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## RF Report

Proposed Wireless Facility  
175 Falmouth Road  
Falmouth, ME 04105



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July 25, 2016

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## 1. Overview

This RF Report has been prepared on behalf of Verizon Wireless in support of its application to the Town of Falmouth for the installation and operation of a wireless facility located at 175 Falmouth Road in Falmouth, ME. The proposed facility consists of a ground based equipment shelter and a proposed monopole tower.

This report concludes that the proposed site is needed to fill in coverage gaps and provide capacity relief to sections of Falmouth in order to improve deficient service areas along the Falmouth Spur, Falmouth Road, and the surrounding roads, neighborhoods, and business/retail/community areas within the proximity of the proposed site.

Included in this report is: a brief summary of the site's objectives, maps showing Verizon Wireless' current network plan, and predicted Radio Frequency coverage of the subject site and the surrounding sites in Verizon Wireless' network.

## 2. Introduction

Verizon Wireless provides digital voice and data communications services using 3rd Generation (3G) CDMA/EVDO technology in the Cellular (800 MHz) and PCS (1900 MHz) frequency bands, and is in the midst of deploying advanced 4th Generation (4G) voice and data services over LTE technology in the 700 MHz, PCS, and AWS (2100 MHz) frequency bands as allocated by the FCC. These networks are used by mobile devices for fast web browsing, media streaming, and other applications that require broadband connections. The mobile devices that benefit from these advanced networks are not limited to basic handheld phones, but also include devices such as smartphones, PDA's, tablets, and laptop air-cards. With the evolving rollout of 4G LTE services and devices, Verizon Wireless customers will have even faster connections to people, information, and entertainment.

As explained within this report, Verizon Wireless has identified the need to add a new facility to its existing network of sites in the Falmouth area to improve capacity and coverage to a significant gap in service that now exists in Falmouth, in order to support reliable communications and meet the growing demand in the area.

To maintain a reliable and robust communications system for the individuals, businesses, public safety workers and others who use its network, Verizon Wireless deploys a network of cell sites (also called wireless communications facilities) throughout the areas in which it is licensed to provide service. These cell sites consist of antennas mounted on structures, such as buildings and towers, supported by radio and power equipment. The receivers and transmitters at each of these sites process signals within a limited geographic area known as a "cell."

Mobile subscriber handsets and wireless devices operate by transmitting and receiving low power radio frequency signals to and from these cell sites. Handset signals that reach the cell site are transferred through land lines (or other means of backhaul transport) and routed to their destinations by sophisticated electronic equipment. In order for Verizon Wireless' network to function effectively, there must be adequate overlapping coverage between the "serving cell" and adjoining cells. This not only allows a user to access the network initially, but also allows for the transfer or "hand-off" of calls and data transmissions from one cell to another, and prevents unintended disconnections or "dropped calls."

Verizon Wireless' antennas also must be located high enough above ground level to allow transmission (a.k.a. propagation) of the radio frequency signals above trees, buildings and other natural or man-made structures that may obstruct or diminish the signals. Areas without adequate radio frequency coverage have substandard service, characterized by dropped and blocked calls, slow data connections, or no wireless service at all, and are commonly referred to as coverage gaps.

The size of the area potentially served by each cell site depends on several factors including the number of antennas used, the height at which the antennas are deployed, the topography of the surrounding land, vegetative cover, and natural or man-made obstructions in the area. The actual service area at any given time also depends on the number of customers who are on the network in range of that cell site. As customers move throughout the service area, the transmission from the phone or other device is automatically transferred to the Verizon Wireless facility with the best reception, without interruption in service, provided that there is overlapping coverage between the cells.

Each cell site must be primarily designed to strike a balance between the overall geographic coverage area it will serve, and the site's capacity to support the usage within the coverage footprint. In rural areas, cell sites are generally designed to have broader coverage footprints because the potential traffic is sparser and distributed over a larger area. In more densely populated suburban and urban environments, the capacity to handle calls and data transmissions is of increasing concern, and cell sites must limit their coverage footprint to an area where the offered network traffic can be supported by the radio equipment and resources. Due to the aggressive historical and projected growth of mobile usage, particularly for mobile data (49% in 2015-2016, 42% CAGR 2015-2020 in North America)<sup>1</sup>, instances arise where the usage demand can no longer be supported by the site(s) serving an area, and new facilities must be integrated to provide capacity relief to the overloaded sites.

We have concluded that by installing the proposed wireless communication facility at 175 Falmouth Road, Verizon Wireless will be able to fill the substantial coverage gap that it now experiences, and provide improved coverage and capacity to residents, businesses, and traffic corridors within sections of Falmouth that are currently located within deficient service areas of Verizon Wireless' network.

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<sup>1</sup> "Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2015-2020", February 3, 2016, Cisco Systems, Inc. <http://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/mobile-white-paper-c11-520862.html>

### 3. The Proposed Facility

As shown on the plans submitted with the application, Verizon Wireless' proposal consists principally of the following elements:

- 1) A monopole tower within the proposed 75'-0" x 75'-0" fenced equipment compound containing a 11'-6" x 26'-0" equipment shelter with internal back-up power generator, and power/telco/fiber utility connections;
- 2) Twelve (12) panel antennas (four per sector), mounted on the proposed monopole tower;
- 3) Remote Radio Heads (RRH) with accessory junction boxes and surge suppressors mounted alongside the antennas;
- 4) A liquid propane tank, on a 4'-0" x 8'-0" concrete pad within the fenced compound;
- 5) An ice bridge from the proposed equipment shelter to the tower in order to protect cabling between the equipment cabinets and the cable entry port located near the base of the tower.

## 4. Coverage and Capacity Objectives

As mentioned above, Verizon Wireless is in the process of rolling out its 4G LTE high-speed wireless broadband system in the 700 MHz, PCS, and AWS frequency bands, in accordance with its licenses from the FCC. In order to expand and enhance their wireless services throughout New England, Verizon Wireless must fill in existing coverage gaps and address capacity, interference, and high-speed broadband issues. As part of this effort, Verizon Wireless has determined that insufficient network capacity and significant coverage gaps exist in and around sections of the Town of Falmouth, ME, as described further below.

Verizon Wireless currently operates wireless facilities, similar to the proposed facility, within the surrounding cities/towns in the vicinity. Due in large part to the distances between the existing sites, the intervening topography, and volume of user traffic in the area, these existing facilities do not provide sufficient coverage and capacity to portions of Falmouth. Specifically, Verizon Wireless determined that much of Falmouth is without reliable service in the following areas and town roads<sup>2</sup>, including but not limited to:

- Falmouth Spur, between the Falmouth Road overpass and the Route 9 (Middle Road) overpass;
- Falmouth Road, between Woodville Road and Route 9;
  - Serves 10,990 vehicles per day, as measured northeast of Allen Avenue (2013);
- Woodlands Drive and the Woodlands Golf Club development;
- The surrounding roads, neighborhoods, and business/retail/community areas within the proximity of the proposed site.

The proposed site located at 175 Falmouth Road (“Falmouth 3”) is needed to fill in these targeted capacity and coverage gaps, in order to improve network quality and reliability for Verizon Wireless subscribers traveling along these roads, as well as to the numerous residences, businesses, and visitors in this area.

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<sup>2</sup> Traffic counts are sourced from the Maine Department of Transportation, Traffic Volume Counts 2015 Annual Report.

## 5. Site Search and Selection Process

To find a site that provides acceptable service, provides adequate capacity relief, and fills the gaps in coverage, computer modeling software is used to define a search area. The search ring identifies the area within which a site could be located (assuming that sufficient height is used) that would have a high probability of addressing the significant coverage gap and meeting the capacity objectives established by the Verizon Wireless RF (Radio Frequency) engineers.

Once a search ring is determined, Verizon Wireless' real estate specialists search within the proximity of the defined area for existing buildings, towers, and other structures of sufficient height that would meet the defined objectives. If none are found, then the focus shifts to "raw land" sites. A suitable site must satisfy the technical requirements identified by the RF engineers, must be available for lease, and must have access to a road and be otherwise suitable for constructing a cell site of the required size and height. Every effort is made to use existing structures before pursuing a "raw land" build to minimize the number of towers throughout the towns being serviced.

