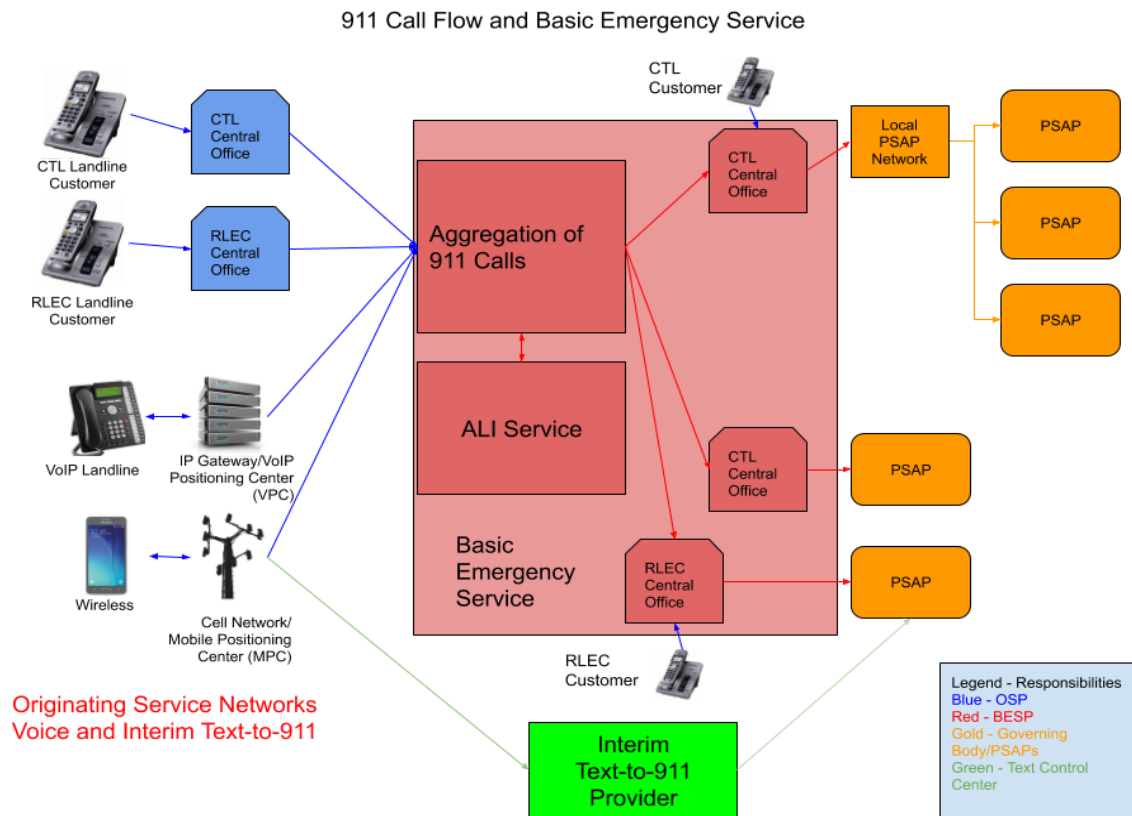


Figure 2.1: 9-1-1 Network Call Flow

Originating Service Providers (OSPs) include any vector by which a 9-1-1 call may be made, currently encompassing wireline, wireless, and Voice-over-Internet-Protocol (VoIP) services, and to a lesser extent satellite phones. In the future, this may also include vectors from the Internet-connected service, such as smart assistants.

Basic Emergency Service (BES) includes the aggregation, routing, and transport of 9-1-1 calls to a PSAP.²⁰ BES also includes the delivery of the location information that is associated with a 9-1-1 call.²¹ Lumen Technologies is currently the only BESP in Colorado that delivers 9-1-1 calls to PSAPs.

There are currently 82 primary PSAPs in Colorado (PSAPs that receive 9-1-1 calls directly from the BESP), and four secondary PSAPs (PSAPs that only receive 9-1-1 calls transferred from a primary PSAP and delivered by the BESP).²² The Local Domain also includes 58 9-1-1 governing

²⁰ § 29-11-101(7), C.R.S.

²¹ 4 CCR 723-2-2131(j).

²² A full list of Colorado’s PSAPs may be found on the Colorado 9-1-1 Program web page.

<https://sites.google.com/state.co.us/colorado911program/home>

bodies, or “governing bodies” (29-11-101(16), C.R.S.).²³ These governing bodies collect 9-1-1 emergency telephone charge remittances from telecommunications service providers and fund the local emergency telephone service, and in some cases provide technical support and local networks for PSAPs.

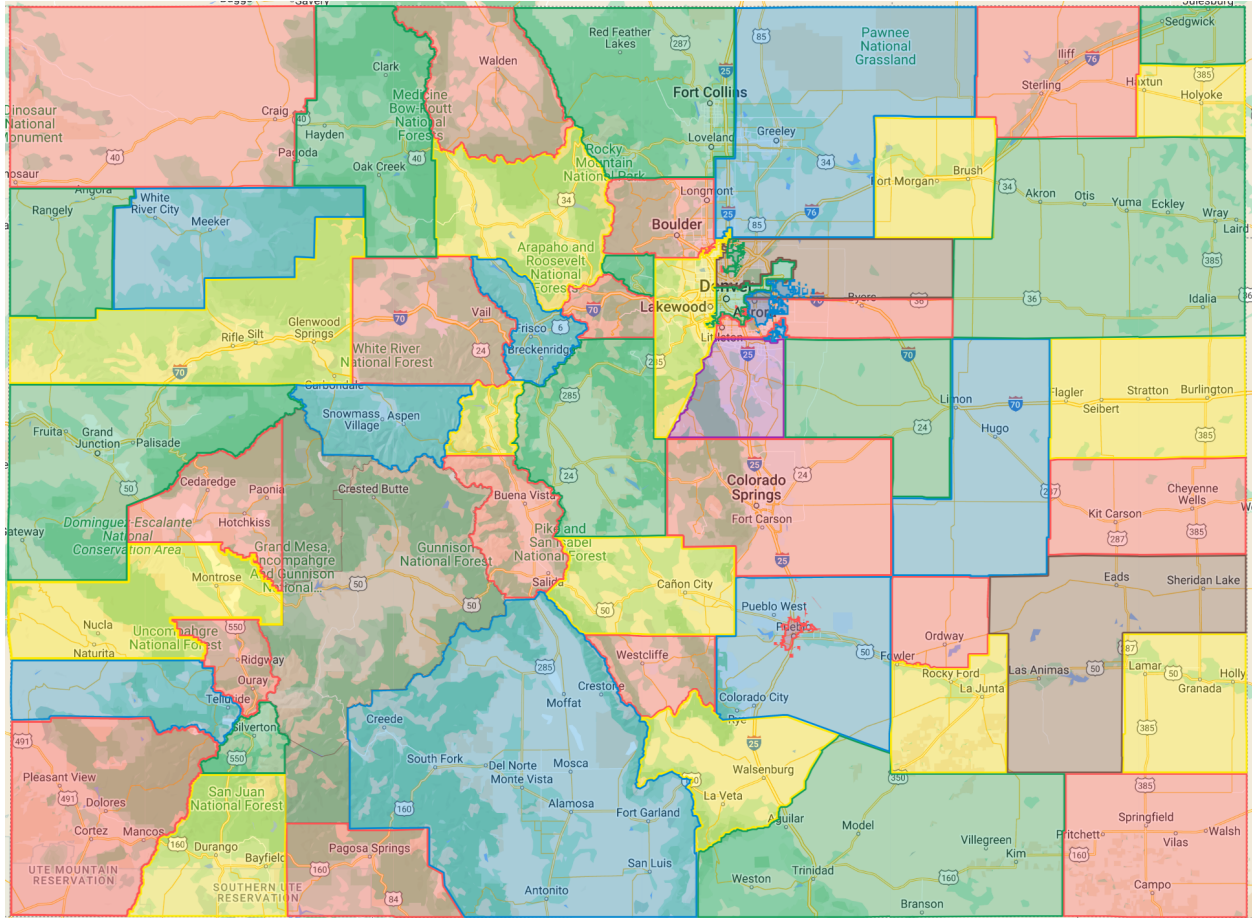


Figure 2.2: Colorado’s 9-1-1 Governing Bodies. Each governing body may fund one or more PSAP²⁴

The Statutory Limits of Commission Oversight of 9-1-1 Service

It is important to differentiate what parts of the 9-1-1 call flow are overseen by the Commission, and what parts of the 9-1-1 call flow the Commission is statutorily restricted from regulating.

A 9-1-1 call begins with an individual caller dialing 9-1-1 on their landline, wireless, or VoIP

²³ A full list of Colorado’s 9-1-1 governing bodies may be found on the Colorado 9-1-1 Program web page. <https://sites.google.com/state.co.us/colorado911program/basic-emergency-service>

²⁴ An interactive version of this map may be found on the Colorado 9-1-1 Program web page. <https://sites.google.com/state.co.us/colorado911program/basic-emergency-service>

device. It must then pass through a variety of networks, owned by a variety of different entities, before it is finally delivered to the BESP for aggregation and delivery to the PSAP. Since the Commission is only granted regulatory authority by statute over “Basic Emergency Service,” any failure within the 9-1-1 call flow that occurs before the call is delivered to the Basic Emergency Service Provider is unregulated by the Commission.²⁵

Likewise, once the call is delivered by the BESP to the demarcation point of a 9-1-1 governing body or PSAP, it is no longer part of “Basic Emergency Service,” meaning any failure that occurs within local PSAP networks or within the PSAPs themselves are outside of the jurisdictional scope of the Commission’s authority regarding 9-1-1 service.

For a visual representation of this, note that in figure 2.1 above, only the portion of the call flow shaded in red is regulated by the Commission.

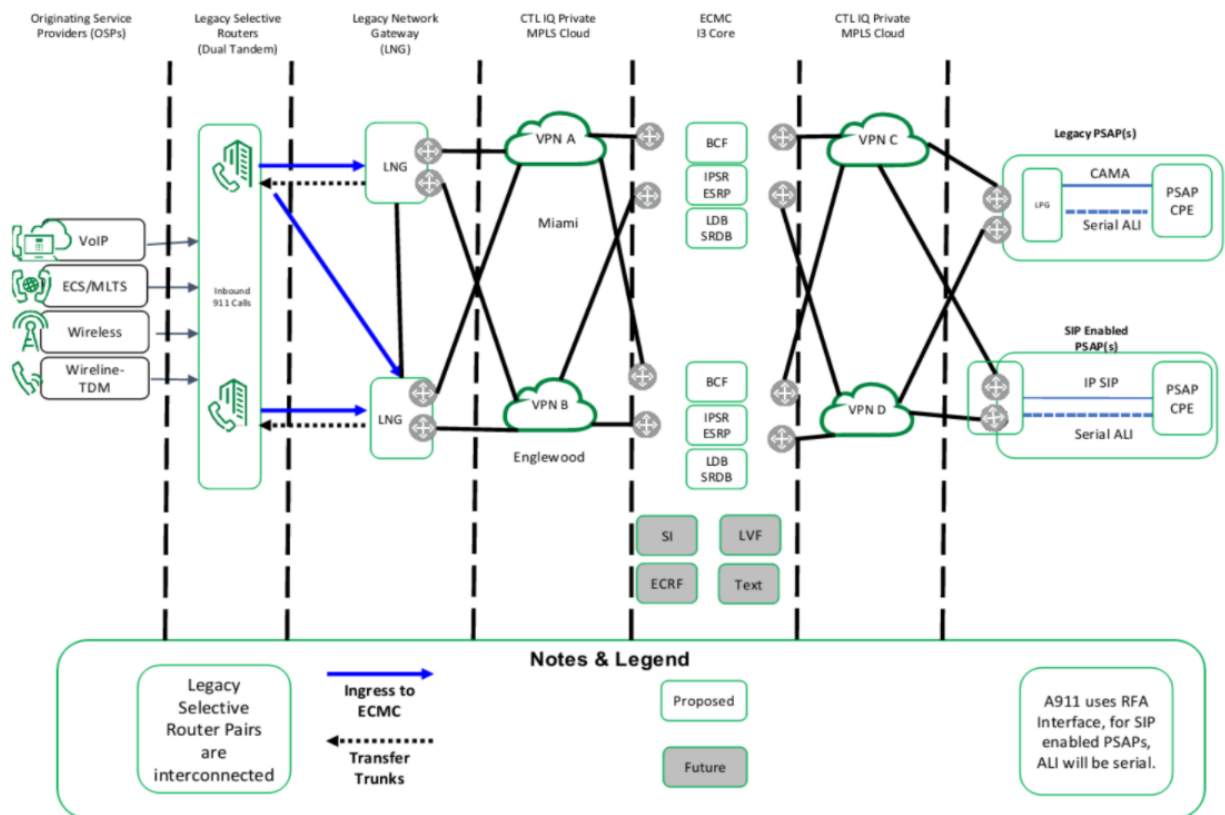
In practical terms, this means that the Commission cannot require outage reporting from Originating Service Providers. Nor can the Commission impose requirements, including outage reporting, on the PSAPs, with the exception of requiring annual reporting as allowed in § 29-11-102(4), C.R.S.

One implication of these limits that should be noted is that Lumen Technologies serves as both a BESP and an OSP, sometimes operating under the name CenturyLink and sometimes under Lumen Technologies. Whether the company is considered a BESP or an OSP depends upon which parts of its network are being considered. An outage in a portion of the network that affects call flow from the aggregation point of the Basic Emergency Service network to the PSAP is regulated, but an outage that occurs in a portion of their network preventing calls from ever reaching the aggregation point is not.

Technology

9-1-1 calls are delivered by originating service providers to the Basic Emergency Service Provider (BESP) at one of several points of interconnection, often co-located with one of three sets of redundant selective routers. The selective router compares the phone number from which the 9-1-1 call is originating against a selective router database (SRDB) and routes the call to the appropriate PSAP, accordingly. Prior to delivery of the 9-1-1 call to the PSAP, Lumen Technologies converts the call, if necessary, to SIP (Session Initiated Protocol) format, so that the call may be delivered to the PSAP via the Emergency Services IP Network (ESInet). In some cases, the call is then converted back into an analog format for handling by the PSAP’s 9-1-1 phone equipment, also referred to as Customer Premise Equipment (CPE). If the PSAP’s CPE is capable of handling calls in IP format, this last step conversion is unnecessary, and it is anticipated that as older CPE is retired at the PSAPs, eventually all 9-1-1 calls will be handled in IP format.

²⁵ § 40-15-201, C.R.S.



Legend:

- BCF - Border Control Function
- ECRF - Emergency Call Routing Function
- ECS – Enterprise Communications System
- ESRP - Emergency Services Routing Proxy
- IPSR - IP Selective Router
- LDB - Location Database
- LNG – Legacy Network Gateway
- LPG – Legacy PSAP Gateway
- MLTS – Multi-Line Telephone System
- MPLS – Multiple Protocol Labeling Service
- SI - Spatial Interface
- TDM – Time Division Multiplexing
- Text - Text to 911 service
- VPN – Virtual Private Network

Figure 2.3: ESInet 9-1-1 Call Flow with Legend. Source: CenturyLink/Lumen Basic Emergency Service Tariff, Colorado Tariff No. 25

Once received by the PSAP, the PSAP’s CPE will use the phone number from which the 9-1-1 call originates to query the Automatic Location Identification (ALI) database. This database

will then return basic information about the call, such as the subscriber name and address, to the PSAP. For wireless and VoIP calls, the OSP or its agent populates the ALI database with the caller's location, if known.

Colorado's 9-1-1 network is currently a mix of "legacy" technology, and "transitional" technology, as opposed to "Next Generation 9-1-1". As of the end of the 2021-2022 fiscal year, all but 3 PSAP sites have been migrated to the "transitional" technology, a step toward a Next Generation 9-1-1 network, while the rest of the state's PSAPs remain on the legacy 9-1-1 network. See [Section 3](#) for information about Colorado's migration to Next Generation 9-1-1.

Because legacy 9-1-1 networks are unable to deliver data types other than voice to the PSAP, text to 9-1-1 is delivered separately from the BES network. Text to 9-1-1 calls are routed through a third party called a Text Control Center (TCC), which then delivers the call directly to the PSAP answering the call.

9-1-1 calls may be placed from one of four general categories of services, currently.

- Landline (or wireline). These are 9-1-1 calls from traditional wired home or business phones.
- Cellular (or wireless). These are 9-1-1 calls from mobile phones, including smartphones. This category includes prepaid wireless telecommunications services.
- VoIP. These are 9-1-1 calls from phones that use the Internet for delivery of the call. These may be either static (installed in a specific location) or nomadic (meant to be portable and to move with the caller).
- Multi-Line Telephone Systems (MLTS, also called Enterprise Communications Systems, or ECS). These are 9-1-1 calls from enterprise telephone systems in schools, office buildings, hospitals, factories, or anywhere else that makes use of multiple extensions branching from a single phone system.

