Vertical Bridge CUP Application

US-OR-5156 TANSY

ATTCH 4, RF Justification

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Warrenton, Oregon

Site Analysis - Verizon Wireless – Warrenton, Oregon

Overview and Service Area:

Verizon Wireless strives to provide excellent wireless service with a network of cell sites that allows our customers to reliably place calls and use it for data services. In this particular case, we are trying to remedy the coverage and capacity challenges between Warrenton and Hammond.

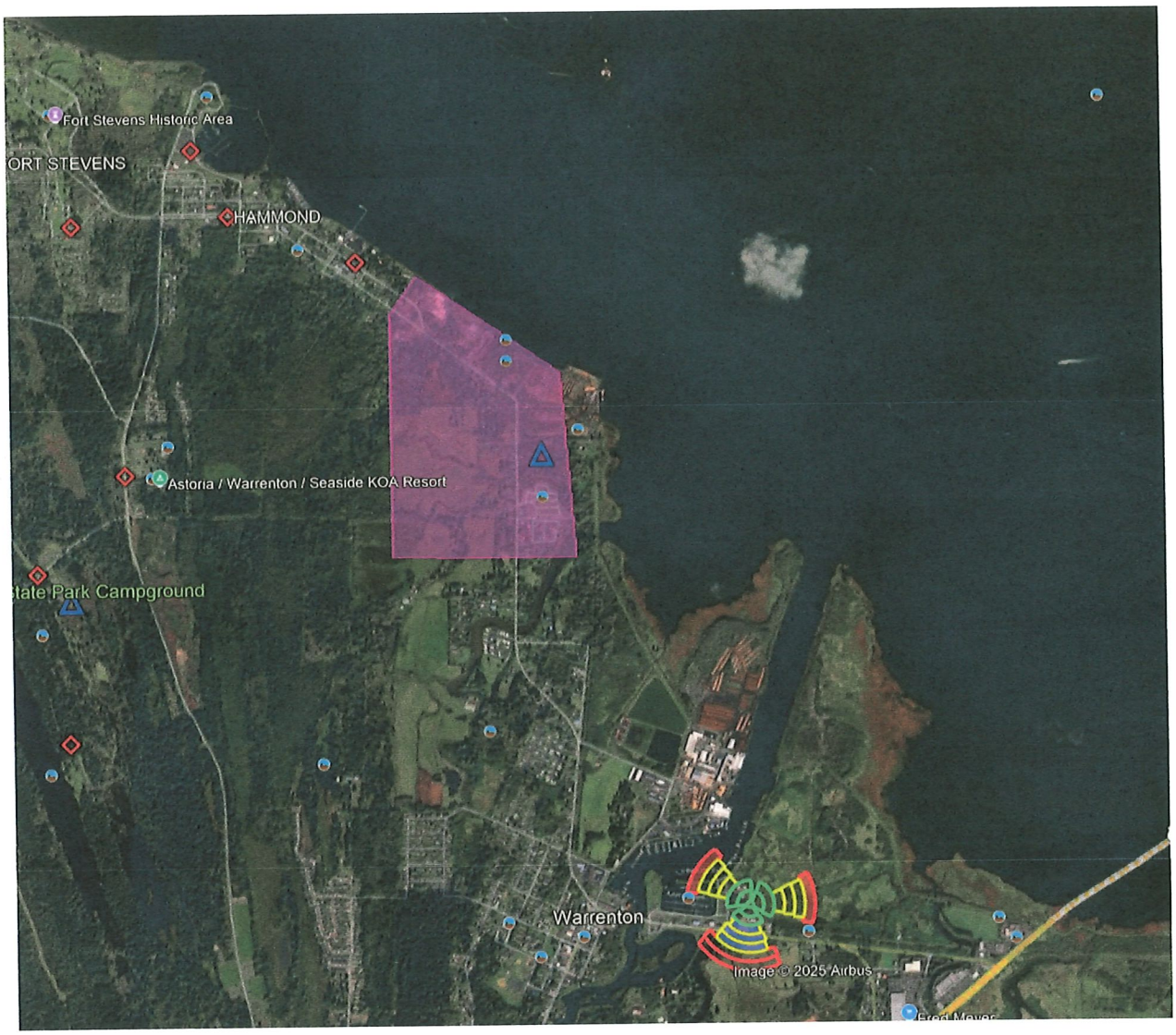
Coverage is the need to expand wireless service into an area that either has no service or bad service. The request for service often comes from customers or emergency personnel. Expansion of service could mean improving the signal levels in a large apartment complex or new residential community. It could also mean providing new service along a newly built highway.