After the search of the area had been completed, Verizon Wireless determined that there are no existing structures suitable for collocation<sup>3</sup> with respect to its network requirements, and that constructing a wireless communications facility at 175 Falmouth Road is the best solution to address the targeted coverage and capacity objectives. Verizon Wireless seeks conditional rezoning of the parcel to permit a so-called "Tier III" facility at the site. The Town's ordinance provides that such a rezoning is permissible provided, in relevant part, that it is impractical to meet the coverage and/or capacity objectives with some combination of installations on existing structures within the coverage area. As noted herein, Verizon Wireless cannot provide adequate service without construction of a new facility.

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<sup>3</sup> Verizon investigated both the proposed tower at Falmouth Town Hall and the existing tower at the DPW yard and were unable to secure a lease agreement at either location. As such, a technical analysis of these locations has not been included in this report.

## 6. Pertinent Site Data

Table 1 below details the site-specific information for the existing, approved, planned, and proposed Verizon Wireless sites used to perform the coverage analysis and generate the coverage plots provided herein.

Site Name	Address	City/State	Location		Structure Type	Antenna Height (ft AGL)	Status
			Latitude	Longitude			
Cumberland	Range Way	Cumberland, ME	43.7637	-70.2298	Lattice	148	On-Air
Cumberland 2	60 Val Halla Road	Cumberland, ME	43.7957	-70.2411	Monopole	97	Approved
Falmouth 4	356r US-1	Falmouth, ME	43.7363	-70.2264	Monopole	67	Planned
Falmouth N	Victoria Lane	Falmouth, ME	43.7578	-70.3205	Guyed	177	On-Air
Westbrook	115 Hardy Road	Falmouth, ME	43.7439	-70.3330	Guyed	187	On-Air
Portland 6	Church Avenue	Peaks Island, ME	43.6608	-70.1958	Steeple	36.7	On-Air
Falmouth	525 Presumpscot Street	Portland, ME	43.6996	-70.2585	Monopole	150	On-Air
Monument Sq	1 Monument Square	Portland, ME	43.6575	-70.2583	Rooftop	150.5	On-Air
Portland 2	202 Woodford Street	Portland, ME	43.6707	-70.2877	Steeple	69	On-Air
Portland 3	476 Summit Street	Portland, ME	43.7171	-70.2957	Stealth Pole	95	Approved
Portland 5	52 Canco Road	Portland, ME	43.6817	-70.2870	Monopole	119	On-Air
Portland N	220 Riverside Industrial Parkway	Portland, ME	43.7060	-70.3107	Guyed	272	On-Air
Portland 4	12 Saunders Way	Westbrook, ME	43.6739	-70.3417	Lattice	120	On-Air
Westbrook Dt	Off Bridge Street	Westbrook, ME	43.6968	-70.3621	Guyed	110	On-Air
Falmouth 3	175 Falmouth Road	Falmouth, ME	43.7283	-70.2627	Monopole	87	Proposed

**Table 1: Verizon Wireless Site Information Used in Coverage Analysis<sup>4</sup>**

<sup>4</sup> Some sites listed in this table are outside the plot view but are included for completeness of information.



## 7. Coverage Analysis and Propagation Plots

The signal propagation plots provided in this report show coverage for the 700 MHz frequency range and were produced using deciBel Planner™, a Windows-based RF propagation computer modeling program and network planning tool. The software takes into account the geographical features of an area, land cover, antenna models, antenna heights, RF transmitting power and receiver thresholds to predict coverage and other related RF parameters used in site design and network expansion.

The plots included as attachments show coverage based on RSRP signal strengths of -90 dBm, -95 dBm, and -100 dBm. All other areas (depicted in white) fall within coverage areas characterized by poor service quality, low data throughput, and the substantial likelihood of unreliable service.

Attachments A - H are discussed below:

**Attachment A** titled “Falmouth 3 – Existing 700 MHz LTE Coverage” shows the coverage provided to areas of Falmouth from the “On-Air” sites listed in Table 1. “On-Air” sites are defined as existing Verizon Wireless facilities. The green areas represent the minimum desired level of coverage for the more developed areas or neighborhoods, whereas the orange areas represent a slightly lower signal strength sufficient for the lesser developed, or roadway only areas. The deficient areas of coverage are defined by the unshaded white areas, and to a lesser degree, the grey areas.

**Attachment B** titled “Falmouth 3 – Existing/Approved/Planned 700 MHz LTE Coverage” shows the coverage provided to areas of Falmouth from the “On-Air,” “Approved,” and “Planned” sites listed in Table 1. “Approved” sites are defined as those that are in the final stages of permitting or construction and are expected to be turned on-air in the near future. “Planned” sites are those which have either started or are expected to begin the permitting process in the near future. As shown in this plot and described in the Coverage and Capacity Objectives section of this report, much of Falmouth will continue to be in an area of deficient coverage. These coverage gaps include the Falmouth Spur, Falmouth Road, and the surrounding roads, neighborhoods, and business/retail/community areas within the proximity of the proposed site.

**Attachment C** titled “Falmouth 3 - 700 MHz LTE Coverage with Proposed Site at 87 ft” shows the composite coverage with the proposed “Falmouth 3” facility. As shown by the additional areas of coverage, the proposed facility will provide coverage to:

- ~ 0.7 mi along the Falmouth Spur;
- ~ 0.4 mi along Falmouth Road;
- ~ 0.5 mi along Woodlands Drive;
- ~ 350 (-90 dBm) to 900 (-95 dBm) new residents<sup>5</sup> within the proximity of the proposed facility;
- The surrounding roads, neighborhoods, and business/retail/community areas within the proximity of the proposed site.

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<sup>5</sup> Residential population counts are based upon the 2010 U.S. Census data.

**Attachment D** titled “Falmouth 3 - 700 MHz LTE Coverage with Proposed Site at 107 ft” shows the composite coverage with the proposed “Falmouth 3” facility at a centerline height of 107 ft AGL (representing a 110 ft tower). As evident by the additional areas of coverage:

- ~ 1.5 mi along the Falmouth Spur;
- ~ 1.6 mi along Falmouth Road;
- ~ 1.8 mi along Woodlands Drive;
- ~ 1,250 (-90 dBm) to 2,500 (-95 dBm) new residents within the proximity of the proposed facility;
- The surrounding roads, neighborhoods, and business/retail/community areas within the proximity of the proposed site.

This modest tower height increase of 20’ provides substantial improvement to the area in comparison to that shown in Attachment C. This benefit is due to the additional antenna height and the proposed facility’s location relative to the area topography and surrounding tree clutter in the area.

**Attachment E** titled “Falmouth 3 – Existing/Approved/Planned 700 MHz LTE Sector Footprints” depicts the areas primarily served by the sectors (a.k.a. signal “footprints”) of the existing/approved/planned Verizon Wireless sites in the area, which are shown by the unique color for each particular sector of interest. For clarity, all other sectors of less interest with respect to the proposed site are shown in grey. As demand for wireless voice and data services continues to grow, Verizon Wireless manages the footprint of each sector so that it can support the demand within the area it is primarily serving. In addition to improving coverage to the area, the proposed site is also needed to serve existing and anticipated demand in the vicinity and thereby offload some of the burden experienced by the surrounding sites. In that way, those sites will be able to more adequately serve the demand for service in the areas nearer to those surrounding sites. Please note that the outer parts of each sector footprint include areas that presently have signal strength below the targeted value required for reliable service to Verizon Wireless’ customers. The fact that low-level signal is capable of reaching these areas does not mean that these areas experience adequate coverage. These unreliable areas of low signal level impose a significant capacity burden on the sites primarily serving the area.

