

Mobile Wireless Coverage in Vermont

December 2022



2022 Mobile Wireless Drive Test Summary

The PSD conducted a drive test to determine the extent of mobile wireless coverage along all primary roads in the state. In 2019, the PSD conducted a similar test using internal resources that included fewer roads. For the 2022 test, the PSD partnered with the Vermont Agency of Transportation whose road maintenance staff conducted the driving. The PSD retained the services of Ookla[®], a company that provides broadband and mobile internet performance testing, to provide the software and technical support for the project. The project employed Ookla Wind[®], a handset-based testing and monitoring solution to collect performance metrics along the routes. Smartphone devices with mobile wireless service were supplied by the six facilities-based carriers with service in Vermont: AT&T, FirstNet, T-Mobile, US Cellular, Verizon, and VTel Wireless.

The test protocol consisted of a five-second voice call to an automated test voice line, followed by an Ookla Speedtest[®] network performance test, which included component checks for download speed, upload speed, latency, and jitter. The smartphone devices were configured to conduct this repeating test protocol automatically while the driver navigated the planned routes. The drive test included over 6,500 miles of planned routes. This included all routes managed by AoT, as well as over 1,500 miles of additional roads managed by towns. The driving was performed by the maintenance staff of each AoT district. The drive test was conducted between July 1 and September 15, and included 322,245 voice calls and 321,390 Ookla data tests.

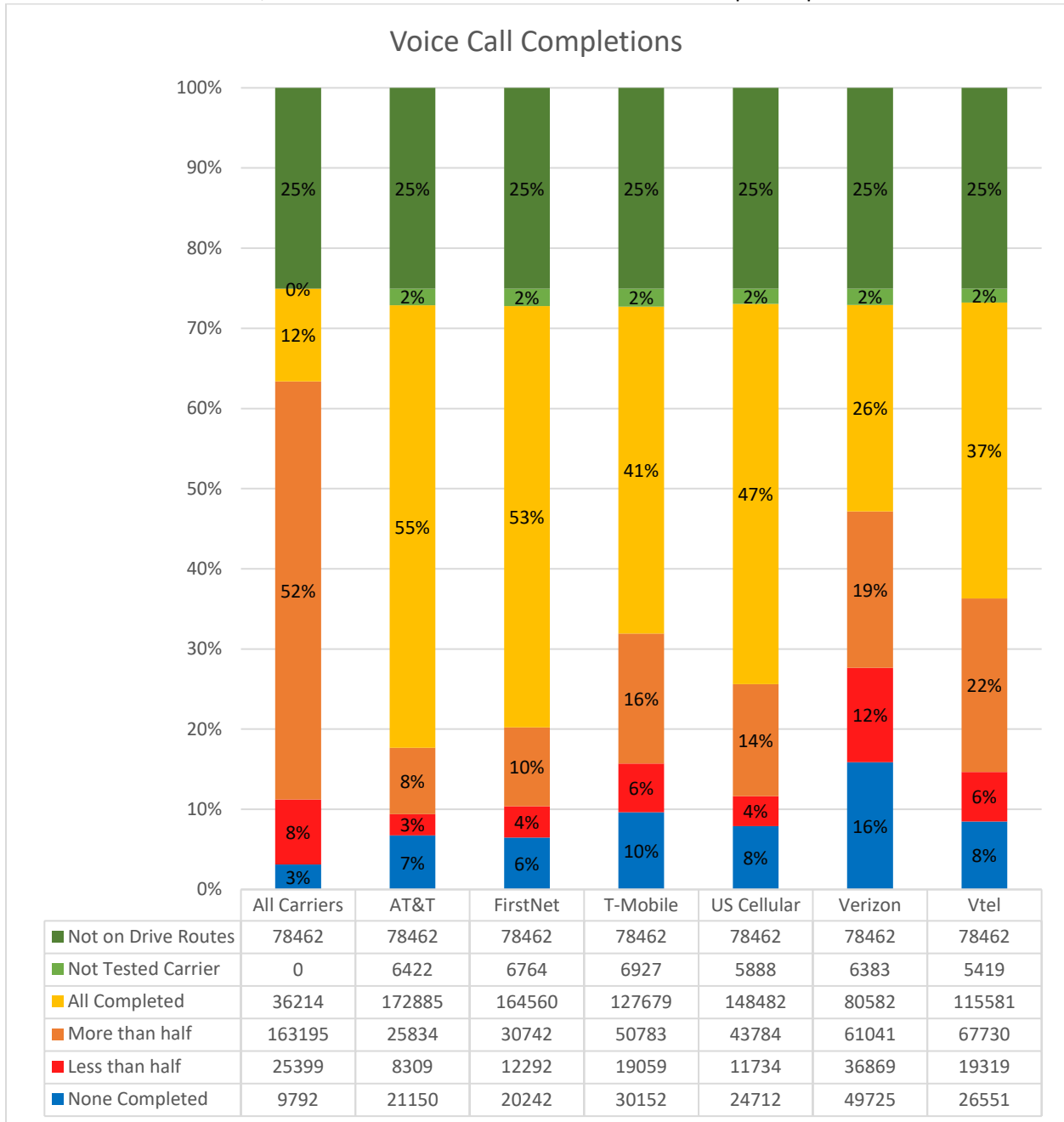
The tests conducted for this project provide performance data for the specific location where each test was conducted. Individual results may be combined and averaged to depict coverage throughout an area. The FCC has adopted the use of H3 resolution 8 hexagons (“hexcells”) to evaluate mobile wireless and broadband deployment. Each hexcell has an area of roughly one square kilometer. We followed the FCC’s example by using hexcells to depict the coverage for the area around each test location on the drive test.