Capacity is the need for more wireless resources. Cell sites have limited amount of resources (In terms of spectrum, number of antennas, radios and basebands) to handle voice calls, data connections and data volume. When these limits are reached, user experience quickly degrades. This could mean customers may no longer be able to make/receive calls nor be able to browse the internet. It could also mean that webpages will be very slow to download. We utilize sophisticated programs that use current usage trends to forecast future capacity needs. Since it takes an average of (1-3) years to complete a cell site project, we have to start the acquisition process several years in advance to ensure the new cell site is in place before the existing cell site hits capacity limits

Location, Location, Location. A good capacity cell site needs to be in the center of the user population which ensures even traffic distribution around the cell. A typical cell site is configured in a pie shape, with each slice (aka. sector) holding 33% of the resources. Optimal performance is achieved when traffic is evenly distributed across the 3 sectors. The main serving cell site has it's west facing sector taking most of the traffic and hence, the cell site is load imbalanced. When a tall cell site serves a large area, it serves more customers. If the customers are far away at cell edge (low SINR), the communication between the cell site and mobile devices takes place in a low-speed mode transmission (transmit diversity), which ensures redundant copies of the same data stream is sent by each antenna port to ensure that the mobile is able to decode at least one of them. Also, the customer experiences low battery life because the phone now has to transmit above higher noise floor to reach the cell site. The customer experiences difficulty reaching the cell site that culminates to an ineffective attempt. Assuming that the customers are near with full signal bars in the mobile, the spectrum is still fixed/limited. When more customers share a fixed resource, they are allotted less resource/grants at a given transmission time interval. These issues bring about a need to have a dominant server in the west residential area that is at the **right height** (with respect to the altitude) and at the **right location** to provide a solid QOS rather than a cell edge service.

Search Ring: The below figure (Fig.1) shows the search ring issued to look for suitable candidate to provide service to our Verizon customers.

FIG 1. SEARCH RING



Propagation Maps:

There are several methods for determining where coverage gaps exist within a given network of wireless sites. One of these is through the use of propagation maps. The propagation map is a computer simulation of the strength of Verizon Wireless signals at a given height and location in the context of the network. Propagation maps are one tool for determining whether a proposed site will meet the coverage objective and what antenna height is needed to provide robust service for Verizon Wireless customers. The radio propagation tool is designed to take factors such as terrain, tree coverage, and existing buildings into account, so that it depicts a reliable estimate of coverage that would be provided by a proposed site. Our propagation model uses Above Mean Sea Level to compute the plots. The Above Ground Level (AGL) is only used to show the location of our antennas in terms of centerline and/or tip height with respect to ground level.

The coverage plots we have provided for this site analyze the signal strengths for the mid-band frequency (capacity handling band). Verizon analyzes mid-band frequency because this frequency serves most of our customers since they have low PIM issues, higher SINR (signal to interference and noise ratio) levels and lower noise floor. Mid-band frequency is also bigger (broader) frequency bands to ensure good DL speeds. Lower bands travel further and hence, are called coverage bands but are narrower. They are meant to serve cell edge users/deep in-building users and are not typically used for site selection purposes.

We will be deploying 6 bands as follows:

700 block: C BLOCK, B13, 5230-10MHz (coverage)
AWS1:B1, B2, C, 2125-15MHz (capacity)
AWS3: DLJ1, DLJ2, 67086-10MHz (capacity)
PCS: BLOCK E, 1025-5 MHz (capacity)
850 block: B1, B2, 2559- 10MHz (coverage)-5G nationwide and 4G LTE
C-Band: Block A1-A3, B1-B5-160MHz (capacity)- 5G

We will be using 3 multi-frequency antennas and 3 dual band radios per sector (total of 3 sectors).