**Attachment F** titled “Falmouth 3 - 700 MHz LTE Sector Footprints with Proposed Site at 87 ft” shows the composite coverage with the overall footprint of the proposed facility in dark green. As shown in this map, the proposed “Falmouth 3” facility is an effective solution to provide the necessary capacity relief to the area, particularly to the overloaded “Falmouth” alpha sector (red), the “Portland N” alpha sector (orange), and the “Westbrook” beta sector (yellow). The proposed facility is centrally located in the area of deficient coverage making it particularly suited to distribute the traffic load across multiple sectors, and provide a dominant server to this pocket of heavy usage. Table 2 below details the capacity relief based on the sector footprints shown in Attachments E and F.

Sector	Current			With "Falmouth 3" at 87 ft			Offload Summary		
	Employee Pops	Residential Pops	Area (mi <sup>2</sup> )	Employee Pops	Residential Pops	Area (mi <sup>2</sup> )	Total Employee Pops Offloaded	Total Residential Pops Offloaded	Area Offloaded (mi <sup>2</sup> /%)
Falmouth Alpha	732	1830	2.61	566	1346	1.83	166 ( 22.7%)	484 ( 26.4%)	0.78 ( 29.9%)
Portland N Alpha	3321	4952	3.34	3259	4446	2.74	62 ( 1.9%)	506 ( 10.2%)	0.6 ( 18%)
Westbrook Beta	351	1375	2.49	285	828	1.96	66 ( 18.8%)	547 ( 39.8%)	0.53 ( 21.3%)

**Table 2: Capacity Offload Summary (87 ft)<sup>6</sup>**

**Attachment G** titled “Falmouth 3 - 700 MHz LTE Sector Footprints with Proposed Site at 107 ft” shows the composite coverage with the overall footprint of the proposed facility in dark green, and at a centerline height of 107 ft AGL (representing a 110 ft tower). As shown in this map, the additional height at the proposed facility provides a larger footprint allowing it to offload the surrounding sites to a greater extent than that of a 90’ tower. Table 3 below details the capacity relief based on the sector footprints shown in Attachments E and G.

Sector	Current			With "Falmouth 3" at 107 ft			Offload Summary		
	Employee Pops	Residential Pops	Area (mi <sup>2</sup> )	Employee Pops	Residential Pops	Area (mi <sup>2</sup> )	Total Employee Pops Offloaded	Total Residential Pops Offloaded	Area Offloaded (mi <sup>2</sup> /%)
Falmouth Alpha	732	1830	2.61	361	1023	1.41	371 ( 50.7%)	807 ( 44.1%)	1.2 ( 46%)
Portland N Alpha	3321	4952	3.34	2375	4208	2.13	946 ( 28.5%)	744 ( 15%)	1.21 ( 36.2%)
Westbrook Beta	351	1375	2.49	216	580	1.66	135 ( 38.5%)	795 ( 57.8%)	0.83 ( 33.3%)

**Table 3: Capacity Offload Summary (107 ft)**

**Attachment H** titled “Falmouth 3 – Area Terrain Map” details the terrain features around the proposed “Falmouth 3” site. These terrain features play a key role in dictating both the unique coverage areas served from a given location, and the coverage gaps within the network. This map is included to provide a visual representation of the terrain variations that must be considered when determining the appropriate location and design of a proposed wireless facility. The blue and green shades correspond to lower elevations, whereas the orange, red, and grey shades indicate higher elevations.

<sup>6</sup> Residential population counts are based upon the 2010 U.S. Census data. Employee population counts are based upon the 2011 U.S. Census Bureau LEHD database. Please note that neither includes visitor, or vehicular counts in the area.

## 8. Certification of Non-Interference

Verizon Wireless certifies that the proposed facility will not cause interference to any lawfully operating emergency communication system, television, telephone or radio, in the surrounding area. The FCC has licensed Verizon Wireless to transmit and receive in the Upper C-Block of the 700 MHz band, B Block of the Cellular (850 MHz) band, the E, F, and C5 Blocks of the PCS (1900 MHz) band, and the B and F Blocks of the AWS (2100 MHz) band of the RF spectrum. As a condition of the FCC licenses, Verizon Wireless is prohibited from interfering with other licensed devices that are being operated in a lawful manner. Furthermore, no emergency communication system, television, telephone, or radio is licensed to operate on these frequencies, and therefore interference is highly unlikely.

## 9. Summary

In undertaking its build-out of 4G LTE service in Cumberland County, Verizon Wireless has determined that an additional facility is needed to provide reliable service and adequate capacity throughout areas of the Town of Falmouth, ME. Verizon Wireless determined that constructing a wireless communications facility at 175 Falmouth Road in Falmouth will provide additional coverage and capacity needed in the targeted coverage areas including key roadways such as the Falmouth Spur, Falmouth Road, and the surrounding roads, neighborhoods, and business/retail/community areas within the proximity of the proposed site. Without the installation of the proposed site, Verizon Wireless will be unable to improve and expand their existing 4G LTE wireless communication services in this area of Falmouth; therefore, Verizon Wireless respectfully requests that the Town of Falmouth act favorably upon the proposed facility.

## 10. Statement of Certification

I certify to the best of my knowledge that the statements in this report are true and accurate.