For this project, Ookla determined which hexcell each voice and data test was started in and then determined the average voice and data performance in each hexcell for each provider. We then determined the quantity of buildings in each tested hexcell. This approach allows us to estimate the wireless performance for buildings throughout the state.

The project identified voice and data performance for 10,946 hexcells. These tested hexcells include 62% of the 19,744 Vermont road miles. Of the 313,062 business and residential buildings in the state, 75% are within the tested hexcells. The charts below depict the quantity of buildings that are within hexcells with various performance. This represents an estimate of service at these locations and is not an absolute indication of service performance.

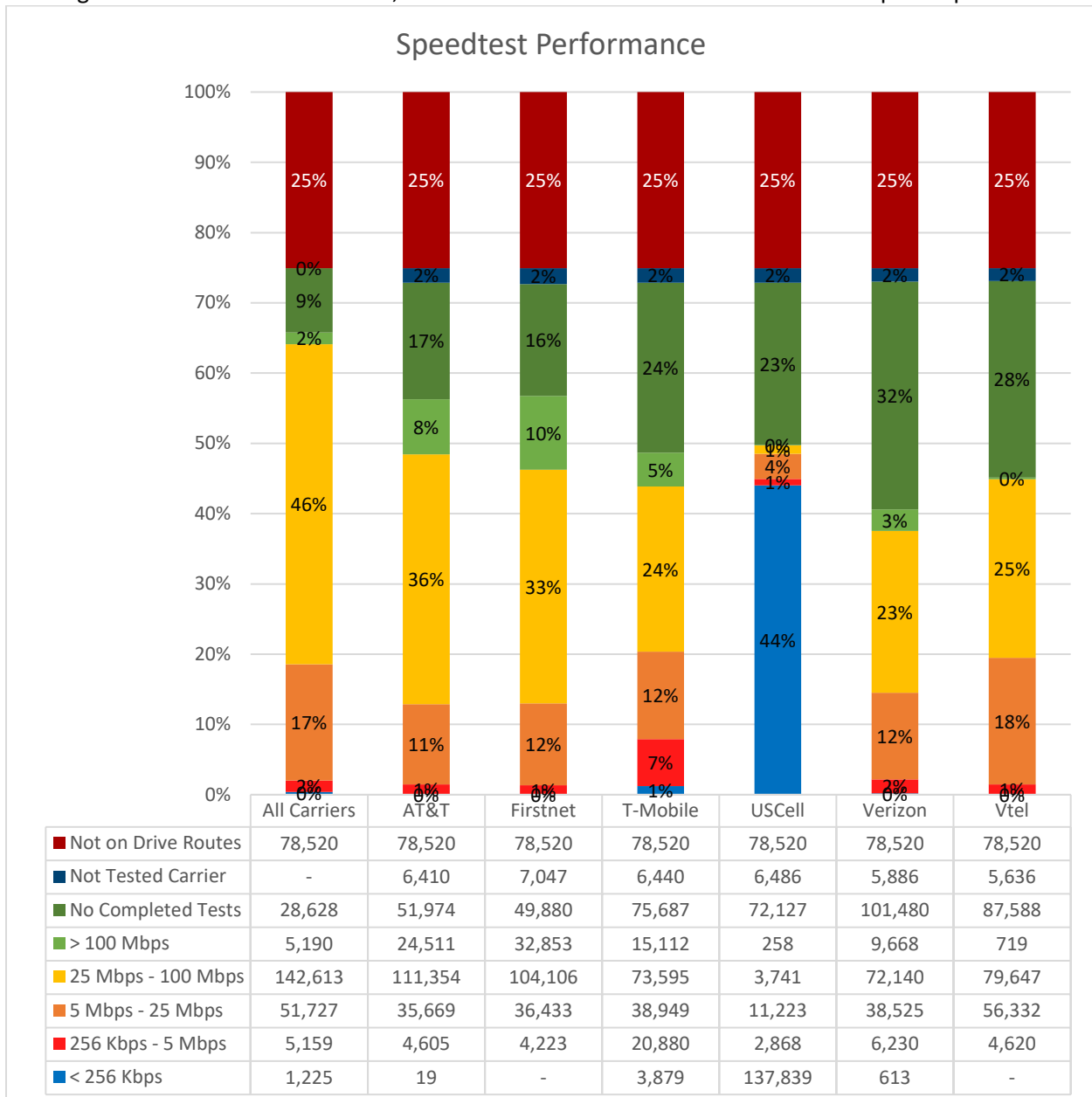
Voice Performance

The chart below depicts voice call completion performance for each service provider. Each section of the bar depicts the portion of buildings in the state that are within hexcells with the indicated level of call completions. For instance, in the yellow portion of the bar for AT&T, the chart indicates that 55% of buildings in the state (172,885 buildings) are within hexcells where all voice calls on AT&T were completed. Voice calls were treated as successfully completed if they were connected and sustained until disconnected by the handset. In the legend below, “Not on Drive Routes” indicates the quantity of buildings not within tested hexcells and “Not Tested Carrier” indicates the quantity of buildings in hexcells that were tested, but where no results were recorded for that specific provider.