9-1-1 Calls by Type 2021-2022 FY

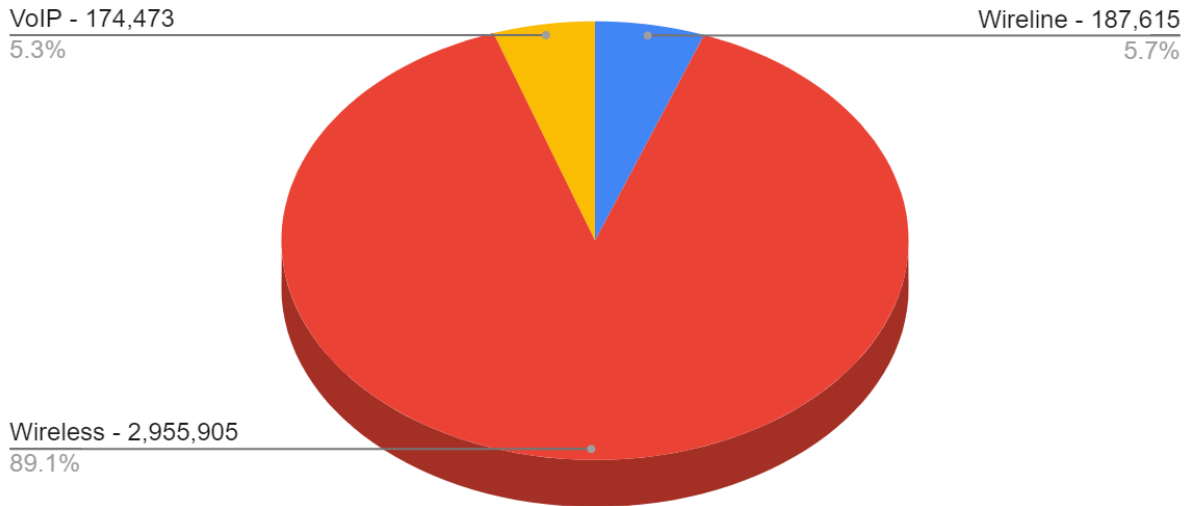


Figure 2.4: 2021-2022 Statewide 9-1-1 calls by type. Total call volume was 3,318,004. This includes initial calls to the PSAP and calls transferred in from another PSAP, so some calls may be counted twice.

All 9-1-1 service in Colorado is considered “Enhanced” 9-1-1 (or E9-1-1), which is distinguished by the use of selective routers for the routing of the 9-1-1 call to the appropriate PSAP. Perhaps more notably, E9-1-1 allows for the association of location information with the 9-1-1 call.

In order for wireless 9-1-1 calls to be associated with location information, the PSAP must be capable of receiving such location information. Every primary PSAP in Colorado is capable of receiving location information from wireless 9-1-1 calls.

Emergency Notification Services

Outbound emergency notifications to the public are provided using different services for different applications, including emergency notifications services (ENS). Local 9-1-1 governing bodies may use 9-1-1 funds to pay for ENS.²⁶ However, ENS is not part of the 9-1-1 system, and its use and operation by local agencies is not regulated by the Commission.

General Operations

²⁶ See § 29-11-104(2)(a)(I)(C) and (D), C.R.S.

Operations within Colorado’s 86 PSAPs (82 primary and 4 secondary) are locally controlled. PSAPs are often operated as a part of a local law enforcement agency but are sometimes operated as independent agencies of a city or county government, or as part of a fire agency. While the term “PSAP” refers only to facilities that answer 9-1-1 calls from the public, every PSAP in Colorado is also a dispatch center, dispatching calls for service to first responders for one or more law enforcement agencies, fire protection service, or emergency medical service. PSAPs also field a large number of non-emergency calls from the public, usually exceeding the number of 9-1-1 calls they receive.²⁷

Accessibility

Access to 9-1-1 services for individuals with accessibility needs is a consideration that must be included in any evaluation of the state’s 9-1-1 services, and in any planning regarding the future of 9-1-1 services in Colorado. There are a number of ways that persons with accessibility needs can access the 9-1-1 system in Colorado.

TTY, Relay Services, and Other Accessibility Devices

TTY (an abbreviation that originally stood for “teletypewriter”) is a method that is still used by some individuals who are deaf, hard of hearing, deafblind or have speech disabilities. These devices allow the user to connect a keyboard telephone and type to and receive typed responses from the individual on the other end of the call also using a TTY or type and receive responses through a third party relay service if the other caller is using a traditional telephone. Once seen as a primary method for individuals with communications-related disabilities to contact 9-1-1, the U.S. Department of Justice still requires all PSAPs nationwide to be able to accept and respond to 9-1-1 calls made with TTY devices. However, due to the widespread availability of text messaging service from mobile devices, and due to other technical limitations of TTY devices, fewer people continue to use TTY devices.

Relay services include traditional Telecommunication Relay Services (TRS), Captioned Telephone Services (CTS), Video Relay Services (VRS), and IP Relay Services. While still used by some individuals with communication disabilities, traditional TRS has seen a decline in usage over recent years due to TRS users switching to Internet-based relay services and video relay services that accommodate sign language users. Because relay services involve the use of a 3rd party to relay the call to the PSAP, location information for the caller is sometimes not available.

²⁷ Note: There is an industry trend to move away from the term “Public Safety Answering Point” or “PSAP” in favor of the term “Emergency Communications Center” or “ECC”. For the purposes of this report, we continue to use the term PSAP since it is the term defined in statute and specifically refers to ECCs that receive 9-1-1 calls, whereas the term “ECC” can be more broad.

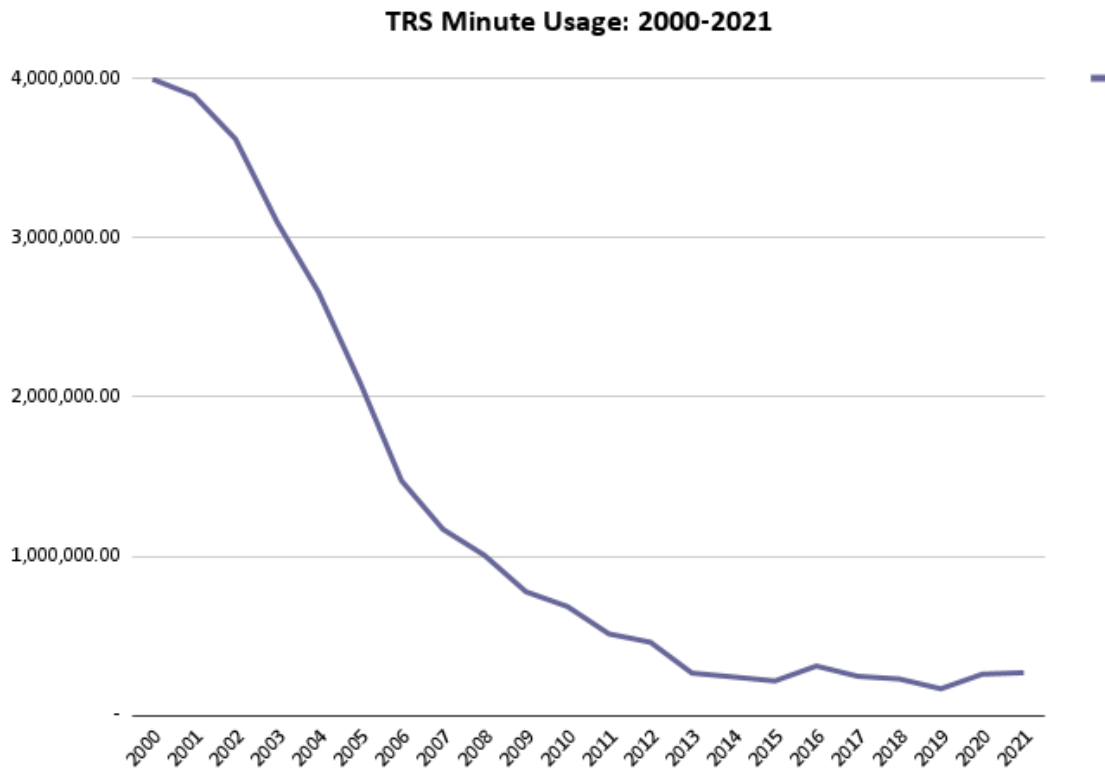


Figure 2.5: Number of minutes of state TRS service usage by fiscal year.

There is a long list of other communications methods other than TTYs that a caller with an accessibility need might use, depending on the nature of their disability. These include IP captioned telephone services, video relay services, IP instant messaging, email, voice carry over (VCO) phones, and more. All of these methods have various limitations, most notably that they require an Internet connection or specialized equipment that may not be convenient for mobile use. Some of these methods, such as IP instant messaging and email, are rarely, if ever, used to request emergency assistance.

Text to 9-1-1

Text to 9-1-1 service allows individuals to send a text message to 9-1-1 by simply entering “911” in the “to” field of their cellular phone’s text messaging application. Although text to 9-1-1 service has applications for hearing individuals as well (such as being able to contact 9-1-1 silently when making a verbal 9-1-1 call might put them in danger), text to 9-1-1 is an accessibility option for callers who are deaf, hard of hearing, deaf-blind, or have a speech disability.

There is no federal or state mandate for PSAPs to provide text to 9-1-1 service to their residents. Despite this, text to 9-1-1 service was first made available in Pitkin County in 2013, and today most of Colorado's primary PSAPs have implemented text to 9-1-1 service. Since the last edition of this report, all six counties of the San Luis Valley implemented text-to-911 through the State Patrol office in Alamosa, which takes 9-1-1 calls for the entire region. Cheyenne County also implemented text-to-911 when it consolidated its 9-1-1 call taking services with Kit Carson County, which already had the service.

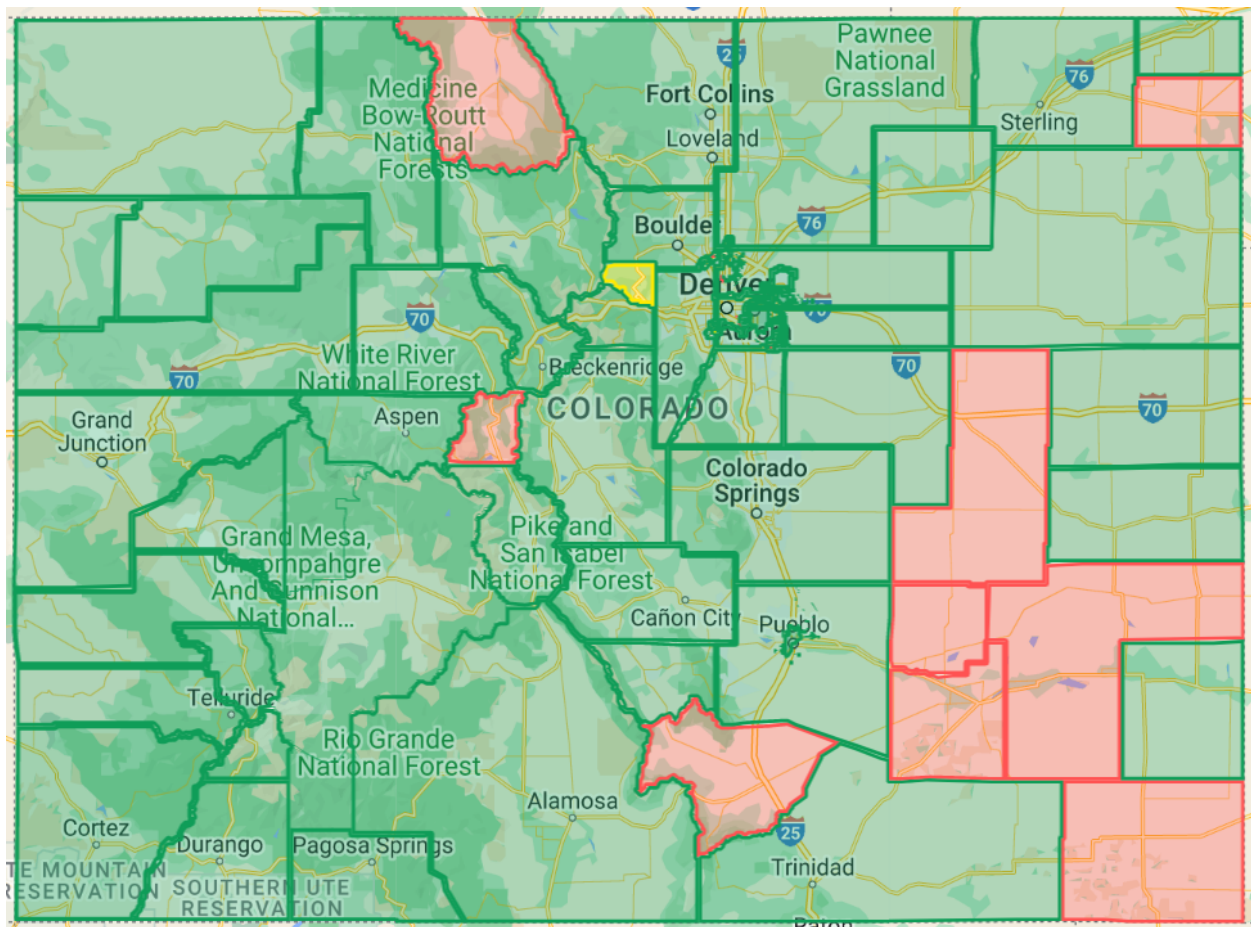


Figure 2.6: Text to 9-1-1 Availability as of July 1, 2022. Red indicates that a 9-1-1 governing body contains no PSAP providing text to 9-1-1 service. Yellow indicates that one but not all PSAPs in that governing body's service area provide text to 9-1-1 service. Green indicates that all PSAPs serving that governing body provide text to 9-1-1 service.

These efforts are being supported largely by the Colorado 9-1-1 Resource Center, a non-profit entity created by order of the Commission in 2006 to provide support and informational resources to local 9-1-1 officials.

The ESInet Users Group, a committee of the Commission's 9-1-1 Advisory Task Force, has entered into discussions with Lumen Technologies regarding the possibility of delivering text

to 9-1-1 calls via the Emergency Services IP network (ESInet) to the PSAPs. This would not necessarily replace the secondary connections most of the PSAPs are currently using to receive text messages from the public, but would help bring Colorado into having 100% coverage for text to 9-1-1 service and add another layer of redundancy that could help make the public's ability to contact 9-1-1 more reliable.

Other Considerations Regarding Accessibility

It is essential that as Next Generation 9-1-1 is implemented, as well as any applications or services that are enabled by Next Generation 9-1-1, that the accessibility community is included in the discussion to ensure that their needs and concerns are addressed and accommodated to the greatest extent possible.

Next Generation 9-1-1 provides opportunities for more consistency in the availability of accessibility functions for 9-1-1 services. For instance, text to 9-1-1 is currently available on a PSAP by PSAP basis, with each PSAP implementing a separate solution for delivery of text 9-1-1 calls to the PSAP. The ESInet Users Group is currently in discussions with Lumen Technologies regarding the feasibility and costs associated with delivering text to 9-1-1 calls via the ESInet, thereby delivering text to 9-1-1 to every PSAP via the same call path that PSAPs use to receive voice 9-1-1 calls.

9-1-1 Frequently Asked Questions

Certain questions are often asked by members of the public about how 9-1-1 service works, or about perceived problems concerning 9-1-1 service. This section attempts to answer some of those questions, which may help legislators better understand issues of concern to their constituents.

“If my food delivery or rideshare app can find me, why can't 9-1-1?”

Location services for wireless 9-1-1 calls were developed at a time when the handsets themselves had no location awareness. As such, they relied first on network triangulation, followed later by GPS location. Today, smartphones have many different sensors that can be used in combination to determine a much more precise location for the caller, but because the location technology developed for 9-1-1 wasn't designed to take advantage of handset-based location information, there hasn't been an easy way to deliver this data to the 9-1-1 center. As a result, the location information typically delivered to the 9-1-1 center today, known as Automatic Location Information (ALI), is sometimes less accurate than handset-based location that is available to applications and other commercial services, or not available at all.

Currently, wireless carriers, handset manufacturers, and even smartphone operating system developers are working to fix this. For example, both Apple and Google have partnerships with a firm called RapidSOS to provide a handset-based location to 9-1-1 centers for every 9-1-1 call from devices using their operating systems. This service is offered without any

direct cost to the call center, although some equipment and software vendors may charge the call center for integrating the service.

Recently, national wireless carriers have also begun providing Z-Axis (altitude) coordinates with the location information for wireless 9-1-1 calls in accordance with requirements imposed by the Federal Communications Commission. While these Z-Axis coordinates are of limited value now, they are the first step to being able to pinpoint not only where a 9-1-1 call is coming from on the surface of the Earth, but what floor of the building the caller is, as well.

“Can I call 9-1-1 on a phone with no active service plan or prepaid minutes?”

The short answer is “yes.” Any cell phone with a cellular signal is able to dial 9-1-1, and the Federal Communications Commission, which has regulatory authority over wireless telecommunications services, requires that carriers deliver the 9-1-1 call to the appropriate 9-1-1 system service provider (or BESP, in Colorado). 9-1-1 calls from phones without a service contract, however, have limitations. Cell phones that don’t have a service contract or prepaid cell phones with no minutes can call 9-1-1, but the PSAP will not receive a callback number with the call. This may prevent the PSAP from following up if the call is disconnected. 9-1-1 calls from such phones are also frequently not accompanied by location information.

“Why does the call-taker ask so many questions?”

9-1-1 call takers (also called telecommunicators or emergency communications specialists) have an important responsibility to gather all of the information necessary for first responders to respond appropriately and quickly to the emergency being reported. This also includes keeping the responders safe, which requires having a comprehensive understanding of the situation at the location of the emergency.

Many PSAPs in Colorado also provide pre-arrival medical instructions and emergency medical dispatch (EMD) services. These are medical protocol systems, developed by medical experts and overseen by local medical professionals. The purpose of these services is to help stabilize a patient’s condition until emergency medical services arrive, but providing pre-arrival instructions also requires a lot of communication between the call taker and the caller. The best thing the caller can do is answer the telecommunicator’s questions and follow their instructions to the best of their abilities.

Typically, medical services are dispatched early in the call and EMD is performed while responders are en route, so there is little to no delay to the response created by performing EMD.

“Since my location is sent to 9-1-1 when I call, why do I have to tell the call taker my address?”