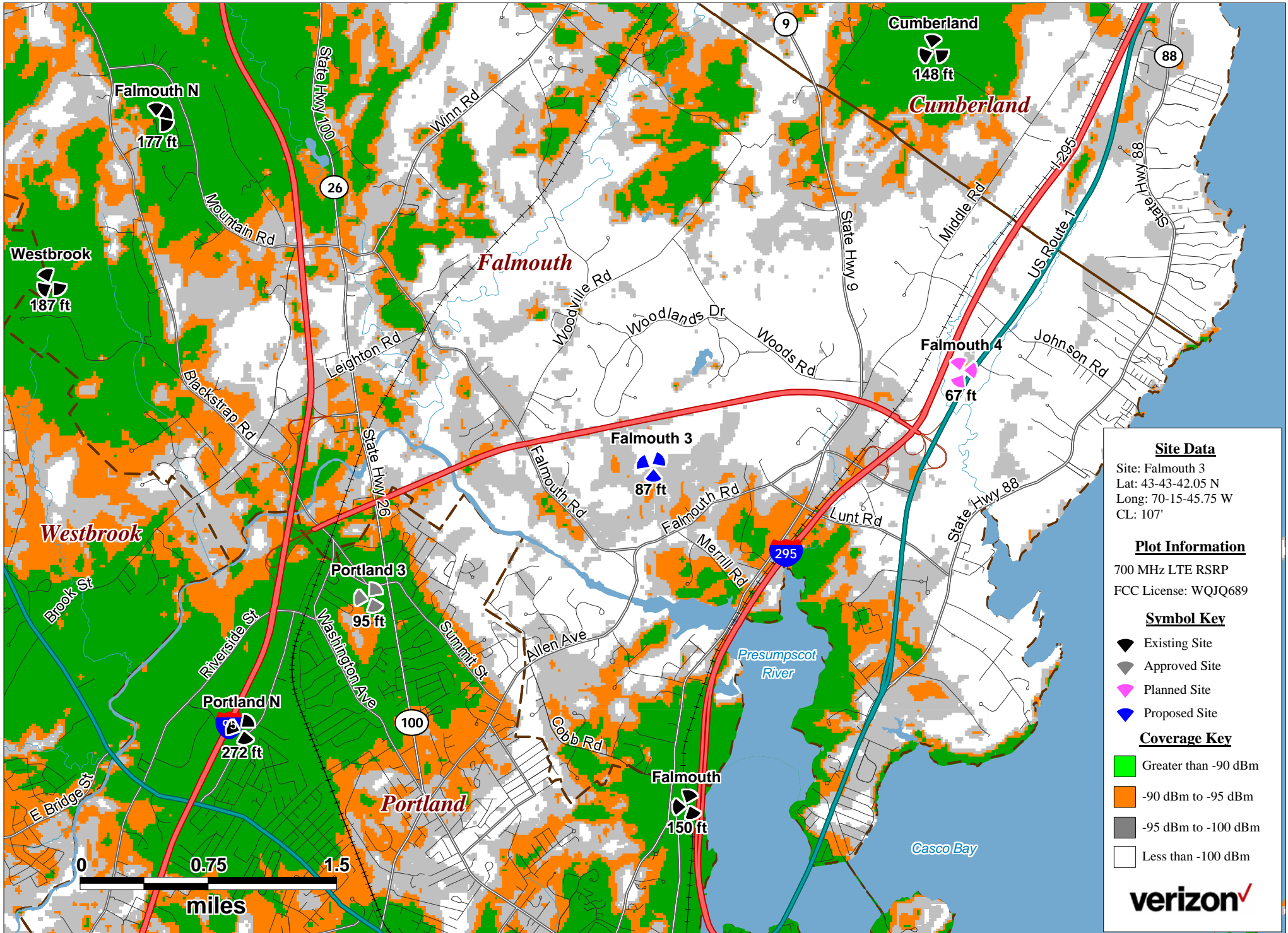


Keith Vellante  
RF Engineer  
C Squared Systems, LLC

July 25, 2016  
Date

## 11. Attachments

**Attachment A:**  
**Falmouth 3 - Existing 700 MHz LTE Coverage**



**Site Data**  
 Site: Falmouth 3  
 Lat: 43-43-42.05 N  
 Long: 70-15-45.75 W  
 CL: 107'

**Plot Information**  
 700 MHz LTE RSRP  
 FCC License: WQJQ689

**Symbol Key**

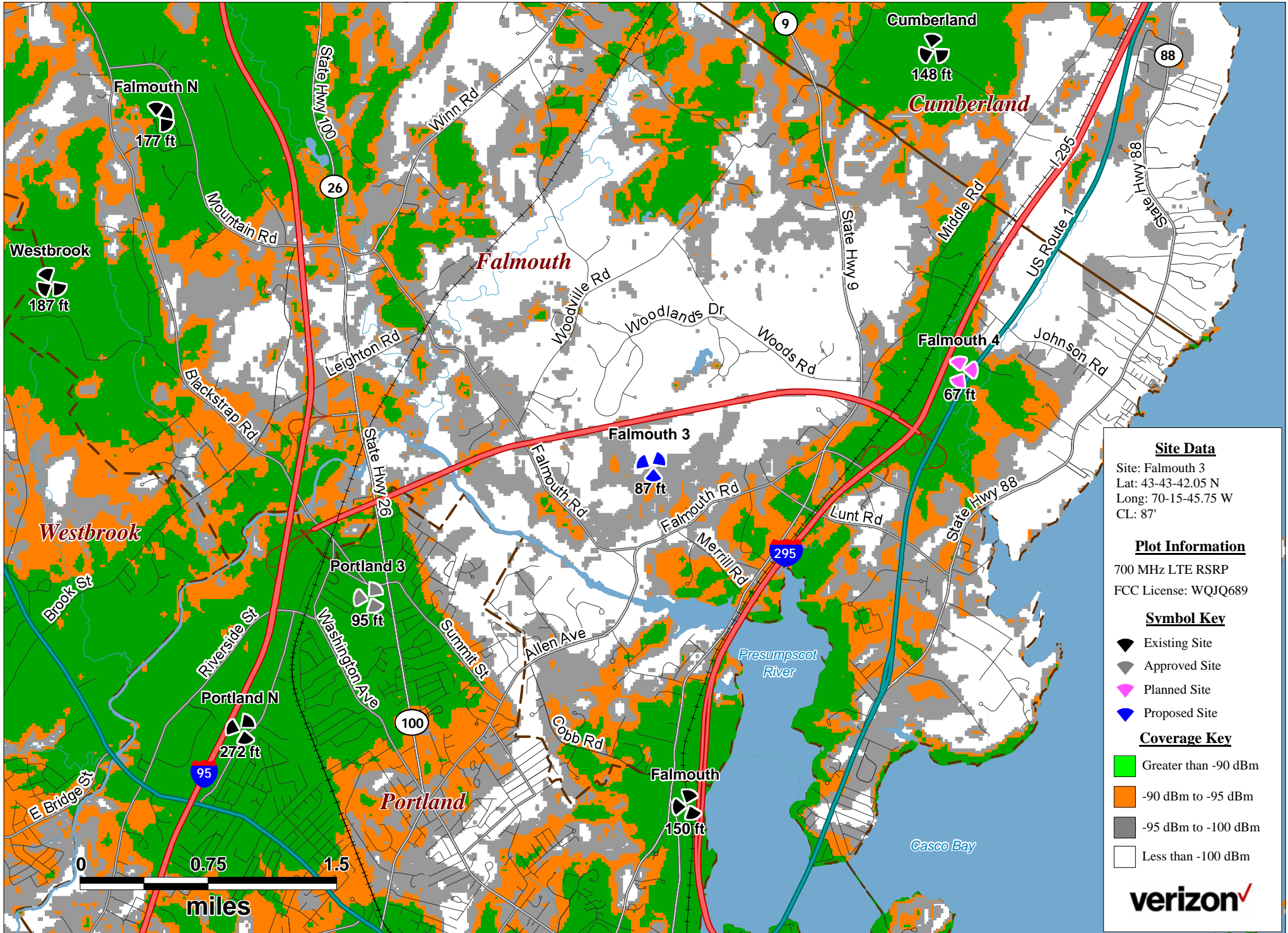
- Existing Site
- Approved Site
- Planned Site
- Proposed Site

**Coverage Key**

- Greater than -90 dBm
- 90 dBm to -95 dBm
- 95 dBm to -100 dBm
- Less than -100 dBm

**verizon**

**Attachment B:  
Falmouth 3 - Existing/Approved/Planned 700 MHz LTE Coverage**



**Site Data**  
 Site: Falmouth 3  
 Lat: 43-43-42.05 N  
 Long: 70-15-45.75 W  
 CL: 87'

**Plot Information**  
 700 MHz LTE RSRP  
 FCC License: WQJQ689

**Symbol Key**

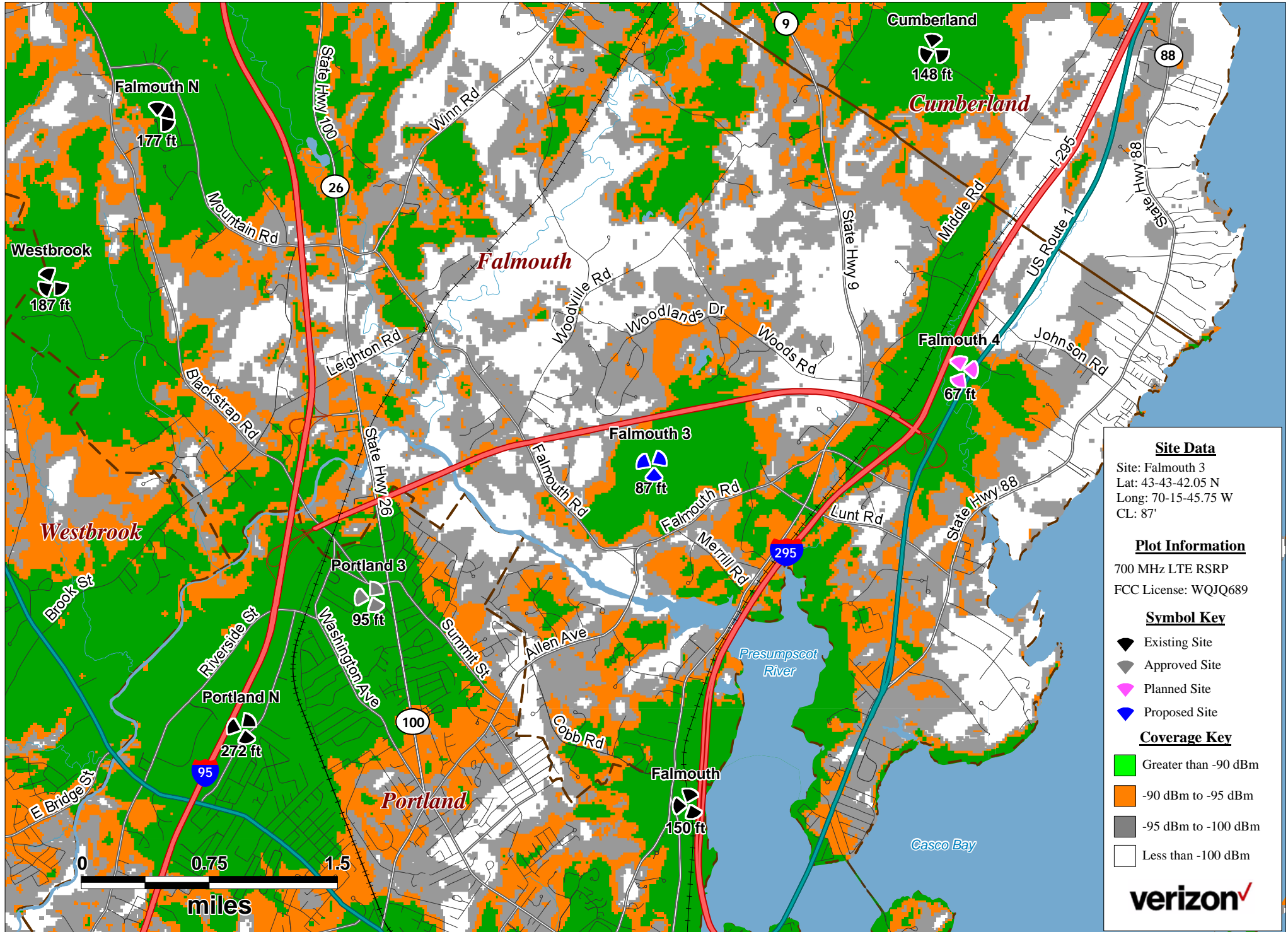
- Existing Site
- Approved Site
- Planned Site
- Proposed Site