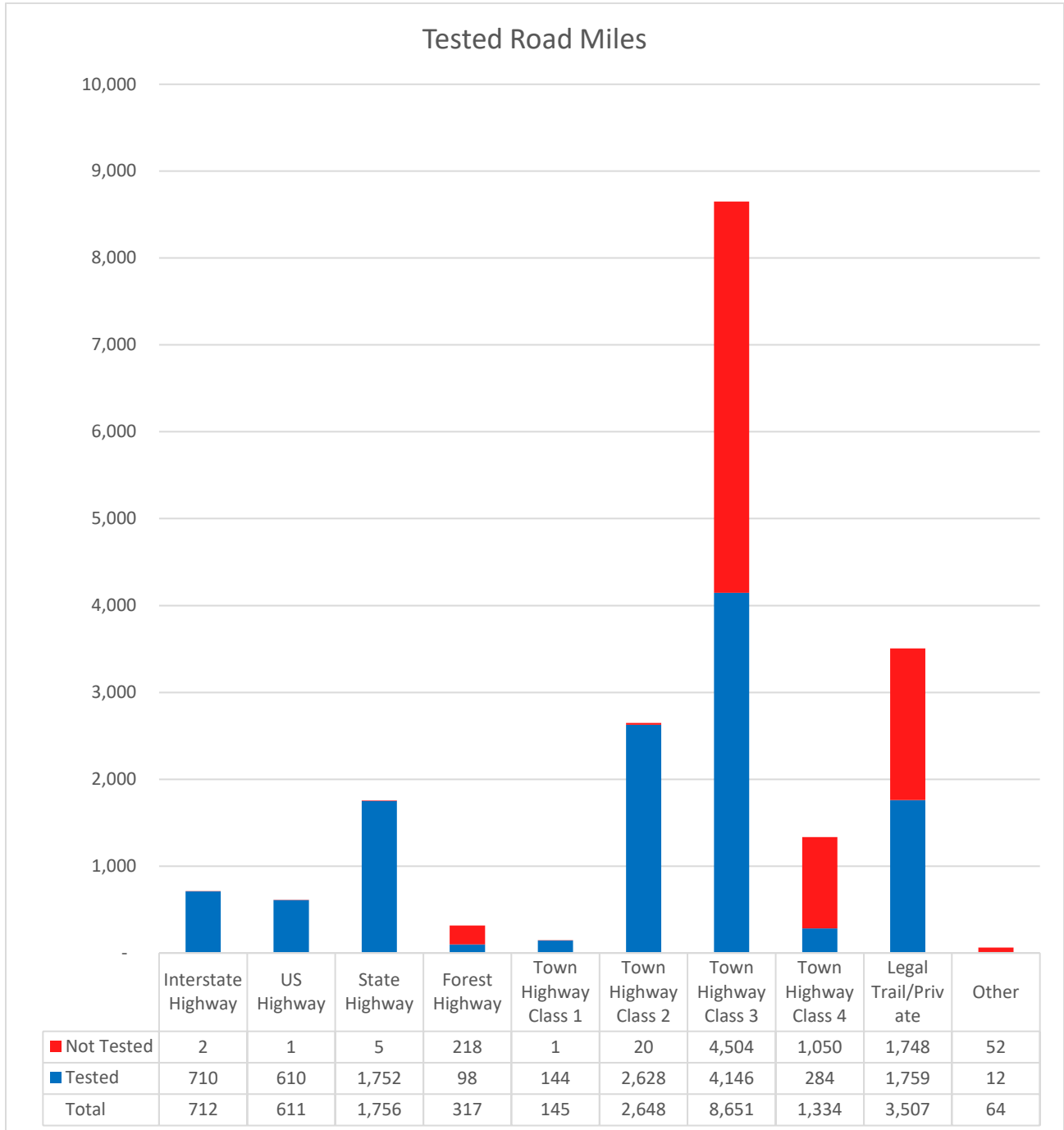
Speedtest Performance

The chart below depicts Speedtest performance for each service provider. Each section of the bar depicts the portion of buildings in the state that are within hexcells with the indicated level of performance. For instance, in the yellow portion of the bar for AT&T, the chart indicates that 36% of buildings in the state (111,354 buildings) are within hexcells where the average recorded download speed was between 25 Mbps and 100 Mbps. An Ookla Speedtest was successfully completed only if all components of the test were completed. In the legend below, “Not on Drive Routes” indicates the quantity of buildings not within tested hexcells and “Not Tested Carrier” indicates the quantity of buildings in hexcells that were tested, but where no results were recorded for that specific provider.



Roadmile Analysis

There are 19,744 identified road miles in the state of Vermont. Of these, 12,144, or 62%, are within tested hexcells, while 7,600 are not. The chart below depicts proportion of road miles within tested hexcells each class of road. As explained above, we treat a hexcell as tested if an individual speedtest or voice test call was initiated within that hexcell. Not all roads in each tested hexcell were driven.



5G performance

The use of the term “5G” in the wireless industry is complicated. The term is sometimes used to indicate the use of specific frequency bands, such as the millimeter wave 30 GHz band. The mobile wireless industry standards body’s 3rd Generation Partnership Project (3GPP) defines 5G as any wireless service that employs “5G New Radio” signaling protocol, regardless of frequency band. The drive test identified 2,055 of the 10,946 tested hexcells where this signaling protocol was detected. The table below depicts the quantity of hexcells by provider:

Provider	Hexcells
AT&T	68
FirstNet	62
T-Mobile	1923
USCC	157
Verizon	70
Vtel	0

FirstNet BandClass

FirstNet has access to a special spectrum frequency range called Bandclass 14. The chart below depicts the extent to which the tests determined deployment of this spectrum.