9-1-1 location technology isn’t 100% accurate. It is extremely useful when there is no other

way to obtain the location of the emergency, such as if the caller can't speak or they don't know where they are. Whenever possible, however, it is best practice for the telecommunicator to ask the caller for the location of the emergency. In most cases, this will be the very first thing a telecommunicator asks of a caller to 9-1-1.

“What happens if I text to 9-1-1 in an area that doesn't provide that service?”

If you attempt to send a text message to 9-1-1 in an area that does not accept text to 9-1-1 messages, you will receive a “bounceback” message, informing you that text to 9-1-1 service isn't available and advising you to make a phone call to 9-1-1 instead. This may also occur if you're roaming on another service provider's network.

“Can someone who does not speak English call 9-1-1?”

Most 9-1-1 call centers in Colorado use 3rd party interpreter services. If an interpreter service is available at your 9-1-1 call center, as soon as the call taker determines that you are a non-English speaker, they can bring in an interpreter for a 3-way call.

“What is the difference between Next Generation 9-1-1 and FirstNet?”

Next Generation 9-1-1 (NG9-1-1) is the Internet Protocol (IP) based delivery of 9-1-1 calls and other information to a PSAP. Upgrading the existing (or, “legacy”) 9-1-1 system to Next Generation 9-1-1 has many benefits, including the potential to make the system more resilient and flexible, allowing for dynamically rerouting 9-1-1 calls when necessary, and potentially opening up the network to accept other types of data, such as medical data, automatic crash notification data, pictures, etc.

FirstNet, the commonly used name for the National Public Safety Broadband Network (NPSBN), is a wireless broadband network for public safety that will allow units in the field to share data and media such as pictures, building schematics, and more.

The best way to describe Next Generation 9-1-1 and public safety broadband together is that both Next Generation 9-1-1 and public safety broadband are needed to ensure the ability to transmit and deliver data and multimedia all the way from the citizen to the responder.

3. Migration to Next Generation 9-1-1

What Is Next Generation 9-1-1?

Next Generation 9-1-1 (NG9-1-1) is a set of technologies and components that, when implemented, comprise a standards-based approach to Internet Protocol (IP)-based 9-1-1 call delivery that incorporates scalable flexibility, capacity, and security into the 9-1-1 system for the public safety answering points of a state or region. The National 9-1-1 Program Office has produced a good primer video for introducing what NG9-1-1 is and what its benefits are.²⁸

It should be noted that the implementation of NG9-1-1 is a transitional process. The FCC’s Task Force on Optimal PSAP Architecture (TFOPA) developed an NG9-1-1 Maturity Model that helps illustrate the different areas of NG9-1-1 deployment, including legacy, foundational, transitional, intermediate, and end state for different aspects or “domains” of NG9-1-1 deployment, governance, and funding.²⁹ In its most recent annual report to the National 9-1-1 Office, Commission Staff estimated the state’s NG9-1-1 maturity levels as the following for the various domains, using the definitions for each state provided by the National 9-1-1 Office, which were in turn based on the TFOPA report:

- Governance: Transitional
- Routing and Location: Legacy
- 9-1-1 GIS Data: Legacy
- NG9-1-1 Core Services: Legacy
- Network: Foundational
- PSAP Call Handling Systems and Applications: Legacy
- Security: Foundational
- Operations: Foundational
- Optional Interfaces: Foundational

It should also be noted that while there is a national standard for the basis of NG9-1-1, there is disagreement about what actually constitutes “full Next Generation 9-1-1,” meaning that there may not be a specific point in time when we can specifically say that “Today, we have implemented NG9-1-1.” Viewing NG9-1-1 as an evolutionary process applying to the entire 9-1-1 call flow is more helpful in this regard.

The industry-recognized standard for NG9-1-1 protocols is the “NENA i3” standard, an ANSI-approved technical standard developed by a large array of stakeholders through the National Emergency Number Association.^{30,31} In August of 2022, the Association of Public

²⁸ <https://www.911.gov/issues/ng911/video-benefits-of-next-generation-911/>

²⁹ https://transition.fcc.gov/pshs/911/TFOPA/TFOPA_WG2_Supplemental_Report-120216.pdf

³⁰ https://www.nena.org/page/i3_Stage3

³¹ Colorado 9-1-1 Advisory Task Force, “Recommended 9-1-1 Standards”. Published May 11, 2022. <https://docs.google.com/document/d/1z2U7ABOPiGocRN84kvhYkiWtZtxkW-qzF9k2y6Zm2N4>

Safety Communications Officials published a “definitive guide to Next Generation 9-1-1,” which outlines additional considerations regarding implementation of NG9-1-1 and provides a draft scope of work if NG9-1-1 were to be purchased through a Request for Proposal process.³² It should be noted that due to the purely local funding of 9-1-1 in Colorado, purchase of NG9-1-1 call delivery must currently be accomplished through a tariff rather than a statewide RFP and contract.

Next Generation 9-1-1 and ESInet

Throughout this document, there is a differentiation between two related terms, NG9-1-1 and ESInet. As described above, NG9-1-1 describes a full suite of technologies and components that fully replace every aspect of a legacy (non-IP) 9-1-1 network, as well as provide additional functionality to the 9-1-1 network that is not supported in legacy networks.

An ESInet is a part of that suite of technologies and components. It is an IP-network connected to every Public Safety Answering Point (PSAP) in a given geographic area (such as state-wide) that allows for the delivery of 9-1-1 calls and other data to PSAPs in Internet Protocol (IP) format. While it by itself does not constitute NG9-1-1, it is an important foundational component for the implementation of NG9-1-1.

NG9-1-1 and FirstNet

FirstNet, the common name for the National Public Safety Broadband Network (NPSBN) currently being provided nationally by AT&T, is not the same thing as NG9-1-1. The purpose of the NPSBN is to provide a wireless data network for public safety agencies to communicate with *each other*, whereas one of the goals of NG9-1-1 is to provide a way for non-voice data to be sent *from the public* to 9-1-1 call centers. Together, these two systems would potentially allow the public to send non-voice data (pictures, video, medical data, etc.) to a 9-1-1 call center, and then for the 9-1-1 call center to send such data to responding units. However, the implementation of the NPSBN does not remove the need for implementation of NG9-1-1. They are two separate systems, and the functionality of both networks are needed to complete the chain from the public to the first responder.

Planning, Transition, and Implementation

In late 2019, the Commission established an ESInet Users Group as a committee of the Commission’s 9-1-1 Advisory Task Force to oversee the implementation and statewide deployment of an ESInet. Previous to this, the Commission had approved a jointly proposed settlement filed on August 31, 2018, between Lumen Technologies and a number of local 9-1-1 governing bodies that had intervened in the proceeding to transition Lumen’s 9-1-1 network in Colorado from a legacy 9-1-1 network (using a combination of switch-based and IP

³²

<https://www.apcointl.org/technology/next-generation-9-1-1/apcos-definitive-guide-to-next-generation-9-1-1/>

technology) to a fully IP-based network, or ESInet. A final version of the tariff was filed by Lumen on December 28, 2018³³, and subsequently modified through an additional filing on May 10, 2019³⁴.

The tariff as approved by the Commission contained a schedule for each Public Safety Answering Point (PSAP) in the state to migrate from Lumen's legacy 9-1-1 network to the ESInet over the course of 13 months, starting in October of 2019 and completing in October of 2020. This schedule has been revised on a rolling basis, but we are nearing completion of the migration, with only two PSAP sites remaining to be converted from the legacy network to the ESInet. The remaining PSAPs consist of the PSAP operated by Buckley Space Force Base and the Cheyenne Mountain Space Force Station.

The migration is mandatory, since Lumen Technologies states in the ESInet tariff its intent to retire the legacy 9-1-1 tariff, and Lumen Technologies is currently the only provider certified by the Commission to provide Basic Emergency Service that also has an active tariff on file.³⁵

The approved Settlement called for the creation of an ESInet Users Group as part of the Commission's 9-1-1 Advisory Task Force. This Users Group has been meeting regularly and has been instrumental in identifying concerns and issues of the local 9-1-1 governing body representatives that make up the voting membership of the body. This Users Group will continue to monitor the progress of the implementation and help resolve issues as they are identified between Lumen and the 9-1-1 governing bodies or Public Safety Answering Points. Commission staff are also participating in the meetings. If issues cannot be resolved within the ESInet Users Group, parties may still petition the Commission for resolution.

The migration of Colorado's PSAPs to the ESInet is not the end of the implementation of an NG9-1-1 system, but only the beginning. The ESInet is the foundation upon which the core services and advanced services can operate, and with the implementation of an ESInet will come an opportunity for the 9-1-1 stakeholder groups to begin planning what they want Colorado's NG9-1-1 system to be. While much of the work of the ESInet Users Group will be focused on ensuring a smooth transition from the legacy 9-1-1 network to the ESInet, planning the future development of that ESInet, and negotiating the details and costs of that development with Lumen, will also be part of the duty of the ESInet Users Group. It is expected that the Users Group will take up those issues as the migration nears completion.

So far, the ESInet Users Group has requested information and pricing from Lumen regarding the possibility of including statewide delivery of text to 9-1-1 calls via the ESInet, pricing and

³³ See [Proceeding 18AL-0916T](#).

³⁴ See [Proceeding 19AL-0238T](#).

³⁵ Lumen Technologies also operates as CenturyLink QC, although the tariff is filed under the name Qwest Corporation.

terms regarding the statewide implementation of a 9-1-1 call data collection system known as ECaTS, and pricing and implementation plans for the provision of Geographic Information System (GIS) data tools to 9-1-1 governing bodies intended to assist governing bodies in preparing local GIS data for use in 9-1-1 call routing.

A number of other potential features and services for the ESInet have been proposed or discussed. To facilitate ongoing consideration of these proposals and possibilities, the Commission's 9-1-1 Program and the ESInet Users Group have collaborated on the creation of a Next Generation 9-1-1 Strategic Plan. The ESInet Users Group members voted to approve this document in August of 2022.³⁶

The ESInet Users Group also serves to monitor quality of service metrics regarding the ESInet. Lumen provides the Users Group with quarterly metrics reports regarding latency, jitter, packet loss,³⁷ and other measures of service quality that are then reviewed by the ESInet Users Group to ensure those metrics are within the ranges agreed upon in the tariff.

A critical component of the planning, transition, and implementation of the ESInet is ensuring proper funding. The new tariff states that the previous tariff rates remain in place until each PSAP has transitioned to the new network, but that once each particular PSAP has transitioned, the new rates take effect. These new rates are significantly higher than they were for the legacy 9-1-1 tariff. The legacy 9-1-1 tariff rates, aggregated state-wide, cost 9-1-1 governing bodies approximately \$2.9 million per year, whereas the estimated costs for service under the ESInet tariff are approximately \$5.9 million per year. With the implementation of the state 9-1-1 surcharge authorized through the passage of HB 20-1293, the Commission has been able to reimburse the state's 9-1-1 governing bodies for the monthly recurring charges under the ESInet tariff, and it is hoped that this surcharge can be leveraged to pay for the additional features and services necessary for the full implementation of NG9-1-1. See [Section 7](#) for a full discussion of funding.

Current Migration Status

As stated previously, as of the writing of this report only two PSAPs remain to be migrated from the legacy E9-1-1 network to the Emergency Services IP Network (ESInet). Lumen has reported that it is actively engaged with one of the two military bases that operate those

³⁶ https://docs.google.com/document/d/1SbsHfCjbJ_aKakD8lfGZqRRz6-44-ZBu35BW1DZmXCw

³⁷ *Latency* is the time it takes data packets to traverse the network. Too much latency in IP-based telephony causes callers to speak over the top of each other. *Jitter* is the measure of inconsistency in the arrival of data packets between sender and receiver, which can cause a connection to be unstable and for data packets to be lost. *Packet loss* is the measure of how many packets of data are lost between sender and receiver. A high degree of packet loss in IP-base telephony can result in poor audio quality.

PSAPs, but that Schriever SFB is not actively cooperating in the migration of its PSAP.

In future editions of this report, this section may be used to provide the legislature with updates regarding the status of implementation of additional features and services for the ESInet.

Projected Timeline for Full Implementation

The NG9-1-1 Strategic Plan recently adopted by the Users Group categorizes different aspects of NG9-1-1 implementation into categories of 1-3 year goals or longer-term goals.³⁸ Much of the timing, however, is dependent on the ability of Lumen and its subcontractors to implement the additional network components necessary for the ESInet to be considered true NG9-1-1.

³⁸ See https://docs.google.com/document/d/1SbsHfCjbJ_aKakD8lfGZqRRz6-44-ZBu35BW1DZmXCw

4. 9-1-1 Network Reliability and Resiliency

Current Status

Terms of particular importance to this section:

- *Redundancy: Additional or alternate instances of network devices, equipment and communication mediums that are installed within network infrastructure as a method for ensuring network availability in case of a network device or path failure and unavailability. Example: Having two separate fiber optic paths between two points in the network.*
- *Diversity: The physical separation of redundant network devices, equipment, and communication mediums necessary to reduce the likelihood of one event causing a failure in both redundant components. Example: Routing two redundant fiber optic lines via geographically separated paths so that a single event, such as a flood or a fire, is unlikely to damage both components.*
- *Resiliency: The level of ability of a network to continue operating despite damage or failure to individual components. The level of resiliency a network possesses is to a large extent the result of its redundancy and diversity.*
- *Basic Emergency Service: The portion of the call flow from the point at which 9-1-1 calls are aggregated from originating service providers (OSPs) to the point that they are transmitted across the demarcation point to a Public Safety Answering Point (PSAP) or local network operated by a 9-1-1 governing body. Location information associated with 9-1-1 calls is also considered part of Basic Emergency Service.*

State statute provides the Commission authority over Basic Emergency Service³⁹, but with some exceptions deregulates other telecommunications services.⁴⁰ Commission rules, therefore, only require notification from carriers for outages to Basic Emergency Service.⁴¹ In practice, this means that the Commission generally only receives outage notifications from the Basic Emergency Service Provider (BESP), currently Lumen Technologies, and from some rural Local Exchange Carriers in instances where they are providing a portion of Basic Emergency Service by delivering 9-1-1 calls to the PSAP.⁴²

Because of this distinction, there are types of disruptions to 9-1-1 service that are not captured in the data collected by the Commission. Examples of those types of outages not

³⁹ § 40-15-201 (2), C.R.S.

⁴⁰ § 40-15-401 (3) and (4), C.R.S.

⁴¹ 4 CCR 723-2-2143 (g)

⁴² The Federal Communications Commission requires reports from carriers experiencing any outage in excess of 900,000 user-minutes, defined as the duration of the outage in minutes multiplied by the number of users affected by the outage. However, these reports are considered confidential and are not shared with the states. See 47 CFR § 4.2, 4.9 and 4.11. The FCC is currently considering granting states read-only access to its outage reporting database. See [FCC 20-20](#).

reflected in our statistics include:

- Outages due to failure of an originating service provider’s network.
- Outages affecting local landline customers but not affecting a PSAP directly.
- Outages that occur due to a failure of a local network past the demarcation point with the governing body or PSAP.
- Outages occurring due to an equipment failure at a PSAP, or due to the failure of a third-party hosted service contracted by a PSAP.

For a graphical representation of the scope of the Commission’s authority regarding outages, refer to figure 2.1, reproduced below. Only outages occurring in the red shaded section of the diagram are considered Basic Emergency Service outages, and therefore are required to be reported to the Commission.

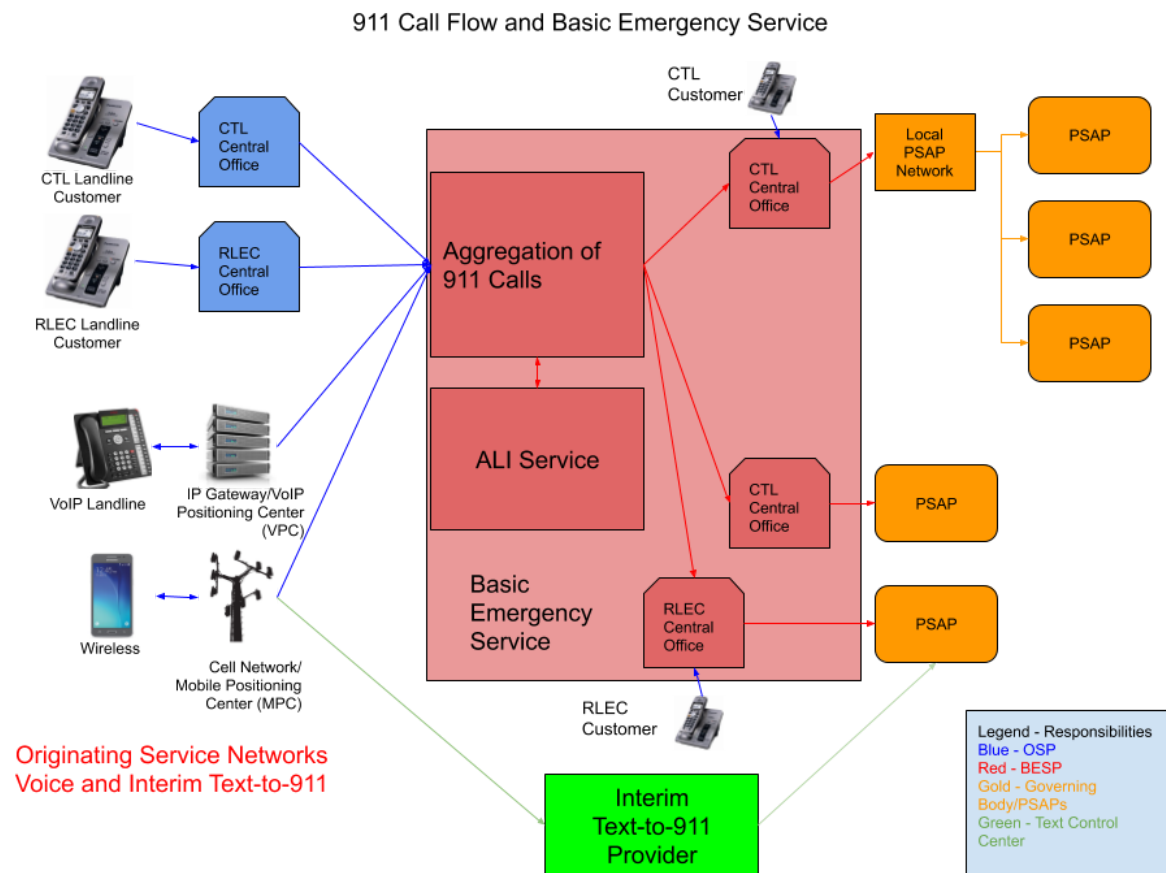


Figure 2.1: 9-1-1 Call Flow with “Basic Emergency Service” shown in red.