**Coverage Key**

- Greater than -90 dBm
- 90 dBm to -95 dBm
- 95 dBm to -100 dBm
- Less than -100 dBm

**verizon**

**Attachment C:**  
**Falmouth 3 - 700 MHz LTE Coverage with Proposed Site at 87 ft**



**Site Data**  
 Site: Falmouth 3  
 Lat: 43-43-42.05 N  
 Long: 70-15-45.75 W  
 CL: 87'

**Plot Information**  
 700 MHz LTE RSRP  
 FCC License: WQJQ689

**Symbol Key**

- Existing Site
- Approved Site
- Planned Site
- Proposed Site

**Coverage Key**

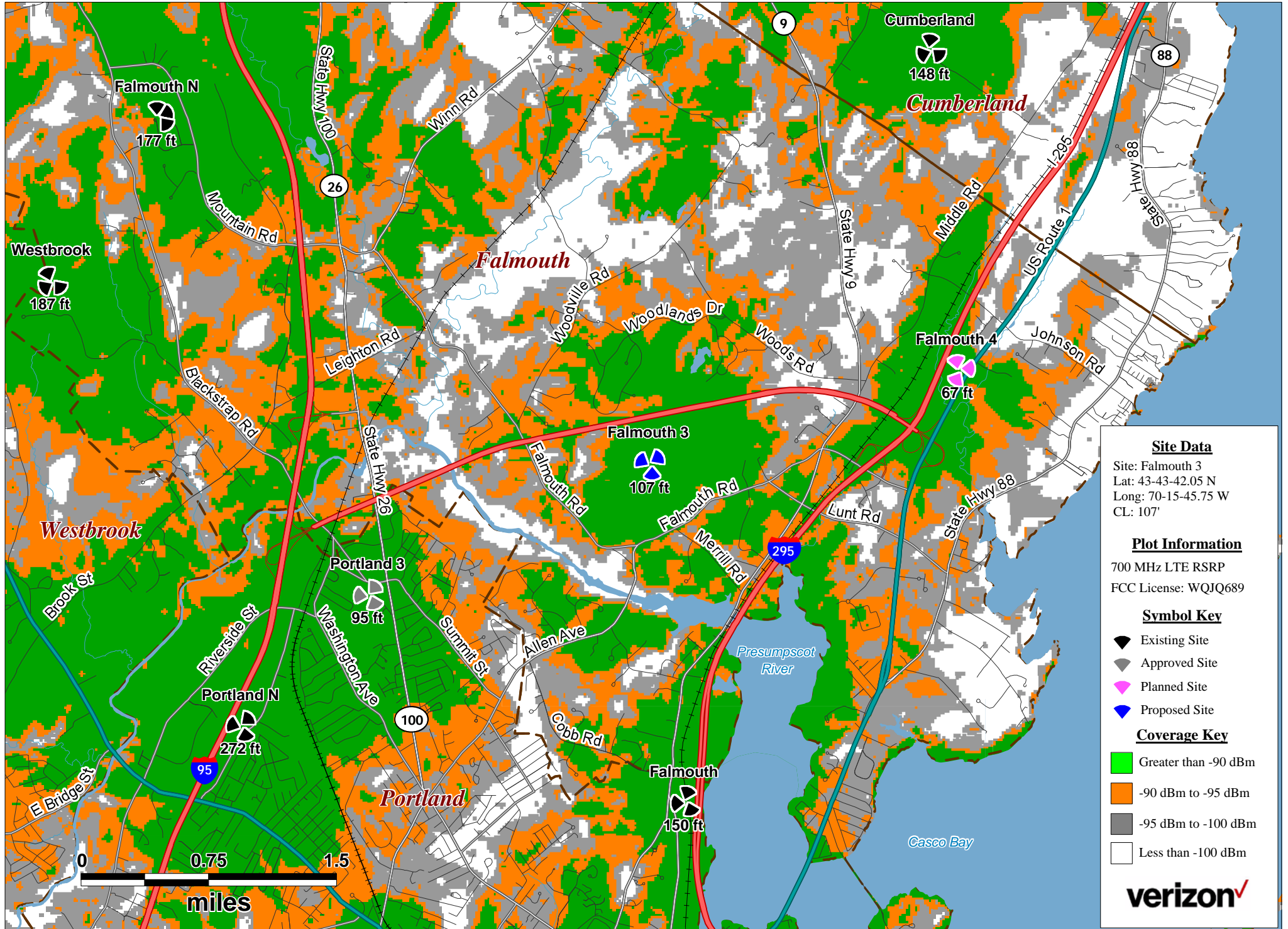
- Greater than -90 dBm
- 90 dBm to -95 dBm
- 95 dBm to -100 dBm
- Less than -100 dBm

