Addendum 1:

Redundancy and Resiliency in Vermont's 9-1-1 System

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SECTION 1. INTRODUCTION/REASON FOR ADDENDUM

As required by Act 11 of the 2018 Special Session, a report, *Redundancy and Resiliency in Vermont's 9-1-1 System*[1], was presented to the Joint Fiscal Committee by the Vermont Enhanced 9-1-1 Board in August 2018. The purpose of the report was to:

- detail the level of resiliency and redundancy within the 9-1-1 system;
- explain plans for ensuring operational integrity in the event of critical software or hardware failures;
- include, with explanation, identification of the locations and services deemed most vulnerable to system outages or call failures, as determined by the Board;
- include a cost estimate for making any recommended system upgrades.

The report began with an explanation of the networks involved in 9-1-1 call delivery. These networks can be grouped into three categories:

- Originating Service Provider (OSP) Networks – The OSP networks are owned and operated by the service providers that offer calling services to customers such as cellular plans, VoIP or traditional wireline service.

- 9-1-1 Tandem/Legacy Network Gateway (LNG) Environment – The 9-1-1 tandems serve as the aggregation point for all 9-1-1 traffic from the OSP networks. The aggregated traffic is converted from Time Division Multiplex (TDM) to Internet Protocol (IP) in the LNG for delivery into the Next Generation 9-1-1 system.

- Next Generation 9-1-1 (NG911) System – The NG911 system processes and selectively routes 9-1-1 calls to Vermont's six Public Safety Answering Points (PSAPs) and provides associated data to allow the call-taker to effectively assist an emergency caller.

Resiliency and redundancy in each network was examined, vulnerabilities and existing mitigation were identified, and recommendations were made for any needed changes and the associated costs of those changes.

This addendum updates mitigation and recommendations for vulnerabilities in the originating service provider networks and the 9-1-1 tandem/LNG network.

[1] Vermont Enhanced 9-1-1 Board, *Redundancy and Resiliency Report – August 2018:* https://ljfo.vermont.gov/assets/Meetings/Joint-Fiscal-Committee/2018-09-27/302878ad62/Redundancy-and-Resiliency_August2018_FINAL_w-cover-memo.pdf

SECTION 2. UPDATED VULNERABILITIES, MITIGATION AND RECOMMENDATIONS – TABLE AND DISCUSSION

The table below summarizes the Board's original findings related to vulnerabilities in each network involved in 9-1-1 call delivery and provides the updated mitigation and recommendations for any changes, and an estimate of associated costs. Updates to the original information are shown in red:

Identified Vulnerabilities			
Identified Vulnerabilities in Originating Networks	**Mitigation**	**Recommendation**	**Costs**
Central Office Isolation	Emergency Stand Alone where available	The Public Utility Commission (PUC) opened a proceeding in April 2019 at the request of the 9-1-1 Board to examine the central office isolation issue. Based on the results of the proceedings, appropriate actions will be pursued.	TBD
Backhaul connectivity for cellular base stations	Overlapping cellular and/or wi-fi signals where available	Encourage continued growth of cellular coverage in Vermont by commercial carriers	N/A
Identified Vulnerabilities in 911 Tandem/LNG Environment	**Mitigation**	**Recommendation**	**Costs**
LNG Environment – Factors contributing to January 5, 2016 event	Final Route to DID and Network Upgrades	The PUC investigation into this event concluded in February 2019 with a number of recommendations for upgrades by Consolidated Communications. The upgrade work is 90% complete as of May 2, 2019	None
Identified Vulnerabilities in NG911	**Mitigation**	**Recommendation**	**Costs**
Physical diversity to each PSAP	Holistic system design delivers calls to alternate PSAPs when a primary PSAP is offline	None – this vulnerability is mitigated by system design	None

Discussion - Vulnerabilities in Originating Networks

Known single points of failure have existed in the wireline network since the inception of 9-1-1 in Vermont. These vulnerabilities are due to the host-remote architecture which, in some cases, allows for the possibility of the isolation of a central office. A central office isolation limits calling only to numbers within the affected exchange. Calls to numbers outside the local exchange, including calls to 9-1-1, are not possible during isolation events.

In March 2019, the 9-1-1 Board requested the Public Service Department's assistance in filing a petition with the Public Utility Commission for an appropriate proceeding to determine the following:

- Identification of the current status, location and impact of isolation vulnerabilities
- Identification of potential solutions, including costs, for the resolution and/or mitigation of the isolation risk."

On 4/16/2019, the Public Utility Commission opened Docket 19-0869-PET, an investigation into the host-remote isolation vulnerabilities. The 9-1-1 Board is a party to this investigation. Based on the results of the investigation, appropriate actions will be pursued.

Discussion - Vulnerabilities in 911 Tandem/LNG Environment

An assessment of the call delivery process and its ability to failover properly - and in an automated manner - was conducted in September 2016.[2] The assessment identified an area of concern within the LNG environment which had, in January 2016, contributed to an event in which the LNG utilized its final route to deliver 9-1-1 calls to PSAP dispatch lines, rather than into the NG911 system as expected. A petition for a Vermont Public Utility Commission (PUC) investigation[3] into the January 5, 2016 event was initiated by the Public Service Department in consultation with the Enhanced 9-1-1 Board.

In February 2019, the Public Utility Commission closed its investigation into the January 5, 2016 event. In accordance with a stipulated agreement, Consolidated Communications has undertaken a comprehensive upgrade of its network that will improve the routing between the public switched telephone network and the emergency services Internet Protocol network in Vermont. Consolidated's most recent compliance filing, dated May 2, 2019, indicates the network upgrade work is approximately 90% complete.

[2] FairPoint Communications, *NG911 Automatic System Failover Report (proprietary)*, September 2016

[3] Public Utility Commission, Docket 8850, *Petition of the Vermont Department of Public Service for an investigation into the 1/5/16 FairPoint Network incident that disrupted delivery of calls into the Vermont 911 system*

SECTION 3. CONCLUSION

The Enhanced 9-1-1 Board has established strong relationships with multiple partners who have the shared goal of ensuring the reliable delivery of Vermont 9-1-1 calls. These partnerships also allow the Board to identify the appropriate course of action in the event of any concerns about, or failures of, 9-1-1 call delivery. The Vermont Enhanced 9-1-1 Board is committed to working with these partners, the legislature, and all stakeholders, to ensure continued redundancy and resiliency in the statewide 9-1-1 system.

A recent example of this collaboration was the Public Utility Commission workshop on April 30, 2019 which was designed to examine the manner in which facilities-based, fixed residential voice service providers are complying with the FCC's back-up power requirements. Concerns had been raised by citizens of a Vermont community about the how their telephone service provider was meeting the requirements. The 9-1-1 Board participated in the workshop and will carefully review the recommendations currently being developed by the Department of Public Service. The 9-1-1 Board will monitor this issue carefully and participate in identifying the best path forward for mitigating any risks associated with the back-up power requirements.

The Vermont 9-1-1 system, and the various networks involved in 9-1-1 call delivery, are resilient and have redundancy throughout. Mitigation steps are in place to lessen the risks of known vulnerabilities. Updates to the information in this addendum and the original report will be provided as necessary.

END OF REPORT