With these limitations in mind, the Commission provides the following statistics in regard to Basic Emergency Service outages.

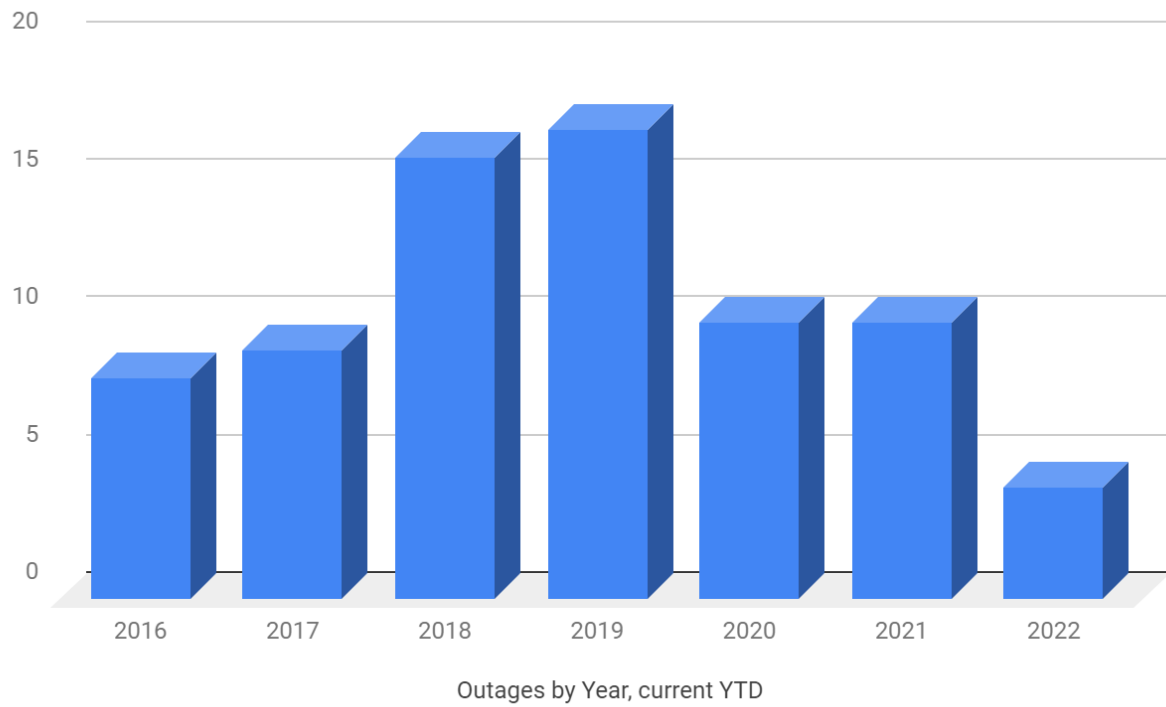


Figure 4.1: BES outages by Year. 2021 shows outages as of July 15, 2022.

Figure 4.1 shows that with half of 2022 completed, Colorado is on track to see fewer outages this year than occurred in 2021. Total outages for 2021 were equal to the outages experienced in 2020.

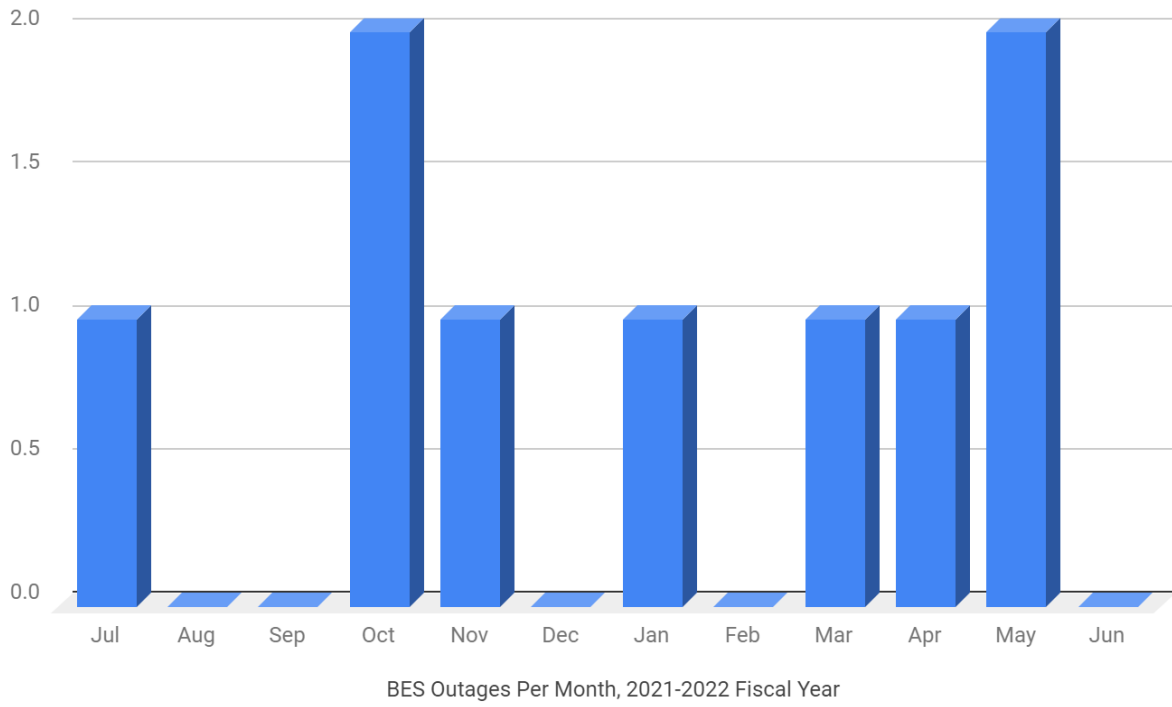


Figure 4.2: Basic Emergency Service Outages per Month, July 2021-June 2022

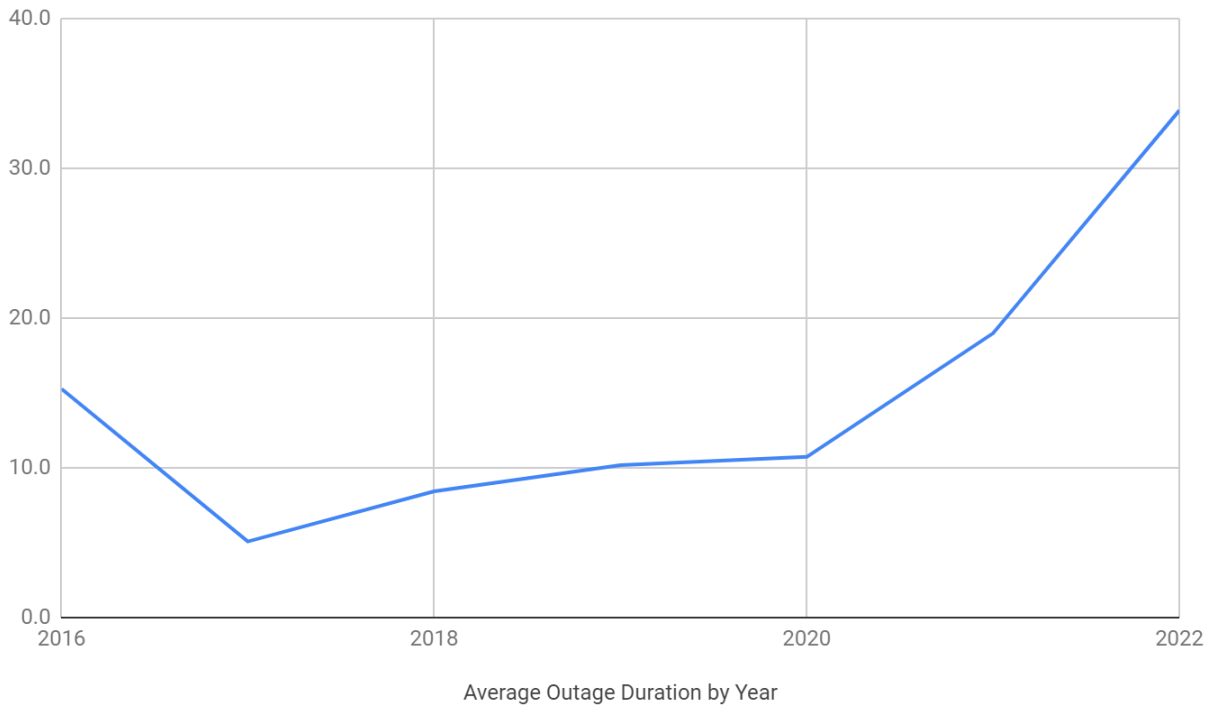


Figure 4.3: Average duration of BES outages in hours. 2022 is YTD as of July 15, 2022.

Basic Emergency Service outage duration is measured in hours, with 2022 having the highest average duration of outages on record.

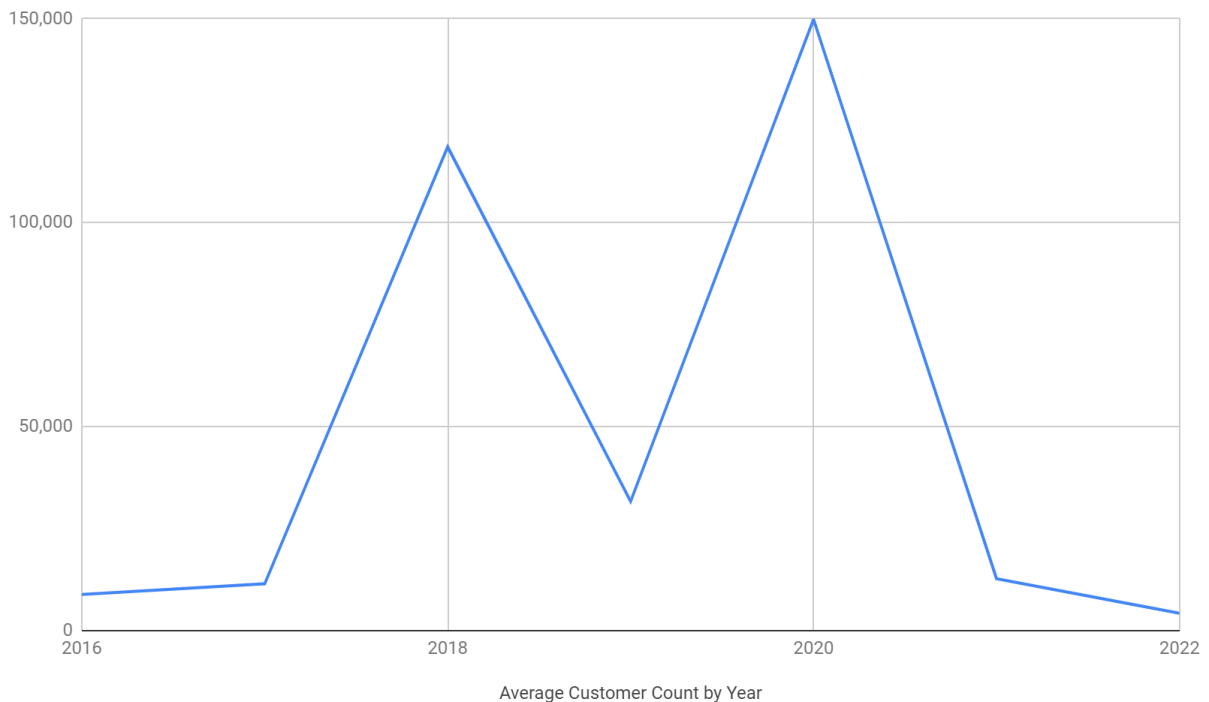


Figure 4.4: Average number of customers affected by a BES outage. 2022 is YTD as of July 15, 2021

Figure 4.4 demonstrates that the average number of customers affected by a basic emergency service outage is, so far this year, the lowest number on record. Between this chart and figure 4.3, we can see that outages in 2022 have, thus far, affected smaller communities for longer durations of time than in recent years. This pattern indicates that outages are more frequently occurring in more rural areas that take longer to repair because of a lack of local technicians or other resources and less frequently in urban areas where larger numbers of customers may be impacted, but the outage may be resolved more quickly.

Commission staff maintains a Basic Emergency Service Outage Dashboard⁴³, which is updated with outage data as it is received from the BESP and from the rural Local Exchange Carriers.

⁴³ <https://sites.google.com/state.co.us/9-1-1-advisory-task-force/outage-dashboard>

Commission Process for Improvement

In 2013, the Commission initiated an inquiry into 9-1-1 network performance following recent floods and fires⁴⁴. As part of that proceeding, Lumen Technologies filed with the Commission a list of locations that lacked redundant routes with geographic or physical separation of the routes in the BES network. Areas without physical network diversity are at particular risk of being the cause of an outage since a single fiber cut or equipment failure in that part of the call delivery path will result in an outage.

This proceeding resulted in an order requiring semi-annual updates from Lumen regarding various aspects of their progress toward developing physical diversity in the portions of the BES network where it is lacking, but potential points of failure persist⁴⁵.

4 CCR 723-2-2143 (a) (II), effective in March of 2018, requires each BESP to file with the Commission a plan for resolution of any components of the Basic Emergency Service that currently lack in diversity, and estimates for how much such resolution would cost. In response to this rule, on January 9, 2019 Lumen filed with the Commission a list of all areas of its Basic Emergency Service network currently lacking redundancy and diversity.⁴⁶ On January 29, the Commission issued an interim decision directing Lumen to conduct an informal stakeholder workshop to review Lumen's plan and to report back every two months to the Commission.⁴⁷

Per the Commission's rules, the result of this process was to be a 911 Diversity Plan that can be approved by the Commission, associated with either a modification of the existing Basic Emergency Service Tariff or a new tariff to be filed to provide the funding for potential improvements to the Basic Emergency Service network's redundancy, geographic diversity, and resiliency⁴⁸. However, on December 29, 2020, Commission staff participating in the workshops filed in the proceeding a letter recommending that the proceeding be closed to allow a rulemaking to proceed to change the Commission's rules regulating resiliency and reliability of the 9-1-1 network. The reasoning behind this request was that with the passage of HB 20-1293, the Commission now has the statewide 9-1-1 surcharge created by that bill to help fund improvements to the Basic Emergency Service network to reduce its vulnerability to outages, and that Commission rules should take this fact into account.⁴⁹

The Commission agreed with this recommendation, and ordered the proceeding to be closed and directed Commission staff to begin preparing a Notice of Proposed Rulemaking on the topic of 9-1-1 network reliability.⁵⁰ At the advice of Commission counsel, this rulemaking was

⁴⁴ See Proceeding [13J-1147T](#).

⁴⁵ See Decision [R14-0303](#).

⁴⁶ See [Proceeding 19M-0026T](#).

⁴⁷ See Decision [C19-0117-I](#).

⁴⁸ 4 CCR 723-2-2143(a)(III).

⁴⁹ See https://www.dora.state.co.us/pls/efi/EFI.Show_Filing?p_fil=G_771812&p_session_id= for a direct link to the letter.

⁵⁰ See [Decision C21-0036](#).

postponed until after the completion of the 2021 rulemaking on 9-1-1 funding and audit procedures.

On March 9, 2022, the Commission issued a Notice of Proposed Rulemaking specifically to address basic emergency service network resiliency and reliability improvements.⁵¹ Following the recommendations of Commission staff, the proposed rules seek to leverage the state 9-1-1 surcharge authorized by the passage of HB 20-1293 to create a funding mechanism for implementing improvements to the reliability of the basic emergency service portion of the 9-1-1 call flow. Following issuance of the Notice and receipt of extensive comments from stakeholders, the Administrative Law Judge overseeing the rulemaking directed Commission staff to coordinate workshops with interested parties to develop consensus draft language. Those workshops and the rulemaking proceeding itself are ongoing, as of the writing of this report, and a final public comment hearing is scheduled for October 13, 2022.

As a certified BESP actively providing service, Lumen is also required by Commission rule 2148(d) to file a contingency plan annually, the most recent being filed May 2, 2022⁵². The purpose of this requirement is to ensure that Lumen has, on file, a list of current contacts for all of the PSAPs as well as phone numbers for alternate routing of 9-1-1 calls, when necessary. The content of future versions of these reports are also being reviewed by the stakeholders participating in the Commission's current 9-1-1 rulemaking.