**verizon**





**Attachment D:**  
**Falmouth 3 - 700 MHz LTE Coverage with Proposed Site at 107 ft**



**Site Data**  
 Site: Falmouth 3  
 Lat: 43-43-42.05 N  
 Long: 70-15-45.75 W  
 CL: 107'

**Plot Information**  
 700 MHz LTE RSRP  
 FCC License: WQJQ689

**Symbol Key**

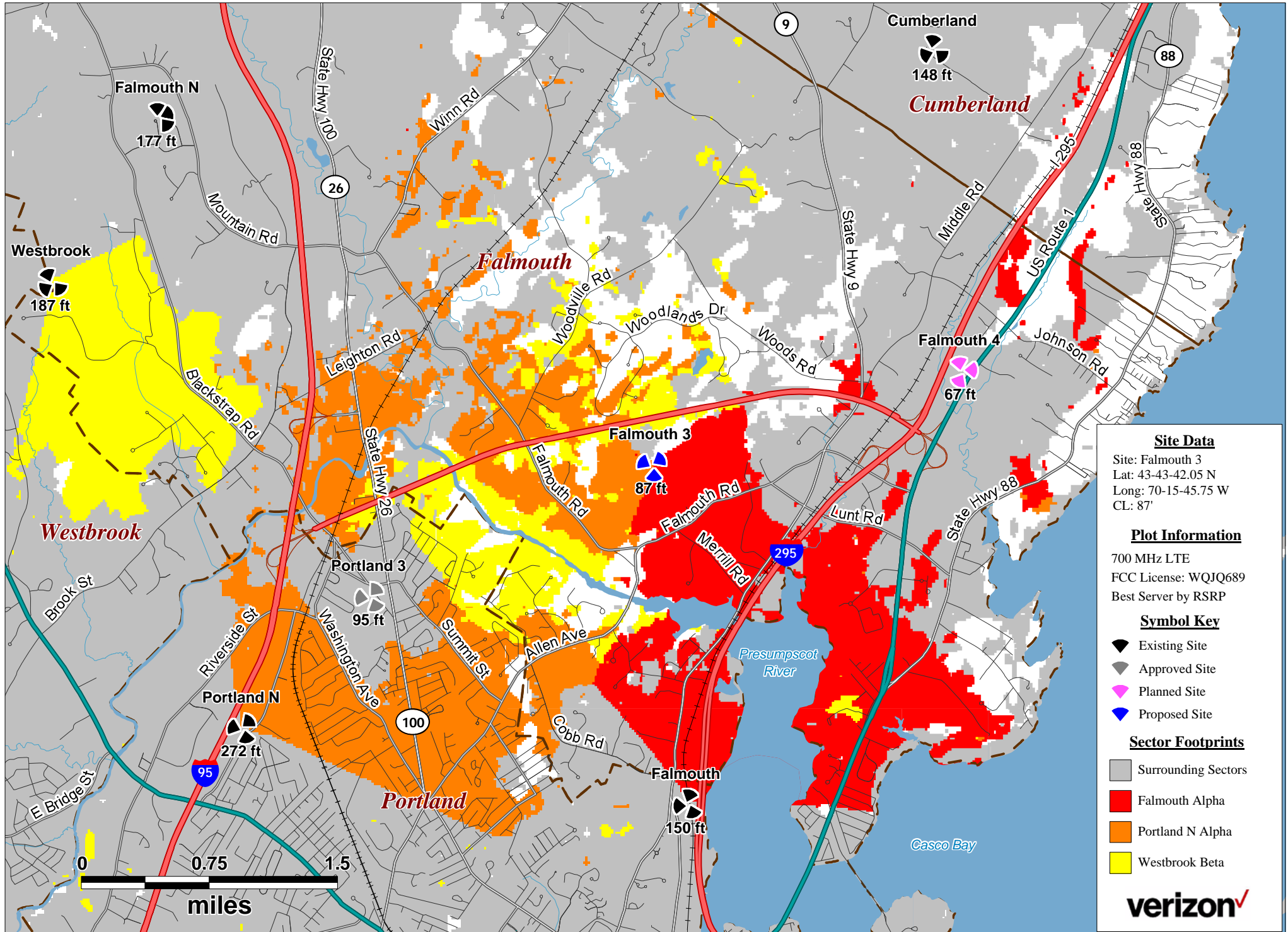
- ▲ Existing Site
- ▲ Approved Site
- ◆ Planned Site
- ◆ Proposed Site

**Coverage Key**

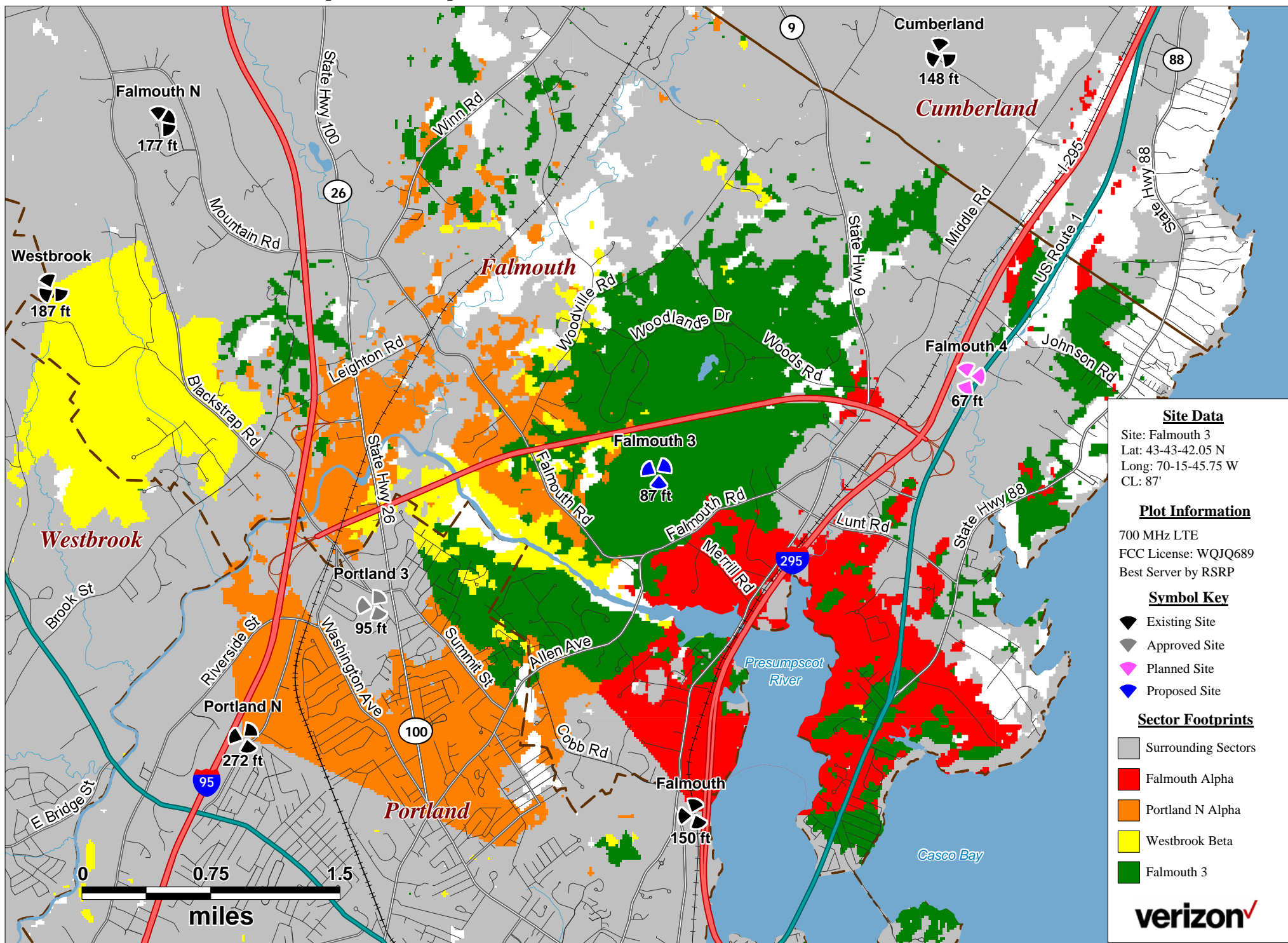
- Greater than -90 dBm
- 90 dBm to -95 dBm
- 95 dBm to -100 dBm
- Less than -100 dBm

**verizon**

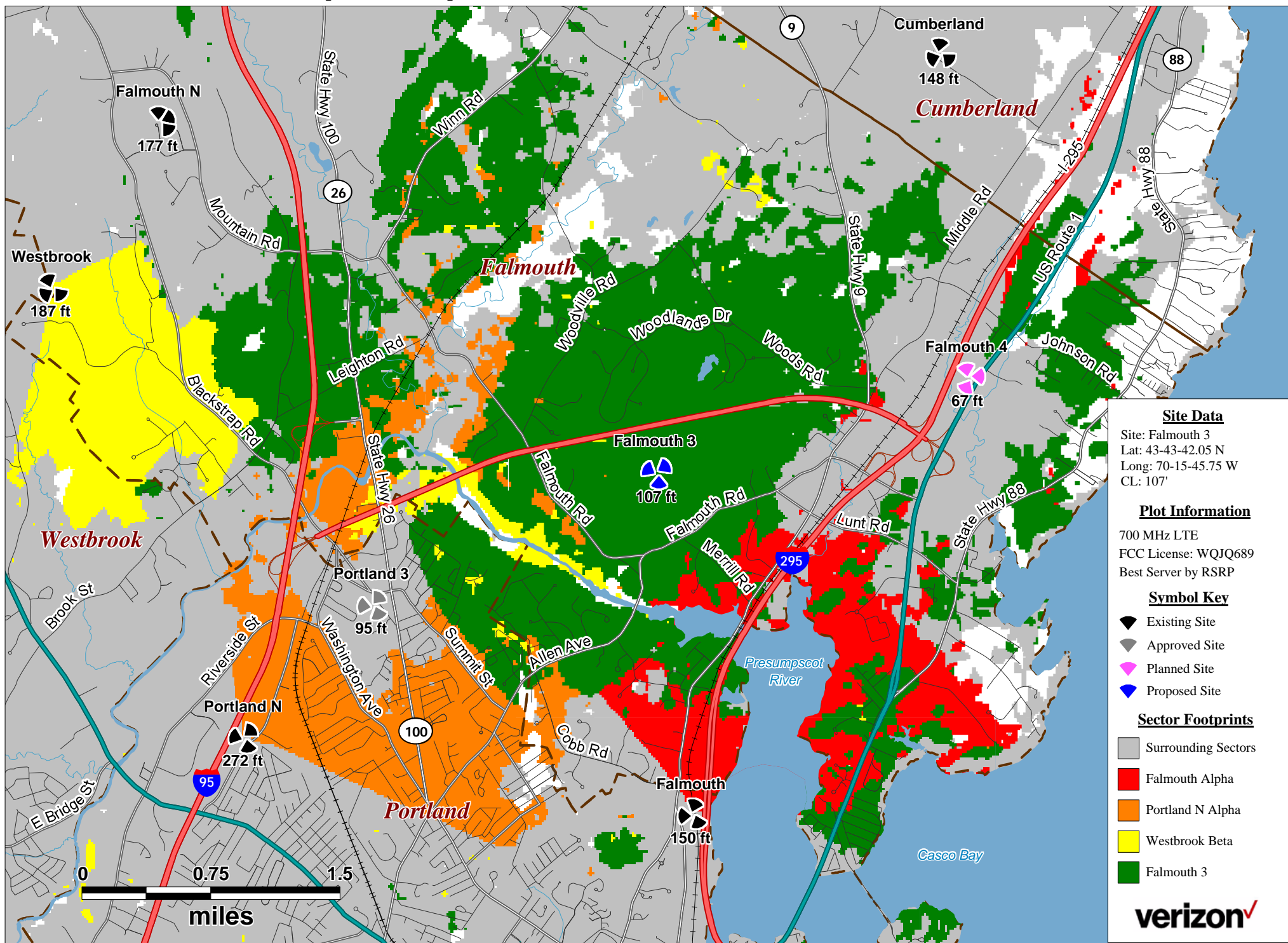
**Attachment E:  
Falmouth 3 - Existing/Approved/Planned 700 MHz LTE Sector Footprints**



**Attachment F:  
Falmouth 3 - 700 MHz LTE Sector Footprints with Proposed Site at 87 ft**



**Attachment G:  
Falmouth 3 - 700 MHz LTE Sector Footprints with Proposed Site at 107 ft**



**Site Data**

Site: Falmouth 3  
 Lat: 43-43-42.05 N  
 Long: 70-15-45.75 W  
 CL: 107'

**Plot Information**

700 MHz LTE  
 FCC License: WQJQ689  
 Best Server by RSRP

**Symbol Key**

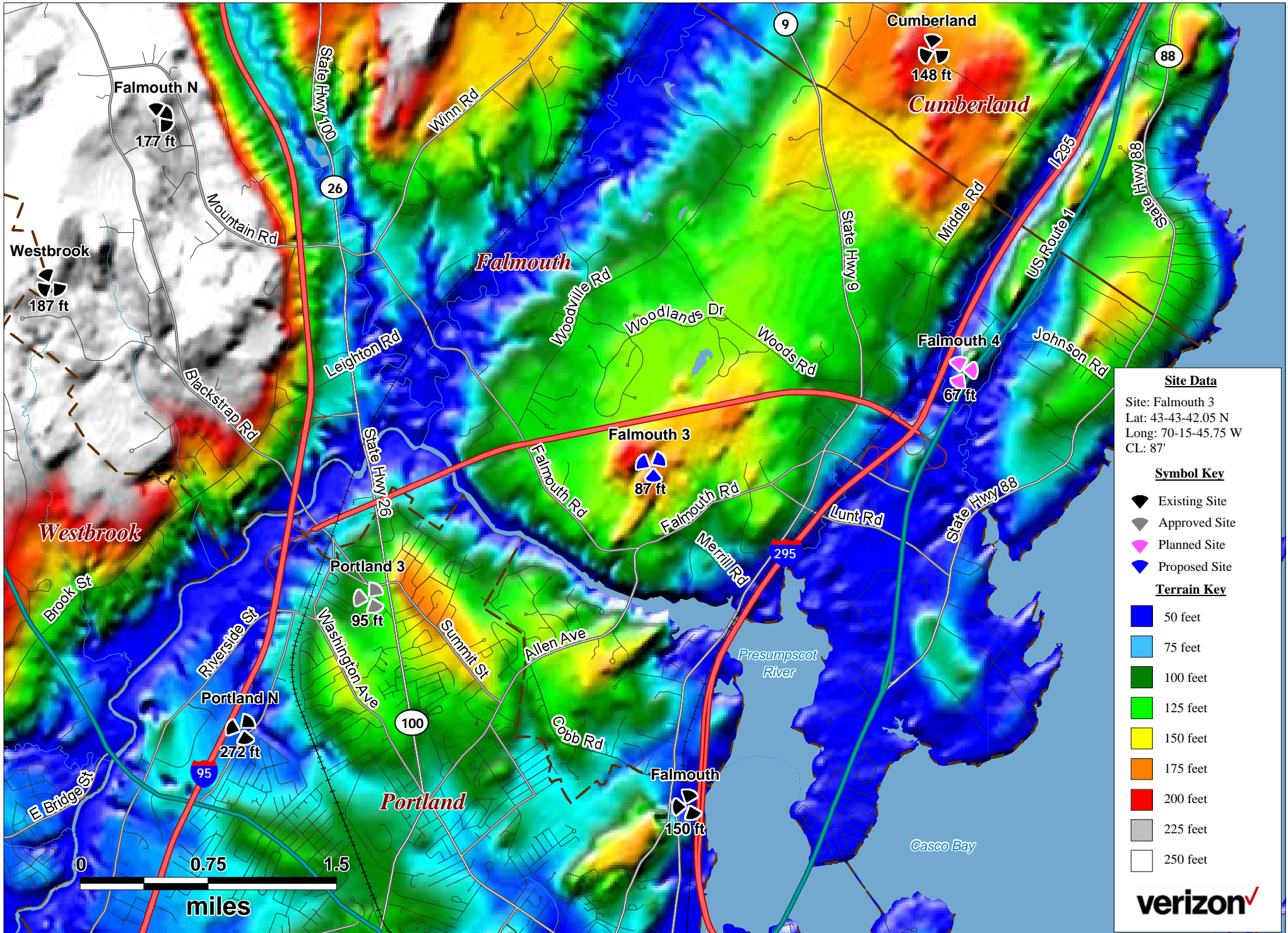
- Existing Site
- Approved Site
- Planned Site
- Proposed Site

**Sector Footprints**

- Surrounding Sectors
- Falmouth Alpha
- Portland N Alpha
- Westbrook Beta
- Falmouth 3



**Attachment H:  
Falmouth 3 - Area Terrain Map**



**Site Data**  
 Site: Falmouth 3  
 Lat: 43-43-42.05 N  
 Long: 70-15-45.75 W  
 CL: 87'

**Symbol Key**

- Existing Site
- Approved Site
- Planned Site
- Proposed Site

**Terrain Key**

- 50 feet
- 75 feet
- 100 feet
- 125 feet
- 150 feet
- 175 feet
- 200 feet
- 225 feet
- 250 feet

**verizon**

January 31, 2017

Town Council  
Planning Board  
Falmouth Town Hall  
271 Falmouth Road  
Falmouth, ME 04105