Work of the 9-1-1 Advisory Task Force Outage Committee

In addition to the work being done in the workshops discussed above, the efforts of the Outage Committee of the 9-1-1 Advisory Task Force are also relevant. In the fall of 2019, this Committee created a set of thresholds for Basic Emergency Service outages that would trigger a special investigation by the committee. This committee conducts a special investigation of any outage that meets any of the following criteria:

- Multiple PSAPs affected.
- Details of the outage are unclear from the outage report.
- Outage duration in excess of four hours.
- Unusual pattern of impact.
- The PSAP or 9-1-1 governing body report differs from the BESP report.
- Any report of poor communication between the PSAP and BESP during the outage.
- Apparent failure to notify the PSAP of the outage in a timely manner.
- Repeated outages of a similar nature or in the same area over a short period of time.
- Any request for a special investigation by either one or more PSAP or 9-1-1 governing bodies, or by Commission Staff.

For each special investigation, the Outage Committee develops a list of questions that it wishes the BESP to answer regarding the outage, and before closing the special investigation

⁵¹ See Proceeding [22R-0122T](#).

⁵² See Proceeding [18M-0294T](#).

it attempts to identify “lessons learned” that will help either avoid a similar outage in the future or mitigate the impact of the outage by reducing the duration, improving communication between the PSAP and the BESP, or providing other remedies.

Based on these special investigations, the Outage Committee has begun compiling a “911 Outage Lessons Learned and Best Practices” document, which is available on the 9-1-1 Advisory Task Force webpage.⁵³ This is a living document that will continue to be updated as additional special investigations are completed. This document serves as a companion document to a document entitled “Colorado 9-1-1 Outage Guidelines for PSAPs and Authorities,” produced in November of 2019.

The special investigations completed by this committee, as well as the PSAP outage guide and best practices document, can be accessed on the [Committee’s web page](#)⁵⁴.

It should be noted that since neither the 9-1-1 Advisory Task Force nor the Outage Committee has not been granted investigatory powers by the Commission, the investigations performed by the Outage Committee are informal and Lumen’s participation in those investigations is voluntary. Lumen has been mostly cooperative with the requests for information from the committee.

Monitoring Outages in the Originating Service Environment

As discussed earlier, the Commission is precluded by Colorado statute from imposing outage notification requirements on originating service providers.⁵⁵ However, outages in the originating service environment do impact the ability of users to call 9-1-1. Currently, the Commission has no way to inform the legislature regarding the degree of impact that such outages are having on the 9-1-1 system and the public in the state.

While the Colorado Public Utilities Commission is prohibited from imposing outage notification rules on originating service providers, the Federal Communications Commission is not. The FCC requires all carriers to report outages to the FCC via the FCC’s Network Outage Reporting System (NORS). On March 17, 2021, the Federal Communications Commission issued a Report and Order directing FCC staff to begin working on a process by which state and local governments could gain read-only access to reports submitted to the FCC in NORS, and to allow those state and local governments to share aggregated statistical information based on those reports.

The Commission intends to participate in this process when it becomes available, although the FCC has set a date of September 30, 2022 to enact this program. That being the case, data regarding the frequency, duration, and impact of originating service provider outages won’t be available for inclusion into this report until the 2022-2023 edition, at the earliest.

⁵³ <https://docs.google.com/document/d/1zX7sl2yb7sR83YxM6YrcW234A-bA-T7duUb7j9KEOPk>

⁵⁴ <https://sites.google.com/state.co.us/9-1-1-advisory-task-force/committees/outage-committee>

⁵⁵ See § 40-15-401, C.R.S.

5. Gaps, Vulnerabilities, and Needs

What follows is a list of gaps, vulnerabilities, and needs regarding the provision of 9-1-1 service in Colorado. Potential solutions for these issues are also presented, with some discussion. While this document will be circulated in draft form and input received and incorporated as appropriate from Colorado's 9-1-1 stakeholders, it should be noted that the entire 9-1-1 community may not be in agreement on any of the challenges or solutions presented here.

Most of the challenges identified below could potentially benefit from the existence of a state-level funding source to pay for certain 9-1-1 related expenses on a statewide basis. Two potential solutions to provide a mechanism for statewide 9-1-1 expenditures are currently being considered by Colorado's 9-1-1 stakeholders, and a description of these potential solutions can be found following the list of challenges below.

Challenges to Be Addressed

9-1-1 System Capabilities Need to Catch Up to User Expectations

The Challenge: User expectations, driven primarily by the functionality available in commercial communications networks, have outpaced the abilities of the 9-1-1 system.

The Details: Commercial communications networks, particularly wireless telecommunications networks, include the ability to send text messages, pictures, video, and other types of data to other users, seemingly without restrictions.

The Solution: In order to accommodate functionality that exists within commercial communications, the existing "legacy" 9-1-1 system must be upgraded to a Next Generation 9-1-1 (NG9-1-1) system. This is a phased, long-term implementation process, which has already begun with the deployment of an Emergency Services IP Network (ESInet). See [Section 3](#) for a full discussion of Colorado's journey to full implementation of Next Generation 9-1-1.

Most, if not all features of Next Generation 9-1-1 could be offered through a cost-averaged tariff approved by the Commission, allowing the Commission to fund the features and services by increasing the state 9-1-1 surcharge rate within its statutory cap of \$0.50 per line per month. However, not all features or services may lend themselves to statewide cost-averaging. If a different funding mechanism is required to pay for these advanced features and services, the potential solutions described at the end of this section may be beneficial.

Recommendation: It is not yet known what additional resources may be required to implement NG9-1-1 services statewide. This is a topic that is currently being explored by the ESInet Users Group. **The Commission's recommendation is to allow the ESInet Users Group to continue developing its vision of what the future of 9-1-1 in Colorado should be, but**

also to be aware that there may be additional requests for funding and resources as that vision solidifies.

Lack of Visibility into the Reliability of the Full 9-1-1 Call Flow

The Challenge: As discussed in more detail in [Section 4](#), the Commission only has authority to require reporting of outages that occur in the portion of the 9-1-1 call flow referred to in statute as Basic Emergency Service.

The Details: Basic Emergency Service is the middle portion of the 9-1-1 call flow, starting where 9-1-1 calls are aggregated from all of the originating service providers to the point where 9-1-1 calls are handed off to the PSAP or to a local network operated by the PSAP or 9-1-1 governing body. As a result, the Commission is unable to provide the legislature with a complete picture regarding the reliability of 9-1-1 service in the state, nor are we able to provide any insight regarding outages at the PSAPs that may affect the public's ability to call 9-1-1. There is no state agency overseeing the reliability of the entire 9-1-1 call flow.

The Solution: The FCC requires reporting from all telecommunications providers for any outage over 30 minutes in duration that potentially affects a "911 special facility" or has the potential to reach 900,000 user minutes.⁵⁶ The contents of these reports, however, are not available to the public, or even to the state. In a Report and Order issued on March 17, 2021, the FCC committed to creating a process by which state agencies and local governments may apply to receive read-only access to the FCC's outage reporting system, known as the Network Outage Reporting System (NORS). The process to apply for access is expected to be in place by September of 2022.

Recommendation: The legislature should wait for the FCC's processes to be put in place so that the Commission may participate and use the data obtained to provide the legislature with aggregated data regarding the frequency, duration, and impact of originating service provider outages that affect Colorado. However, if this process is delayed or fails to produce actionable data for the legislature, the Commission may change this recommendation. An alternative solution would be for the legislature to authorize the Commission to enact outage reporting requirements for originating service providers.

No Public Safety Answering Point Performance and Service Standards

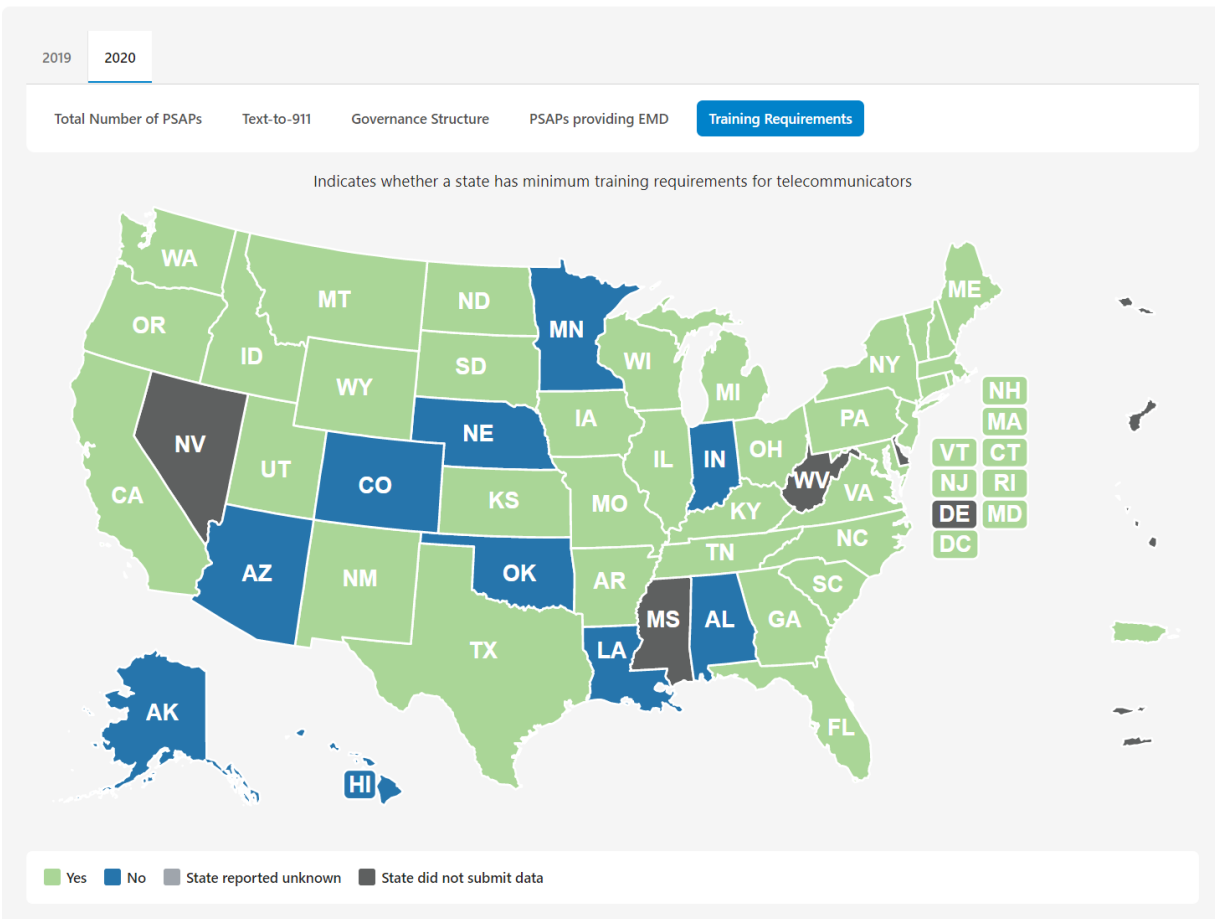
The Challenge: There are no minimum standards for the operation of a Public Safety Answering Point (PSAP), potentially exacerbating uneven outcomes for 9-1-1 callers depending on where the 9-1-1 call takes place.

The Details: There is no statewide standard for performance in place for Colorado's PSAPs. As a result, the level of service provided by PSAPs has the potential to vary widely across the state, and a person traveling through Colorado could experience different levels of care depending on where they place a 9-1-1 call. Examples of ways in which 9-1-1 care may vary

⁵⁶ The "user minutes" of an outage is measured by the number of customers suspected to be impacted by an outage multiplied by the duration of the outage in minutes. See 47 CFR §4.5 and 4.9.

include:

- Most PSAPs provide pre-arrival instructions for medical calls, such as cardiopulmonary resuscitation instructions, and some do not.
- Some PSAPs conduct quality assurance on random samples of their calls, and some do not.
- Most PSAPs contract with foreign language interpreter services to be able to take 9-1-1 calls from non-English speakers, and some do not.
- Most PSAPs support text to 9-1-1 calls from the public, and some do not.
- Most PSAPs in Colorado require public safety telecommunicators to undergo a minimum basic training program, and some do not.



Last Updated: 06/10/2022

Figure 5.1: States with no minimum training requirements for telecommunicators shown in blue.⁵⁷

The Solution: The only solution to a lack of operational standards is to implement standards. Voluntary standards already exist through national organizations such as the National

⁵⁷ <https://www.911.gov/issues/911-stats-and-data/>

Emergency Number Association and the Association of Public Safety Communications Officials, Intl. However, adoption of these voluntary standards has not been consistent across the state. Mandatory standards, developed by a broad cross-section of the 9-1-1 stakeholders in the state, would be more effective at reducing disparities in service levels.

It should be noted that all of the items listed above as examples of disparities in service levels may be funded with local emergency telephone charges,⁵⁸ and that 9-1-1 governing bodies may adjust their emergency telephone charges up to a threshold amount set by the Commission annually.⁵⁹ Governing bodies that determine that an emergency telephone charge in excess of this threshold is necessary to fund PSAP operations may also file an application with the Commission for approval to exceed the threshold.⁶⁰ As such, the funding mechanism for implementation of minimum PSAP operational standards is already in place. However, if a different funding mechanism is necessary to ensure that rural agencies can afford to implement minimum standards without heavily impacting their local emergency telephone charge rates, the potential funding mechanisms described at the end of this section should be considered.

There have been objections to the inclusion of this challenge in previous editions of this report, particularly as it relates to minimum training standards for public safety telecommunicators, stating that decisions regarding operational standards and training standards should remain a local decision. However, the Commission believes that citizens or visitors to the state expect a foundational level of service, at least, when they call 9-1-1, and the Commission believes the only way to achieve this foundational level of service consistently is with the implementation of minimum operational standards for PSAPs. The Commission also believes that the state has an obligation to ensure that every caller to 9-1-1 receives a minimum level of service.

Recommendation: The legislature should consider working with 9-1-1 stakeholders to develop minimum operational standards for PSAPs. Alternatively, the legislature could consider authorizing the Commission or the Department of Public Safety to develop such standards through a collaborative process with stakeholders and implement them.

Interim Measures: In the meantime, while the Commission does not have the jurisdictional authority to mandate minimum standards for Public Safety Answering Point operations, it can issue *voluntary* minimum standards. Following the conclusion of the 9-1-1 network reliability rulemaking currently underway, Commission staff will prepare and present to the Commission a draft decision to open a miscellaneous proceeding to create voluntary minimum standards through a collaborative, stakeholder-driven process. Many non-binding standards already exist through national organizations and these standards could be incorporated into this process. However, because these standards developed through a Commission proceeding would necessarily be voluntary, they may not eliminate the varying levels of care in the state that are the cause of concern.

⁵⁸ See the full list of allowable uses of 9-1-1 funds enumerated in § 29-11-104, C.R.S.

⁵⁹ See § 29-11-102(2)(a), C.R.S.

⁶⁰ See § 29-11-102(2)(c), C.R.S.

No Clear Path Toward Consistent Statewide Cybersecurity Defense at Local PSAPs

The Challenge: Cybersecurity of Public Safety Answering Points is largely left to local IT resources, which may vary in their ability to ensure the security of PSAP systems.

The Details: The Basic Emergency Service Provider, Lumen Technologies, which is authorized to aggregate 9-1-1 calls, then route and transport them to the PSAP, is responsible for cybersecurity on the ESInet. However, all cybersecurity defense within the PSAP itself is the responsibility of the PSAP. PSAPs in the urban areas of the state have robust information technology staff support to rely upon, including the IT staff supporting the cities and counties in those urban areas. It is unclear at this time whether PSAPs in rural areas of the state have sufficient cybersecurity support, and what can or should be done to assist local agencies to ensure that they are sufficiently protected. While the implementation of the ESInet provides a great number of benefits, it does introduce vulnerabilities to every PSAP on the network if one PSAP does not observe sufficient cybersecurity precautions.

The Solution: The Commission does not have sufficient cybersecurity expertise to fill this gap for rural PSAPs that may not have sufficient cybersecurity support locally since the cybersecurity considerations for 9-1-1 centers are significantly different than those of utilities.

Recommendation: The legislature should consider directing other resources to provide cybersecurity support for the state's local 9-1-1 centers that do not have sufficient local resources. The potential funding mechanisms described at the end of this section should be considered as a way to fund a statewide cybersecurity program for PSAPs.

No Clear Path Toward a Statewide GIS Dataset for NG9-1-1

The Challenge: Full implementation of Next Generation 9-1-1 includes geospatial routing of 9-1-1 calls, which is routing of 9-1-1 calls based on the x/y coordinate of the caller rather than the cell tower location. This requires a statewide Geographic Information System (GIS) dataset sufficiently provisioned for use in 9-1-1, which does not currently exist.

The Details: The GIS Committee of the Commission's 9-1-1 Advisory Task Force has been exploring this issue, but the solution is elusive. Since all 9-1-1 funding in Colorado is remitted to local 9-1-1 governing bodies, there is no funding mechanism to pay for statewide GIS data collection for use in an NG9-1-1 system.

The Solution: Some aspects of GIS dataset creation for NG9-1-1 could potentially be provided through cost-averaged pricing in a basic emergency service tariff. GIS work necessary to create a statewide dataset for routing of 9-1-1 calls could be provided by the Basic Emergency Service Provider and the cost for that work could be included in the monthly recurring charges for the service. The Commission could consider those additional costs when setting the annual 9-1-1 surcharge rate so that the local 9-1-1 governing bodies would be reimbursed for those costs.

This approach requires the BESP to file an advice letter and tariff pages, with updated

pricing, to provide these services. Currently, the ESInet Users Group is in discussions with Lumen Technologies to provide GIS data tools that governing bodies and PSAPs may use to validate their GIS data for future use for 9-1-1 call routing, an important first step towards creating a statewide 9-1-1 call routing dataset. However, if and when the BESP chooses to offer this service through an amendment of their Basic Emergency Service tariff is at the discretion of the BESP.