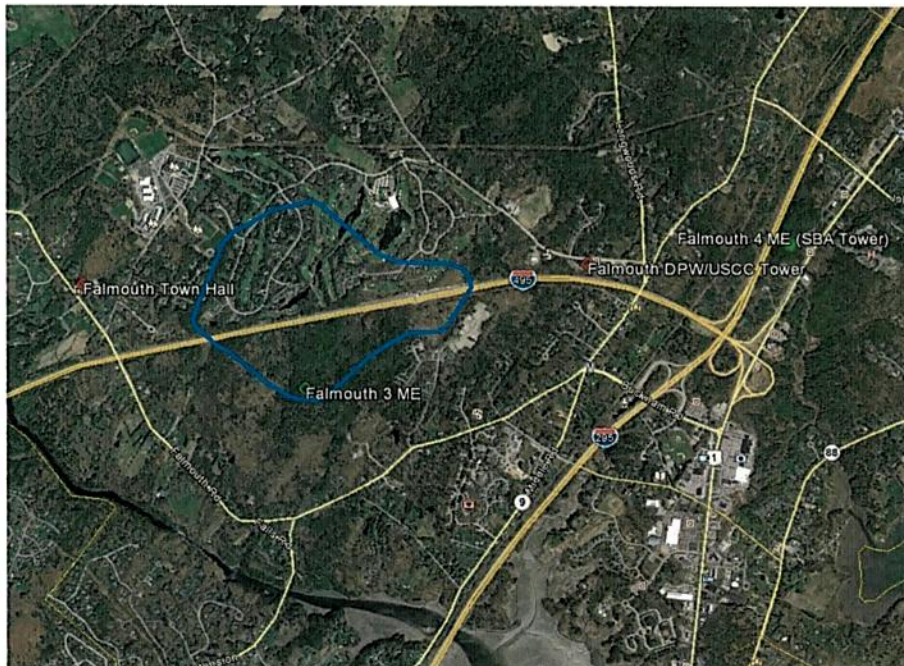
**SUBJECT: 175 FALMOUTH ROAD TELECOMMUNICATIONS TOWER  
VERIZON WIRELESS' PROPOSED SITE IN RELATION TO ALTERNATIVE LOCATIONS**

Members of the Planning Board and Town Council:

This letter is in response to a request for supplemental information regarding the use of alternative locations/structures as they relate to Verizon Wireless' targeted coverage and capacity objectives detailed in the RF Report dated July 25, 2016.

As noted in Attachment B to our July 25<sup>th</sup> report, Verizon currently provides service in Falmouth from existing and planned sites in Falmouth, Cumberland, Westbrook, and Portland. In addition to Verizon's existing facilities located throughout Falmouth and the surrounding area, one of Verizon's planned sites in Town is a collocation on the SBA tower located at 356r Route 1. Verizon has secured a lease and filed for a Building Permit to collocate on this tower and the facility can be expected to be "On-Air" in early 2017. In order to complement these existing and planned sites, Verizon determined that an additional facility is needed to satisfy its coverage and capacity needs along the Falmouth Spur (I-495) and the surrounding area, which deficiencies are shown on Attachment B to our prior report.

To better understand the limited area within which a facility could be located to best meet Verizon's network objectives, the below map<sup>1</sup> shows the search area (blue polygon) in consideration of all existing and planned facilities in the vicinity. This search area is essentially bisected by the Spur, with the Woodlands Golf Club and residential community located in the northern half, and undeveloped, forested land in the southern half. The shape and location of the search area is largely based upon the surrounding topography, such that a site of adequate height located within it would be able to satisfy the key objectives of filling a gap in coverage along the Spur and in the surrounding area, to the greatest extent reasonably possible.



<sup>1</sup> Source: "Falmouth, ME" 42° 43' 57.7" N and 70° 15' 31.2" W. Google Earth. May 9, 2016. November 17, 2016.

In addition to the search area, this map shows the location of the proposed facility at 175 Falmouth Road (“Falmouth 3 ME”), the planned collocation on the SBA tower at 356r Route 1 (“Falmouth 4 ME”), and two alternative locations/structures denoted by the red diamonds. The “Falmouth DPW/USCC Tower” is an existing tower located on the Town’s DPW property at 101 Woods Road that was constructed by, and currently hosts a U.S. Cellular (USCC) facility. The “Falmouth Town Hall” located at 271 Falmouth Road is where an RFP was awarded to AT&T to construct a concealed monopole tower (CMP). It is important to note that AT&T has since assigned their rights to Towerco and, to date, Towerco has not secured the necessary permits allowing for the development of this potential facility.

The DPW tower is located ~0.5 mi east of the search ring, and as a result would not provide the desired extent of coverage and capacity improvement along the Spur, nor into the Woodlands Golf and residential community. It is also located ~0.75 mi west of the planned “Falmouth 4 ME” site and would provide largely redundant coverage and unnecessarily overlap the area that will be served by that site. Therefore, Verizon determined that collocating on the DPW tower would not satisfy its targeted network coverage and capacity needs in the area.

The potential “Town Hall” site is located ~0.9 mi NW of the proposed “Falmouth 3 ME” site, and ~0.4 mi west of Verizon’s preferred area within the search ring. The design of the “Town Hall” site (as per the RFP) consists of a concealed monopole (CMP), such that the panel antennas would be enclosed within fiberglass material to maintain a slim profile of the tower. This perceived visual benefit does not come without significant tradeoffs and drawbacks, however.

Among the limitations of CMPs, the most problematic is the physical space constraints it imposes, which necessitate many of the associated tradeoffs. Verizon’s standard deployment consists of twelve antennas (four per sector) along with the use of Remote Radio Heads (RRHs) that are mounted near the antennas and fed by fiber optic cables from the ground based equipment. Due to the limited space within the CMP, Verizon would have to reduce their installation to a total of three antennas (one per sector) and would be unable to physically fit RRHs within the concealment near the antennas. As a result, RRHs would be placed at ground level, and multiple coaxial cable runs would be used in lieu of the standard fiber optic cables used nowadays. The use of coaxial cable instead of RRHs/fiber introduces additional signal losses into the system, impacting overall system performance. The reduced number of antennas necessitates combining all frequency bands and technologies into a single antenna per sector. This limitation, along with the inability to use RRHs, prevents separately deploying and optimizing multiple technologies across each of Verizon’s four licensed frequency bands, inhibits the deployment of higher order MIMO (multiple input – multiple output) configurations, and reduces system redundancy by potentially creating a single point of failure on each sector. Furthermore, antenna azimuths in a CMP are generally restricted to 120 degrees of separation, which limits the optimization flexibility of the site to meet the changing needs of the network over time. For these reasons, Verizon has determined that the proposed “Falmouth 3 ME” facility at 175 Falmouth Road is better suited to satisfy its network requirements in this area of Falmouth.

Finally, Falmouth’s ordinance requires Verizon to assess whether its coverage objective may be met through one or more so-called “Tier I” or “Tier II” facilities. A Tier I facility is a collocation of a wireless facility entirely within an existing building or structure or certain additions to such existing structures. A Tier II facility includes co-location on an existing building or structure or so-called “treetop facilities.” It appears that the proposed “Falmouth 4” installation on the SBA tower is a Tier II installation on an existing structure.

As part of the siting process Verizon has evaluated whether there are any existing buildings or structures in close proximity to the search ring within or upon which they could install the proposed facility, and none exist. There are no existing towers or other structures within the search ring that would permit an installation that would meet Verizon’s coverage needs. Tier II “treetop” facilities are permitted within the search ring only in the “MUC” zoning district that runs northwest of the Spur. Although it is not clear exactly what constitutes a “treetop facility,” location of a new tower within this strip, assuming Verizon could obtain the requisite property rights, would require location within the highway right-of-way or within the Woodlands facility, including areas adjacent to multiple residential structures.

To the extent there are any questions related to the use of these alternate locations/structures, we welcome any inquiries in the interim and will attempt to address them prior to or during the next scheduled meeting.

Regards,



Keith Vellante  
RF Engineer  
C Squared Systems, LLC  
Contractor to Verizon Wireless