Additionally, some aspects of GIS dataset creation may not be appropriate for a Basic Emergency Service tariff. Datasets or layers for use in the PSAP may not fit the definition of “Basic Emergency Service,” and may therefore not be appropriate for inclusion in a Basic Emergency Service tariff. It may therefore be desirable to have a different funding mechanism, such as the ones described below, to pay for these portions of GIS dataset creation for NG9-1-1.

Recommendations: The legislature should consider the potential funding mechanisms for statewide 9-1-1 expenses described below. One of these potential funding mechanisms would require legislative action to implement. The existence of a funding mechanism for statewide 9-1-1 expenses would alleviate this challenge by providing more options to the 9-1-1 stakeholders for how to address it. For instance, many states have engaged with GIS services vendors to help them build a statewide GIS dataset, but that would require a funding mechanism that could be used to make 9-1-1 related expenditures on a statewide basis.

Potential Funding Mechanisms to Alleviate Statewide 9-1-1 Challenges

An analysis of the challenges listed in this section reveals a commonality among most of them: the existence of a funding mechanism for statewide 9-1-1 expenses could be very beneficial to addressing a variety of challenges currently facing 9-1-1 in the state. This is perhaps why most states have some state-level spending authority regarding 9-1-1 expenses. In its most recent annual report to Congress regarding the collection and use of 9-1-1 fees by states, the Federal Communications Commission reported that 40 states have state-level authority over at least some 9-1-1 expenditures.⁶¹

Two different mechanisms are currently being considered by 9-1-1 stakeholders in Colorado to provide this mechanism to pay for some 9-1-1 related expenditures on a statewide basis, where such expenditures are impractical to be made by individual local 9-1-1 governing bodies.

First, a number of 9-1-1 governing bodies have jointly formed an organization operating as the Colorado Council of Authorities (CCOA). Governing bodies pay membership dues, which could in turn be used to fund statewide projects. Although the membership of CCOA represents a minority of the 9-1-1 governing bodies in the state, that minority is growing, and the

⁶¹ Pages 23-24. FCC. “Thirteenth Annual Report to Congress on State Collection and Distribution of 911 and Enhanced 911 Fees and Charges for the Period January 1, 2020 to December 31, 2020.” Published Dec 21, 2021. Retrieved July 15, 2022.

<https://www.fcc.gov/sites/default/files/13th-annual-911-fee-report-2021.pdf>

organization's goal is to have statewide participation.⁶² If membership were universally adopted by all of Colorado's 58 9-1-1 governing bodies, and if membership dues charged to members based on the number of concurrent sessions on the ESInet being purchased by each governing body, the Commission could potentially reimburse the governing bodies in part or in total for the cost of their membership through an adjustment to the 9-1-1 surcharge.⁶³

Second, and more recently, the Legislative Committee of the Commission's 9-1-1 Advisory Task Force has voted to promote draft legislative changes to Article 11 of Title 29 to create a 9-1-1 Services Enterprise, and to allow a portion of the state 9-1-1 surcharge to be used to fund the Enterprise. The Enterprise, in turn, could use that funding to pay for 9-1-1 related expenses of statewide benefit.

In neither case would a new surcharge or fee be required. The current state 9-1-1 surcharge rate is capped in statute at \$0.50 per line per month, but currently only \$0.09 of that authority is being used. Whether the Commission is increasing the state 9-1-1 surcharge to reimburse governing bodies for their membership dues to CCOA or whether it is increasing the surcharge to fund the 9-1-1 Services Enterprise, the Commission could do so with the existing surcharge and within the existing \$0.50 limit.

Both options have potential. The first option has the benefit of not requiring legislation, while the second option has the benefit of not relying on universal participation of the 9-1-1 governing bodies. The two options are also not mutually exclusive. The existence of the CCOA has benefits beyond spending authority in terms of promoting coordination and collaboration among the 9-1-1 governing bodies,⁶⁴ and the 9-1-1 Services Enterprise could be a funding source for the CCOA.

⁶² As of the writing of this report, CCOA has 13 members out of the 58 local 9-1-1 governing bodies in the state.

⁶³ The state 9-1-1 surcharge is distributed to the governing bodies based on the number of concurrent sessions being purchased by each governing body. See § 29-11-102.3(3)(c)(III), C.R.S.

⁶⁴ For example, CCOA is participating in the Commission's current 9-1-1 reliability rulemaking and has provided comments in recent proceedings before the FCC.

6. Federal Activities and National Trends

Federal Activities

National 9-1-1 Program

The National 9-1-1 Program is housed within the National Highway Traffic Safety Administration (NHTSA) Office of Emergency Medical Services, and it is currently undertaking several activities regarding 9-1-1 service nationwide.

- [9-1-1 Datapath](#): This initiative is working on creating a standardized national 9-1-1 dataset that PSAPs could use to classify calls. The classification will allow data to be compared nationally regarding call volume, what types of calls are received, and what types of calls first responders are dispatched to.
- [CAD Assessment Project](#): Computer Aided Dispatch (CAD) systems, used to track calls for service and field responders, are used in almost all PSAPs, but the functionality of those CAD systems varies widely from vendor to vendor and even among different product lines. This nationwide assessment intends to determine the status of CAD systems, and the resulting report will summarize the current status of CAD and the challenges associated with establishing an interoperable 911 CAD data-sharing capability nationwide.
- [COVID-19 Resources](#): The Program is collecting and making available resources for local 9-1-1 entities.
- [Federal 911 Funding](#): This primarily refers to the federal NG9-1-1 grant program, which has concluded, but this page lists other federal funding resources that could potentially be accessed by local 9-1-1 agencies.
- [GIS Assessment Project](#): This project intends to determine the status of Geographic Information Systems data in use by 9-1-1 agencies across the nation, identify the budget, resources, and organizations required to address challenges in current GIS initiatives, and develop strategies to address obstacles.
- [Next Generation 911 for Public Safety Leaders](#): This initiative regards the creation and collection of resources for educating public safety professionals about the benefits of Next Generation 9-1-1. The web page for this project contains a number of useful educational videos and other material.
- [NG9-1-1 National Roadmap](#): This is a publication of the program utilizing work previously performed by the Federal Communications Commission's Task Force on Optimal Public Safety Answering Point (PSAP) Architecture to develop a national plan

for enabling nationwide interoperability between state and regional NG9-1-1 systems. Commission staff participated in the development of this material.

- [Next Generation 9-1-1 Self-Assessment Tool](#): This is a self-assessment tool that can be used by PSAP managers and local and state 9-1-1 officials to assess their agency's readiness for NG9-1-1.
- [NG911/PSBN Interconnection](#): A collaboration with public and private representatives to address the connection between Next Generation 9-1-1 systems and public safety broadband networks, such as the one managed by the FirstNet Authority.
- [Public Safety Telecommunicator Job Reclassification](#): This is an effort to encourage local, state, and federal agencies (such as the Bureau of Labor Statistics) to recognize 9-1-1 telecommunicators as public safety personnel rather than classifying them as clerical workers.

The Federal Communications Commission

There are several FCC actions and proceedings of relevance to this report.

- For several years, the FCC has maintained a timeline by which wireless carriers were required to improve indoor 9-1-1 location accuracy, including the implementation of Z-Axis measurements, which could eventually be used to inform a 9-1-1 call taker which floor of a multi-level building a caller is on within a certain margin of error. A full timeline of the FCC's phased-in location accuracy improvements is available on the FCC's website.⁶⁵
- On March 17, 2021, the Federal Communications Commission issued a Report and Order that directs FCC staff to implement a process by the end of September 2022, by which states, territories, and other government entities may obtain read-only access to the FCC's Network Outage Reporting System (NORS). They will also be able to share data from that system, with the requirement that the data be aggregated and anonymized. This will be helpful in allowing states and other jurisdictions to understand the reliability of originating service provider networks and what impact outages in those networks may have on the ability of citizens to reach 9-1-1.⁶⁶ The PUC filed comments in response to the Notice of Proposed Rulemaking that preceded this Report and Order, encouraging the FCC to take this action.⁶⁷
- On June 24, 2021, the FCC issued a Report and Order on the topic of 9-1-1 Fee Diversion. As required by the Consolidated Appropriations Act of 2021, the FCC established through this Report and Order a definition of "acceptable purposes and

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<https://www.fcc.gov/public-safety-and-homeland-security/policy-and-licensing-division/911-services/general/location-accuracy-indoor-benchmarks>

⁶⁶ <https://www.fcc.gov/document/fcc-share-communications-outage-info-federal-state-agencies-0>

⁶⁷ <https://drive.google.com/file/d/1J02LHI05-atWTE1kW5hSg8OP-s9UDkT2/view>

functions for the obligation or expenditure of 911 fees or charges” for the purposes of the Act.⁶⁸ The PUC filed comments in reply to the Notice of Proposed Rulemaking that preceded this Report and Order, encouraging the FCC to make specific changes to the proposed rules.⁶⁹ The FCC adopted final rules that included some of the PUC’s proposed changes.⁷⁰

- In compliance with the Consolidated Appropriations Act of 2021, the FCC also created a 9-1-1 Fee Diversion Strike Force to make additional recommendations to Congress regarding what penalties or incentives might be instituted to discourage states, territories, and taxing jurisdictions (such as 9-1-1 governing bodies) from using 9-1-1 fees for purposes other than those designated as “acceptable” by the FCC.⁷¹ The final report from that Strike Force was issued in September of 2021. PUC staff served on this Strike Force. As of this report, the FCC has not taken any action to adopt the recommendations of the Strike Force.
- On December 20, 2021, the FCC issued a Public Notice calling for comments on a Petition for Rulemaking that was filed by the National Association of State 911 Administrators (NASNA).⁷² The Petition calls on the Commission to take several actions to facilitate NG9-1-1 deployment in the states. The fact that the FCC has requested public comment on the Petition indicates that it may be considering taking action on the request.
- On June 9, 2022, the FCC issued a “Public Notice to Refresh the Record on Location-Based Routing of 9-1-1 Calls,”⁷³ and the call for public comment may indicate that the FCC plans on taking further action in the near future regarding this topic. The Public Notice was issued shortly after an announcement by AT&T Mobility that it plans to begin routing wireless 9-1-1 calls on its network based on the location of the caller. This is in contrast to how wireless 9-1-1 calls are routed in legacy E9-1-1 networks, and how most wireless 9-1-1 calls are routed in Colorado, which is based on the location of the cell tower handling the 9-1-1 call. Routing 9-1-1 calls based on the location of the caller has the potential to reduce the number of instances where 9-1-1 calls must be transferred from a PSAP receiving the 9-1-1 call to the PSAP that can process the call for service and dispatch field responders, which in turn increases the chances of a positive outcome for the caller.

Federal Legislation

There have been a number of bills introduced in the 117th Congress involving 9-1-1 service that have not advanced, including Next Generation 9-1-1 deployment grant programs in both

⁶⁸ <https://docs.fcc.gov/public/attachments/FCC-21-80A1.pdf>

⁶⁹ <https://drive.google.com/file/d/1GaMTlxDv5RsTkBL6FIHBx3zGRdeUITPG/view?usp=sharing>

⁷⁰ See 47 CFR §§ 9.21 through 9.26.

⁷¹ <https://www.fcc.gov/911strikeforce>

⁷² <https://www.fcc.gov/document/pshsb-seeks-comment-nasna-petition-rulemaking>

⁷³ <https://www.fcc.gov/document/fcc-examines-location-based-routing-wireless-911-calls-0>

the LIFT America Act (Sec. 15001) and the Build Back Better Bill (Sec. 31101). The most recent effort to provide funding for continued deployment of NG9-1-1 systems can be found in an amendment to H.R. 7624, which directs the FCC to auction certain bands of radio spectrum for commercial use.⁷⁴ The amendment specifies that up to \$10 billion of the revenue from the sale would be used to fund a grant program to assist states with NG9-1-1 deployment.⁷⁵

The potential for future rounds of federal funding to assist with NG9-1-1 system deployment also raises the question of whether Colorado will have a source of funding to meet the matching requirements for such grants. This may add some urgency to the need to have a state-level funding source for certain 9-1-1 related expenditures as discussed in [Section 5](#).

National Trends

National Next Generation 9-1-1 Status

A good source of the national status of NG9-1-1 deployment is the “National 9-1-1 Progress Report,” published annually by the National 9-1-1 Program⁷⁶. In this most recent edition of the report, it is reported that 32 states now have at least some PSAPs receiving 9-1-1 calls via an Emergency Services IP-network (ESInet).⁷⁷

Among states that have implemented ESInets, the progress toward full implementation of NG9-1-1 is less clear. There have states that have reached other milestones in NG9-1-1 implementation, including geospatial routing of 9-1-1 calls, attachment of location information to 9-1-1 calls using NENA i3 standard protocols, and delivery of text to 9-1-1 calls via the ESInet, but how many PSAP have reached each of these or other milestones isn’t tracked.

Other Technological Trends

In May of 2022, AT&T Mobility announced that it plans to begin routing wireless 9-1-1 calls received on its network based on the location of the caller as opposed to routing calls based on the cell tower sector that is providing connectivity to the caller.⁷⁸ This approach, known as geospatial routing, has the benefit of potentially getting 9-1-1 calls to the correct PSAP a

⁷⁴ <https://www.congress.gov/bill/117th-congress/house-bill/7624/text?r=1&s=1>

⁷⁵ Jackson, Donnie. [IWCE’s Urgent Communications](#). “House Subcommittee Proposes NG911 Funding of up to \$10 billion.” Published June 18, 2022.

<https://urgentcomm.com/2022/06/18/house-subcommittee-proposes-ng911-funding-of-up-to-10-billion/>

⁷⁶ National 911 Program. National 911 Progress Report: 2020 Data. Published Feb 2022. Retrieved July 15, 2022. https://911-assets.nyc3.digitaloceanspaces.com/National_911_Annual_Report_2020_Data.pdf

⁷⁷ Page 9.

⁷⁸ AT&T. Press Release: “AT&T Launches First-Ever Nationwide Location-Based Routing with Intrado to Improve Public Safety Response for Wireless 9-1-1 Calls”. Published May 10, 2022.

<https://about.att.com/story/2022/nationwide-location-based-routing.html>

higher percentage of the time, reducing the need to transfer 9-1-1 calls from one PSAP to another and reducing the time before first responders can be dispatched. T-Mobile made a similar announcement in 2019, although T-Mobile's implementation of geospatial routing of 9-1-1 calls on its network requires a request from each PSAP that wishes to participate, whereas AT&T's announcement indicates that the implementation will be automatic, starting in a small number of states including Colorado.

In response to AT&T Mobility's announcement, the FCC issued a Public Notice calling on comments to "refresh the record" regarding the viability of geospatial routing of wireless 9-1-1 calls.⁷⁹ This may indicate that the FCC will take some action in the near future on this matter, and given that two of the three major wireless carriers are already providing the feature, it may be made standard.

It should be noted that this does not remove the need for state 9-1-1 systems to implement geospatial routing capabilities at the level of their Emergency Services IP Network (ESInet), since there are other desirable capabilities that such functionality could provide, such as dynamic rerouting of calls that will help prevent neighboring PSAPs from becoming overwhelmed in the event that a large PSAP must be temporarily taken off of the network. However, geospatial routing of wireless 9-1-1 calls is one of the major reasons for implementing geospatial routing on an ESInet, so the implementation of this feature by the carrier networks before the call even reaches the ESInet would be welcome.

The Transform911 Initiative

Over the course of the last year, the University of Chicago Health Lab has been undertaking an initiative referred to as Transform911 to "explore how the nation's 911 system can better prioritize health and safety and ensure the right responder is dispatched at the right time."⁸⁰ This effort included roundtable discussions involving over one hundred stakeholders from a wide range of backgrounds to discuss ways to improve 9-1-1 generally.

The culmination of this effort was the publication of a "Blueprint for Change" that outlined seven primary recommendations for improving 9-1-1 service in the United States.⁸¹ Several of these recommendations echo what other organizations such as the National Emergency Number Association and the Association of Public Safety Communications Officials have previously called for, such as providing greater support for the 9-1-1 workforce in terms of staffing, training, and other resources. Other recommendations are more novel, such as ensuring community engagement on PSAP oversight boards and committees and making PSAPs independent entities equal to other first responder agencies instead of departments within a police department, sheriff's office, or fire department.

⁷⁹ <https://www.fcc.gov/document/fcc-examines-location-based-routing-wireless-911-calls-0>

⁸⁰ <https://www.transform911.org/>

⁸¹ <https://www.transform911.org/blueprint/>



Figure 6.1: The Transform911 seven-point plan.

Commission staff participated in a number of the roundtable discussions that resulted in the publication of the Blueprint document.

Telecommunicator Training

Colorado is one of only fourteen states that have not legislated minimum training standards for public safety telecommunicators or did not respond to the data request conducted by the National 911 Program Office on this topic.

\$1.62 (up from \$1.54 in last year's report), with a low of 70¢ and a high of \$3.00. Compared to locally set 9-1-1 surcharges in other states, our local emergency telephone charge rates are neither the lowest nor the highest. The highest rates include \$6.00 in parts of Louisiana and \$6.40 in parts of West Virginia.

Our state 9-1-1 surcharge is \$0.09 (a decrease from last year's rate of \$0.10), which continues to be the lowest in the nation, followed by 20¢ (Arizona) at the low end and \$1.75 (Alabama) at the high end.⁸⁵

Commission and Colorado Involvement in National Venues

The Commission has been involved in national 9-1-1 venues in the following ways over the past year:

- Filed comments with the FCC in support of a Petition for Rulemaking filed by the National Association of State 9-1-1 Administrators (NASNA). In brief, the Petition filed by NASNA calls on the FCC to issue rules to facilitate deployment of Next Generation 9-1-1 systems and technologies at the state level.⁸⁶
- Commission staff currently serving as the treasurer of the National Association of State 9-1-1 Administrators.⁸⁷
- Commission staff served on the governance committee of the Transform911 initiative, an undertaking by the University of Chicago and over one hundred 9-1-1 stakeholders from across the nation, to develop recommendations for the future evolution and development of 9-1-1 services.⁸⁸

⁸⁵ <https://www.nena.org/page/911RateByState?>

⁸⁶ <https://docs.google.com/document/d/1hBacXUU4efXK2SDS3WhvM0xqc3px5KIC/>

⁸⁷ <https://www.nasna911.org/>

⁸⁸ The final recommendations of the Transform911 initiative can be retrieved at <https://www.transform911.org/blueprint/>

7. Funding and Fiscal Outlook

Costs of Providing 9-1-1 Service

Key point: Based on partial responses to a data request sent to the 9-1-1 governing bodies, Commission staff estimated that roughly \$150 million was spent by all of the state's 9-1-1 centers combined.

It is difficult to determine the total cost of providing 9-1-1 service in Colorado. Some costs are borne directly by the 9-1-1 governing bodies, which serve as the funding entity for 9-1-1 service. Others are borne by the entities that operate the Public Safety Answering Points (PSAPs), and some of those costs may not even be attributed to the PSAP budget, particularly when a PSAP is housed within a larger facility operated by a county or municipal government.

Early in 2022, Commission staff issued a data request to all of Colorado's 9-1-1 governing bodies asking, among other things, what the total annual expenses were for all of their PSAPs in 2021. The total of all of the responses was roughly \$150 million, but 12 9-1-1 governing bodies failed to provide cost data as requested, so the actual costs may be higher.⁸⁹ It should be noted that § 29-11-102(4), C.R.S., requires governing bodies to respond to annual data requests provided by the Commission, but provides no penalties for governing bodies that do not comply.

Costs Per Capita

Beginning this year, using data from the annual data collection authorized by § 29-11-102(4), C.R.S., Commission staff is able to begin developing a baseline cost for providing 9-1-1 service in the state. Based on information provided by each governing body regarding the total amount of funding expended on 9-1-1 related costs in their service areas divided by the estimated population of that service area, staff has calculated an average cost of \$61.76 per capita annually for providing 9-1-1 service in the state. The per capita cost varies widely between 9-1-1 governing bodies, and outliers in the data provided by the governing bodies indicate that not all governing bodies may have included all of the same costs in their totals, reducing confidence in the certainty of this average. However, this average is a starting point for comparison in future years, and it is hoped that subsequent data collections may help refine this average and allow for a comparison between the governing bodies.

⁸⁹ Governing bodies that operate PSAPs but failed to provide cost data: Baca County Emergency Telephone Authority Board, Eastern Rio Blanco County Emergency Telephone Authority, Emergency Telephone Service Association of La Plata County, Grand Junction Emergency Telephone Service Authority, Huerfano County Authority Board, Larimer Emergency Telephone Authority, Las Animas County E911 Authority Board, Pueblo County E911 Emergency Telephone Service Authority Board, Western Rio Blanco County 911 Emergency Telephone Service Board, Moffat County 911 Board, and San Juan County Emergency Telephone Services Authority.

Funding Sources

Key points:

- *The current funding mechanisms are sufficiently flexible to meet the 9-1-1 funding needs of Colorado and its 9-1-1 centers.*
- *Roughly \$117 million was raised through local emergency telephone charges, the prepaid 9-1-1 charge, and the state 9-1-1 surcharge combined in 2021.*
- *The Commission recommends that the legislature revisit the prepaid wireless 9-1-1 charge and consider whether returning to a percentage-based prepaid wireless 9-1-1 charge might be more appropriate and equitable.*

The provision of 9-1-1 service in Colorado is funded from several sources, including:

- The state 9-1-1 surcharge, implemented in January of 2021 due to the passage of HB 20-1293. The rate of the surcharge is set by the Commission, up to \$0.50 per line per month.
- The Emergency Telephone Charge (ETC), a local charge established separately by the 58 9-1-1 governing bodies that apply to landline, wireless, and Voice over Internet Protocol (VoIP) services.⁹⁰ These rates can be set by local 9-1-1 governing bodies independent of oversight up to a threshold set annually by the Commission. ETC rates in excess of this threshold require approval from the Commission obtained through an application process.
- The Prepaid Wireless 9-1-1 Charge, which is set annually by the Commission and charged per transaction. The charges are collected by retailers of prepaid wireless telecommunications services and remitted to DOR. The methodology the Commission uses to set this surcharge is prescribed by statute, and must be the sum of the average of the local emergency telephone charge rates and the state 9-1-1 surcharge.
- “User fees” on agencies dispatched by the Public Safety Answering Point (PSAP).
- Local city and county general funds.

The State 9-1-1 Surcharge

The state 9-1-1 surcharge was first implemented in January of 2021. The rate for this charge is set annually by the Commission, which is directed by statute to reasonably calculate the rate to “to meet the needs of governing bodies to operate the 911 system.”⁹¹ The rate is capped at \$0.50 per “9-1-1 access connection,” meaning telephone line, per month.

Because the emergency telephone charge and the prepaid wireless 9-1-1 charge also exist to provide funding to meet the needs of the governing bodies to operate the 911 system, the Commission has primarily used the state 9-1-1 surcharge to reimburse the 9-1-1 governing bodies for the cost of 9-1-1 call delivery to the PSAPs. The charges for basic emergency service set forth in the current Lumen tariff are charged per concurrent session, and the

⁹⁰ § 29-11-102(2)(a) and (b), C.R.S.

⁹¹ § 29-11-102.3(1)(b), C.R.S.

funds raised through the state 9-1-1 surcharge are distributed to the governing bodies based on how many concurrent sessions they are purchasing from Lumen.⁹² This makes it a relatively simple matter to calculate a state 9-1-1 surcharge rate that will essentially reimburse the governing bodies for those costs.

The state 9-1-1 surcharge rate set by the Commission for calendar year 2021 was \$0.10 per line per month. This raised roughly \$6,823,285.46 for the year, \$6,612,023.15 of which was distributed to the governing bodies.⁹³ In contrast, the total statewide costs for recurring charges to Lumen Technologies for delivery of 9-1-1 calls to the PSAPS was approximately \$5.5 million, meaning that the Commission achieved its goal of reimbursing the governing bodies for the cost of 9-1-1 call delivery with an additional \$1.1 million that the governing bodies could spend on other expenses allowed under § 29-11-104, C.R.S. Due to this overage, the Commission reduced the state 9-1-1 surcharge rate from \$0.10 to \$0.09 for calendar year 2022.

The implementation of this new surcharge, authorized by the passage of HB 20-1293, has had a significant impact on local 9-1-1 service. First, it allowed for the deployment of the Emergency Services IP Network (ESInet) without passing the higher costs of that service on to the local 9-1-1 governing bodies. Further, it freed up the funds previously being spent by the governing bodies for 9-1-1 call delivery to be used for other expenses within the PSAP, including equipment, personnel, and training.

Local Emergency Telephone Charges

Based on the partial response to the data request sent by Commission staff to all of the 9-1-1 governing bodies in early 2022, staff estimates that roughly \$101 million was raised through emergency telephone charges in calendar year 2021. These are funds remitted by telecommunications service providers directly to the 9-1-1 governing bodies. The rates for these charges vary across the state, but the average rate in Colorado is currently \$1.62.⁹⁴

Governing bodies are free to set a surcharge rate that is sufficient for their needs to provide an emergency telephone service and emergency notification service, up to a threshold set annually by the Commission.⁹⁵ The effective date of the new rate must be either February 1 or June 1, and the governing body must provide at least 60 days notice to the telecommunications service provider prior to the new rate taking effect.

⁹² A “concurrent session” is a connection to the ESInet. The number of concurrent sessions that a PSAP has determines the number of simultaneous 9-1-1 calls that can be received by the PSAP.

⁹³ The difference between these two numbers is the amount retained by the Commission to cover actual expenses for administration of the surcharge. Statute allows up to 4% to be retained. The actual amount retained was roughly 3%. See § 29-11-102.3(3)(c)(II), C.R.S.

⁹⁴ A full list of the rates can be found at

<https://sites.google.com/state.co.us/telecom-surcharges/non-puc-surcharges>

⁹⁵ See § 29-11-102(2)(b), C.R.S.

Average Emergency Telephone Charge Rates by Year

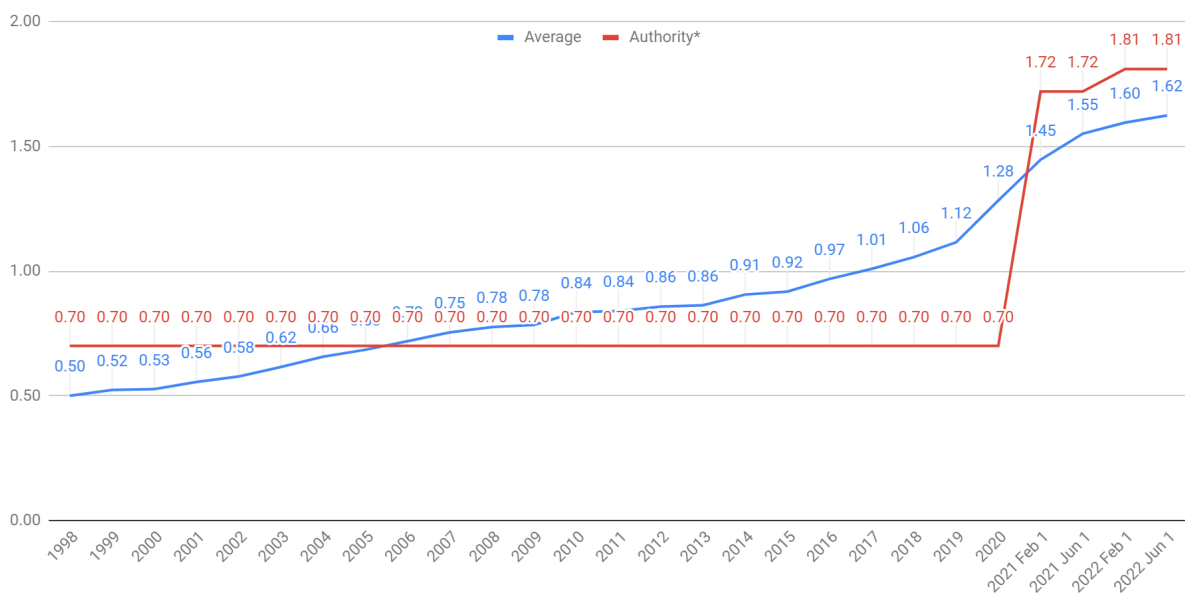


Figure 7.1: Average emergency telephone charge rates in Colorado Since 1998 (blue) compared to the threshold above which governing bodies must apply for approval from the Commission (red). Prior to 2021, the threshold was set in statute at \$0.70 per line per month.

Prior to 2021, the threshold for local emergency telephone charge rates that required an application to be approved by the Commission prior to making the rate effective was statutorily set at \$0.70. With the passage of HB 20-1293, the Commission now sets that threshold annually, taking into account “inflation and the needs of the governing bodies.”⁹⁶ The threshold is currently \$1.81 per line per month, and as demonstrated by *Figure 7.1*, the threshold is now leading the average ETC rate in the state, so that only those ETC rates that exceed the norm require approval from the Commission.

This in turn means that governing bodies have more freedom to determine what the appropriate emergency telephone charge rate is to meet their needs, and this means there is more local funding available to pay for PSAP-related expenses such as equipment, personnel, and training.

Prepaid Wireless 9-1-1 Charge

Based on data provided by the Colorado Department of Revenue, roughly \$9.7 million was raised through the prepaid wireless 9-1-1 charge.

Prior to the implementation of HB 20-1293, the prepaid wireless 9-1-1 charge was set in statute at 1.4% of the value of the prepaid wireless telecommunications service being sold,

⁹⁶ See § 29-11-102(2)(f)(II), C.R.S.

which raised roughly \$200,000 per month in 2020. Beginning in January of 2021, the charge was changed to a flat rate of \$1.38 per transaction. No data existed regarding how many prepaid wireless telecommunications transactions were taking place in the state, so it was not possible to predict what the revenue generated from this flat rate would be. Since the implementation of that flat rate, reports issued by the Colorado Department of Revenue indicated that the revenue from the prepaid wireless 9-1-1 charge increased roughly five-fold, bringing in around \$1 million per month. These funds are distributed to the 9-1-1 governing bodies based on wireless call volume at PSAP or PSAPs associated with each governing body.

Statute now requires the Commission to adjust the prepaid wireless 9-1-1 charge rate annually using a formula that is the sum of the average of the local emergency telephone charge rates plus the state surcharge rate.⁹⁷ For calendar year 2021, this resulted in a prepaid wireless charge rate of \$1.63 for calendar year 2022, and so far in this calendar year this rate has yielded roughly \$1.2 to \$1.3 million per month to be distributed to the local 9-1-1 governing bodies.

Statewide Prepaid Wireless 9-1-1 Charge Collections

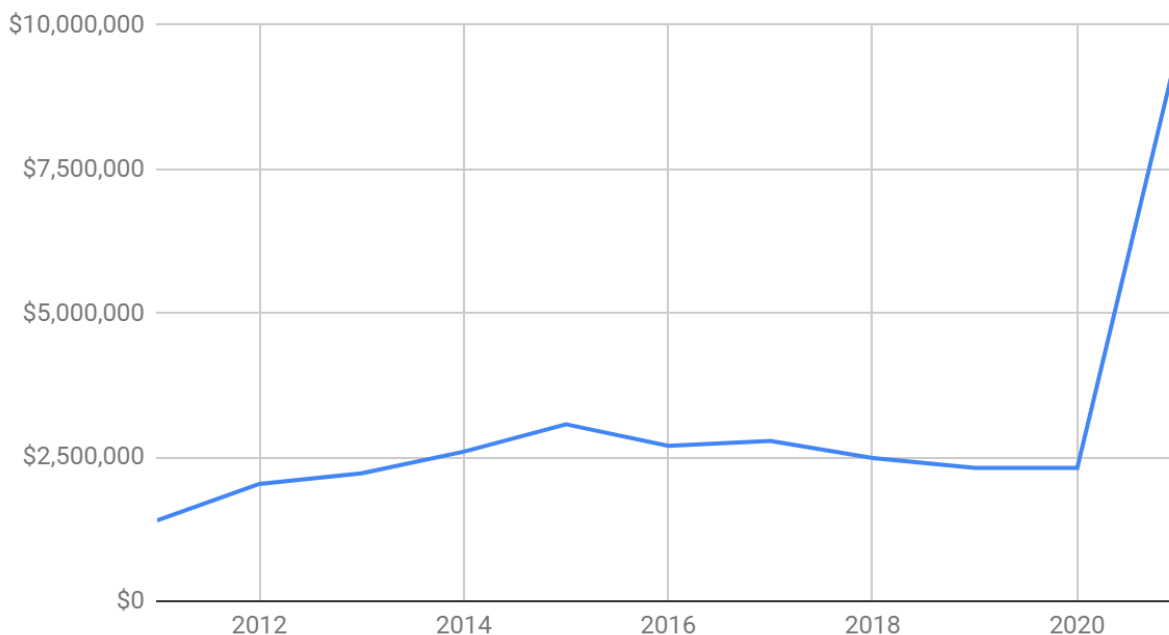


Figure 7.2: Prepaid 9-1-1 surcharge revenues by year. The sharp increase in 2021 was due to changes made by HB 20-1293, which took effect in January of 2021.

Source of data: Colorado Department of Revenue.

As can be seen from *Figure 7.2*, the revenue generated from the prepaid wireless 9-1-1 charge has significantly increased due to transition to a flat, per transaction rate as required in HB 20-1293. This represents nearly \$7.5 million being provided annually to local 9-1-1

⁹⁷ See § 29-11-102.5(2)(c), C.R.S.

governing bodies to fund expenses within their PSAPs, including equipment, personnel, and training. Presuming that most prepaid wireless telecommunications service users purchase minutes on a monthly basis, this the transition of the rate from 1.4% of the value of the transaction to a flat rate per transaction based on the average local emergency telephone charge rate and the state 9-1-1 surcharge rate means that prepaid wireless telecommunications service users are remitting surcharges on parity with other telecommunications service users in the state.

However, one Commissioner has expressed concern that the transition from a percentage-based prepaid wireless 9-1-1 charge to a per-transaction flat rate may adversely impact low-income individuals, who may be forced by circumstances to purchase prepaid wireless telephone service minutes in smaller increments, resulting in them paying more transactions fees than customers that can afford to buy prepaid services in larger quantities with fewer transactions. **We recommend that the legislature revisit this issue and consider whether a percentage-based prepaid wireless 9-1-1 charge might be more appropriate and equitable.** Now that data is available regarding the number of prepaid wireless telecommunications service transactions that are taking place, it would be possible to set a percentage rate that will generate the same revenue as is currently being received with a flat rate, but won't penalize consumers who purchase service in smaller increments.

Local City and County General Funds

Together, the state 9-1-1 surcharge, prepaid wireless 9-1-1 charge, and local emergency telephone charges raised approximately \$117.3 million in 2021. Comparing this to the estimated cost of 9-1-1 service provision of roughly \$150 million, this means that a shortfall of roughly 32.7 million had to be funded by the cities and counties operating the state's PSAPs, either through direct appropriations or through the payment of agency user fees paid to the PSAPs for dispatching services.

In some limited cases, local sales taxes have also been approved and set aside for public safety communications, including the PSAP. Otherwise the remaining costs of operating Colorado's PSAPs are paid out of county and municipal budgets.

Funding Challenges

Per-line surcharges applied to communications services remains the primary method for funding 9-1-1 services not just in Colorado, but nationally.⁹⁸ However, this method has challenges.

Dropping Line Counts in Rural Areas

First, line counts have been decreasing in some rural areas of the state, which results in fewer revenues generated from per-line emergency telephone charges (ETCs). This requires

⁹⁸ See <https://www.nena.org/page/911RateByState> for a list of 9-1-1 fees in other states.

rural governing bodies to raise their emergency telephone charge rates just to maintain revenue levels, let alone to keep up with increasing costs of personnel, equipment, training, and other costs of operating a PSAP.

Conversely, on a statewide basis, the number of lines has increased. In 2020, the phone lines reported to the Commission by the telecommunications service providers numbered at an average of 5,935,852. For the period of June 2021 through May of 2022, the average number of lines reported was 6,250,123, an increase of 5.2% in one year.

Taken together, the decreasing number of lines being reported in rural areas of the state and the increasing number of lines statewide, these facts indicate that it may be necessary in the future to shift more costs from local emergency telephone charges to the state 9-1-1 surcharge. Alternatively, some other funding source may be needed to supplement emergency telephone charge revenue in rural areas. To do neither of these things will likely result in greater pressure in rural areas to increase their emergency telephone charge rates.

Non-Traditional Sources of 9-1-1 Calls

Another challenge to the per line surcharge is that in the future not all calls for service may originate from 9-1-1 calls from telecommunications services that have monthly billing cycles. As an example, prepaid wireless telecommunications services have already proven a challenge to the traditional monthly surcharge model, requiring an additional surcharge to apply only to prepaid wireless telecommunications services.

However, in the future, the list of sources for 9-1-1 calls may be much greater. The explosion of Internet-based sensors and other connected devices on the market may serve as a growing source of 9-1-1 calls in the future, and may eventually represent a sizable portion of the calls. Examples of these potential sources include automated alarm systems, including home-based Internet-of-Things (IoT) alarm systems, personal medical monitoring devices (including smartwatches that can monitor for falls, irregular heart rhythms, and more), automatic crash notification systems installed in vehicles, smart cameras that can detect potential crimes in progress, and AI-driving smart speakers.

To date, many of these types of services already access 9-1-1, but do so using an existing smart phone connection, so surcharge revenue is already being captured. In the future, there may be a greater desire by the public for these devices to be able to deliver requests for assistance directly to the Emergency Services IP Network (ESInet). If this happens, the number of ways 9-1-1 calls can reach a PSAP will no longer equal the ways that surcharge revenue is assessed, causing greater shortfalls that will have to be made up or by either raising rates on the remaining services that do pay monthly surcharges or by shifting more of the costs of operating PSAPs to local governments.

The Commission has no recommendations to the legislature at this time regarding this issue, but wishes the legislature to be aware of these trends. This potential for a future mismatch between the source of costs for 9-1-1 systems and the source of funding for paying 9-1-1

expenses is not limited to Colorado, and it is likely to be a growing topic of discussion nationally over the coming decade.

Potential Funding Mechanisms for Transition to and Implementation of Next Generation 9-1-1

Specific to the question of funding Next Generation 9-1-1 implementation, Colorado's existing funding mechanisms are sufficient for their current purposes. However, additional funding mechanisms may be required for statewide expenses.

Currently all costs for NG9-1-1 deployment are either funded through the payment of tariff charges or through the expenditure of emergency telephone charges on NG9-1-1 equipment and services at the governing body or PSAP level. The revenues of the state 9-1-1 surcharge are used to fund the tariff-based costs of NG9-1-1, and the Commission currently only uses 9 cents of the 50 cent cap in the surcharge to reimburse the 9-1-1 governing bodies for those costs. Likewise, the 9-1-1 governing bodies have the authority to adjust their emergency telephone charge rates, with some oversight from the Commission, to meet the needs of NG9-1-1 deployment costs within the PSAPs.

However, all three of Colorado's 9-1-1 surcharges, being the state 9-1-1 surcharge, the emergency telephone charge, and the prepaid wireless 9-1-1 charge, are either remitted directly to the local governing bodies or they are remitted to the state and distributed to local agencies. No funds are retained at the state level to pay for statewide expenses, including expenses related to NG9-1-1 deployment. As such, statewide NG9-1-1 related costs may benefit from the funding mechanisms discussed at the end of [Section 5](#). Examples of these types of expenses may include statewide integration of GIS datasets for use in NG9-1-1 call routing and matching funds for potential future federal grants for NG9-1-1 deployment.

As discussed in [Section 5](#), these potential mechanisms include:

1. The formation of a statewide association of the local 9-1-1 governing bodies, using the dues from the governing bodies to pay for certain statewide expenses, and reimbursement of the dues through the state 9-1-1 surcharge. Such an organization, known as the Colorado Council of Authorities (CCOA) has already formed, and is trying to grow its membership.
2. The creation of a 9-1-1 Services Enterprise, and the authority for that Enterprise to receive a portion of funding generated by the state 9-1-1 surcharge and use that funding on 9-1-1 expenses of statewide benefit. The Legislative Committee of the Commission's 9-1-1 Advisory Task Force is currently proposing legislation to accomplish this.
3. A combination of these two approaches.

Conclusion

The intent of this report is to meet the requirements of § 40-2-131, C.R.S., to provide “overall understanding of the state of 911 service in Colorado” by specifically covering the topics listed in that statute. This general overview goes beyond the portion of the 9-1-1 system that is regulated by the Commission, but in fulfilling its duty to regulate Basic Emergency Service, established in § 40-15-201, C.R.S., the Commission endeavors to understand the entire 9-1-1 call flow and the components and actors that make it work.

As described in this document, Colorado’s 9-1-1 system is in a transitional period between a legacy E9-1-1 network and a Next Generation 9-1-1 system. This transition has begun with the migration of every Public Safety Answering Point (PSAP) in the state off of analog 9-1-1 trunks of the legacy network and onto an Emergency Services IP Network (ESInet). The deployment of the ESInet is almost complete, and the state’s 9-1-1 stakeholders are currently in discussions with the state’s Basic Emergency Service Provider (BESP), Lumen Technologies, regarding next possible steps.

In the meantime, Colorado’s 9-1-1 stakeholders must continue to work to meet consumer and citizen expectations. This includes promoting local implementation of text-to-911 service, improving uniformity of minimum training standards for public safety telecommunicators, and improving the reliability and resiliency of the 9-1-1 network. While they are outside the Commission’s authority to address directly, the Commission is doing what it can informally to promote text-to-911 service adoption and improved uniformity of PSAP standards, including training standards. On the topic of improved reliability and resiliency of the basic emergency service network, the Commission is taking direct action through its ongoing rulemaking on that topic.

An examination of the challenges discussed in [Section 5](#) of this report reveals a common theme, which is that some challenges are difficult to address without a state-level funding source to pay for the solutions. Currently all 9-1-1 funding in Colorado is local, being remitted directly to local 9-1-1 governing bodies or by remitting the funds to the state and distributing them to the local agencies. Two potential solutions are discussed at the end of Section 5 that would not impact the existing local funding, but create a state-level source of funding for addressing statewide challenges related to 9-1-1 service delivery.

The Commission is committed to continuing to work with Colorado’s 9-1-1 stakeholders and the legislature to ensure that Colorado’s 9-1-1 system is reliable, resilient, and meets the needs of Colorado’s residents and visitors. Our partners in this endeavor are the cities, the counties, the PSAPs, the 9-1-1 governing bodies, the BESP, and the citizens and visitors to the state of Colorado who rely on 9-1-1 for emergency response. Together, we will continue to develop solutions and strategies to improve the provision of 9-1-1 service in the state, and ensure that Colorado’s residents and visitors have access to the high quality 9-1-1 service that they expect and deserve.

Appendices

Appendix A: Glossary

Sources for these definitions: 4 CCR 723-2-2131, § 29-11-101, C.R.S., and the *NENA Master Glossary of 9-1-1 Terminology*⁹⁹. In a few cases, definitions were written specifically for this report.

9-1-1 - Three-digit abbreviated dialing code used to report an emergency situation requiring a response by an emergency service provider.

9-1-1 Access Connection - Any communications service including wireline, wireless cellular, interconnected voice-over-internet-protocol, or satellite in which connections are enabled, configured, or capable of making 911 calls.

9-1-1 Call - A request for emergency assistance from the public by dialing 911 or addressing the E911 regardless of the technology used.

9-1-1 Governing Body - See *Governing Body*.

9-1-1 Service - The service by which a 9-1-1 call is routed and transported from the end user placing a 9-1-1 call to the Public Safety Answering Point (PSAP) serving the caller's location. 9-1-1 service also includes any related caller location information routed to the PSAP, if any.

9-1-1 Surcharge Fee - The statewide 9-1-1 surcharge fee established by § 29-1-102.3, C.R.S.

Automatic Location Identification (ALI) - The automatic display, on equipment at the PSAP, of the telephone number and location of the caller. ALI data includes non-listed and non-published numbers and addresses, and other information about the caller's location.

Automatic Number Identification (ANI) - The automatic display of the caller's telephone number at the PSAP.

Basic Emergency Service (BES) - The aggregation and transportation of a 9-1-1 call directly to a point of interconnection with a governing body or PSAP. Location information and selective routing of 9-1-1 calls are also considered basic emergency service. (Note: This is a modification of the Commission's definition of BES simplified for the purpose of this report. See 4 CCR 723-2-2131(j) or § 29-11-101 (7), C.R.S. for the full definition.)

Basic Emergency Service Provider (BESP) - Any person certificated by the Commission to provide basic emergency service.

⁹⁹ <https://nenawiki.org/wiki/Category:Glossary>

Demarcation Point - The physical point where the responsibility of a portion of a network changes from one party to another.

Emergency Call Center (ECC) - A facility that is designated to receive requests for emergency assistance, including but not limited to 9-1-1 calls, and staffed to perform one or more of the following functions:

- Determine the location where an emergency response is being requested.
- Interrogate callers to identify, assess, prioritize, and classify requests for emergency assistance and other gathered information.
- Determine the appropriate emergency response required.
- Assess the available emergency response resources that are, or will be, available in the time required.
- Dispatch appropriate emergency response providers.
- Transfer or exchange requests for emergency assistance and other gathered information with other emergency communications centers and emergency response providers.
- Analyze and respond to communications received from emergency response providers and coordinate appropriate actions.
- Support incident command functions.

All PSAPs in Colorado are also ECCs.

Emergency Communications Specialist - See *Public Safety Telecommunicator*.

Emergency Services IP Network (ESInet) - A managed IP network that is used for emergency services communications, and which can be shared by all public safety agencies. It provides the IP transport infrastructure upon which independent application platforms and core services can be deployed, including, but not restricted to, those necessary for providing NG9-1-1 services. ESInets may be constructed from a mix of dedicated and shared facilities. ESInets may be interconnected at local, regional, state, federal, national and international levels to form an IP-based inter-network (network of networks).

Emergency Telephone Charge (ETC) - a charge established by a governing body pursuant to § 29-11-102(2)(a), C.R.S. to pay for the expenses authorized in § 29-11-104, C.R.S.

Enhanced 9-1-1 (E9-1-1) - 9-1-1 service that includes the association of ANI and ALI (including non-listed and non-published numbers and addresses), and selective routing.

FirstNet - The common name used to refer to the National Public Safety Broadband Network (NPSBN), a national network to provide prioritized wireless data coverage for public safety agencies.

Governing Body - The organization responsible for establishing, collecting, and disbursing the emergency telephone charge in a specific geographic area, pursuant to §§ 29-11-102, 103,

and 104, C.R.S.

Intermediary Aggregation Service Provider (IASP) - A person that aggregates and transports 9-1-1 calls for one or more originating service providers (OSPs) for delivery to a BESP selective router or the functional equivalent of such a router.

Internet Protocol (IP) - The method by which data is sent from one computer to another on the Internet or other networks.

Legacy 9-1-1 - The existing, switch-based 9-1-1 system and service, as opposed to Next Generation 9-1-1.

Multi-Line Telephone System (MLTS) - A system comprised of common control units, telephones, and control hardware and software providing local telephone service to multiple customers in businesses, apartments, townhouses, condominiums, schools, dormitories, hotels, motels, resorts, extended care facilities, or similar entities, facilities, or structures.

Multi-line telephone system includes:

- (I) Network and premises-based systems such as Centrex, PBX, and hybrid-key telephone systems; and
- (II) Systems owned or leased by governmental agencies, nonprofit entities, and for-profit businesses.

Next Generation 9-1-1 (NG9-1-1) - A secure, IP-based, open-standards system comprised of hardware, software, data, and operational policies and procedures that:

- A. Provides standardized interfaces from emergency call and message services to support emergency communications;
- B. Processes all types of emergency calls, including voice, text, data, and multimedia information;
- C. Acquires and integrates additional emergency call data useful to call routing and handling;
- D. Delivers the emergency calls, messages, and data to the appropriate public safety answering point and other appropriate emergency entities based on the location of the caller;
- E. Supports data, video, and other communications needs for coordinated incident response and management; and
- F. Interoperates with services and networks used by first responders to facilitate emergency response.

Originating Service Provider (OSP) - A local exchange carrier, wireless carrier, Voice-over-Internet-Protocol service provider, or other provider of functionally equivalent services supplying the ability to place 9-1-1 calls.

Public Safety Answering Point (PSAP) - A facility equipped and staffed on a 24-hour basis to receive and process 9-1-1 calls from a BESP. Types of PSAPs:

- **Primary PSAP:** A PSAP to which 9-1-1 calls are routed directly from the 9-1-1 Control Office.
- **Secondary PSAP:** A PSAP to which 9-1-1 calls are transferred from a Primary PSAP.

Public Safety Telecommunicator (PST) or Telecommunicator - Person employed by a PSAP qualified to answer incoming emergency telephone calls and/or provides for the appropriate emergency response either directly or through communication with the appropriate PSAP.

Selective Routing: The capability of routing a 9-1-1 call to a designated PSAP based upon the location of the end user. (Note: This is a modification of the Commission's definition of Selective Routing simplified for the purpose of this report. See 4 CCR 723-2-2131(w) for the full definition.)

Teletypewriter (TTY) - A special device that lets people who are deaf, hard of hearing, or speech-impaired use the telephone to communicate, by allowing them to type text messages. A TTY is required at both ends of the conversation in order to communicate. Unlike sending text messages from a mobile phone, using a TTY allows for users to see each character as it is typed by the other party.

Text to 9-1-1 - A service that allows users of 9-1-1 to send a text message directly to "911" from their mobile device and allows that text message to be relayed to the appropriate PSAP. There are interim methods of text to 9-1-1 service that relay text to 9-1-1 messages directly to a PSAP, bypassing the existing 9-1-1 network. If a Next Generation 9-1-1 system is available, text to 9-1-1 messages may be relayed through the NG9-1-1 network.

Voice-over-Internet-Protocol (VoIP) - Technology that permits delivery of voice calls and other real-time multimedia sessions over IP networks.

Appendix B: Participating Stakeholders

Pursuant to § 40-2-131(2), C.R.S., this report was developed in consultation with representatives of public safety answering points, 9-1-1 governing bodies, and state-wide organizations that represent public safety agencies.

This report was provided in draft form to the following organizations with a request for comment:

- The Commission's 9-1-1 Advisory Task Force
- The Colorado Chapter of the National Emergency Number Association and the Association of Public Safety Communications Officials, Intl.
- County Sheriffs of Colorado

- Colorado Association of Chiefs of Police
- Colorado State Fire Chiefs
- Emergency Medical Services Association of Colorado
- Colorado Emergency Management Association
- Colorado Counties Incorporated
- Colorado Municipal League

Additionally, a copy was provided to the following state agencies and bodies with a request for comment:

- The Colorado Department of Public Safety
- The Colorado Department of Homeland Security and Emergency Management
- The Homeland Security Advisory Committee's Public Safety Communications Subcommittee

Commission Staff involved in the development and updating of this report consisted of:

- Daryl Branson, state 911 program manager
- Holly Bise, state TRS program manager
- Jolene Sena, telecom surcharge administrator

Appendix C: Additional Resources

For more information:

The Commission's 9-1-1 Program Webpage

<https://sites.google.com/state.co.us/colorado911program/home?authuser=1>

The Commission's 9-1-1 Advisory Task Force Webpage

<https://sites.google.com/state.co.us/9-1-1-advisory-task-force/home?authuser=1>

The Colorado 9-1-1 Resource Center

www.co911rc.org

The Colorado Chapter of NENA and APCO

www.conenaapco.org

The National Emergency Number Association

www.nena.org

The Association of Public Safety Communications Officials, Intl.

www.apcointl.org

The National Association of State 9-1-1 Administrators

www.nasna911.org

The National 9-1-1 Program

www.911.gov

The FCC’s Task Force on Optimal PSAP Architecture

<https://www.fcc.gov/about-fcc/advisory-committees/general/task-force-optimal-public-safety-answering-point>

The FCC’s Communications, Security, Reliability and Interoperability Council

<https://www.fcc.gov/about-fcc/advisory-committees/communications-security-reliability-and-interoperability-council>

The FCC’s Ending 9-1-1 Fee Diversion Now Strike Force

<https://www.fcc.gov/911strikeforce>

The National Public Safety Telecommunications Council

<http://www.npstc.org/>