The propagation maps that follow show three levels of service, designated as the following colors:

a) Green: until -85 dBm. This signal threshold represents a level of service adequate for providing reliable coverage inside a building. It provides good indoor and outdoor service.

b) Yellow: until -95 dBm. This signal threshold represents a level of service adequate for providing reliable coverage outdoors or inside a car, but indoor or in-building coverage is unreliable. It provides good outdoor and in-car service but inadequate indoor service as QOS will be (or start getting) hampered.

c) Light Pink: until -120 dBm. This signal threshold represents a signal quality that is unreliable to make and/or hold a call. Very slow latency and data speeds. Both outdoor and indoor QOS will be unreliable.

FIG 2: Before Bakers Creek

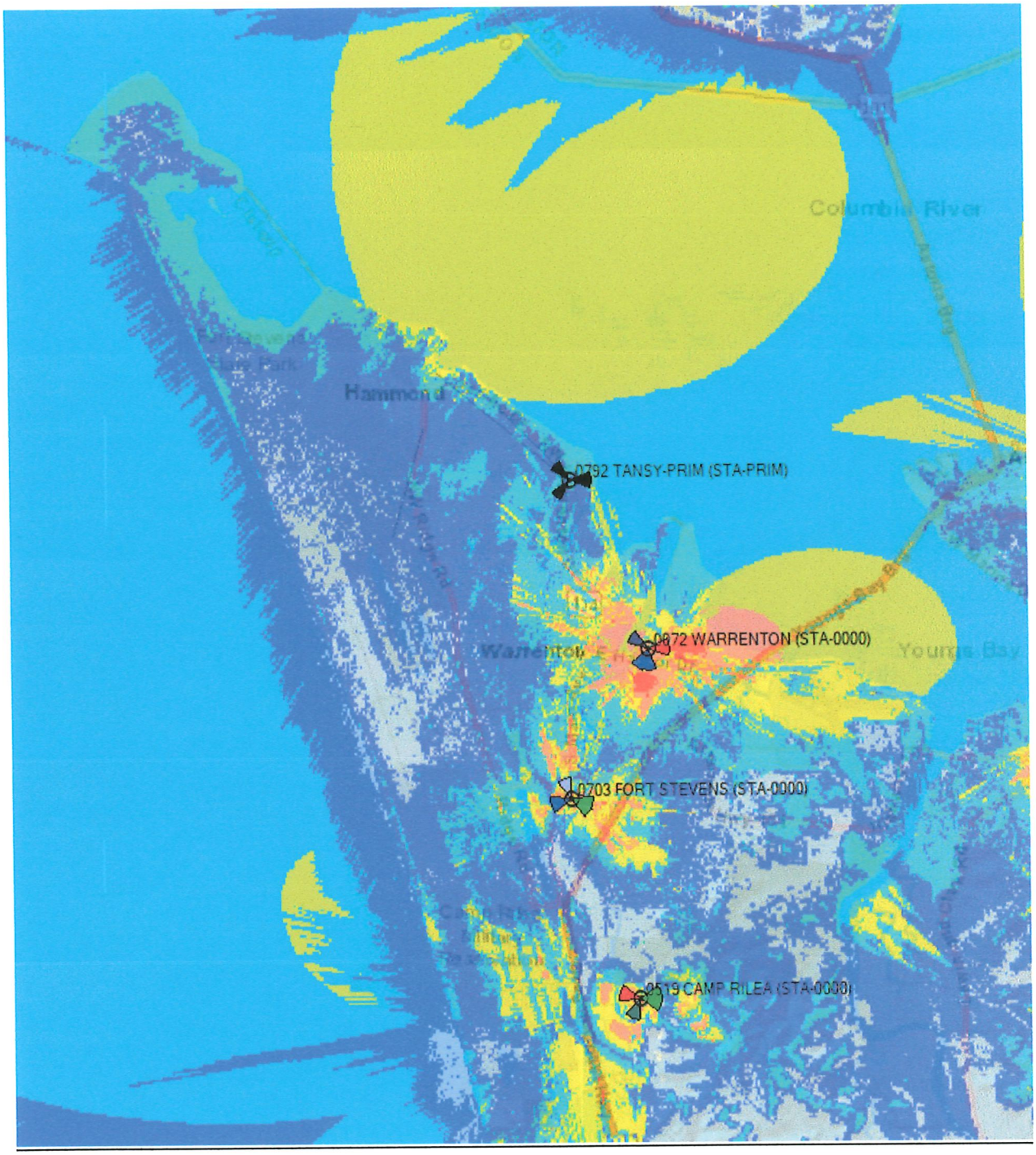
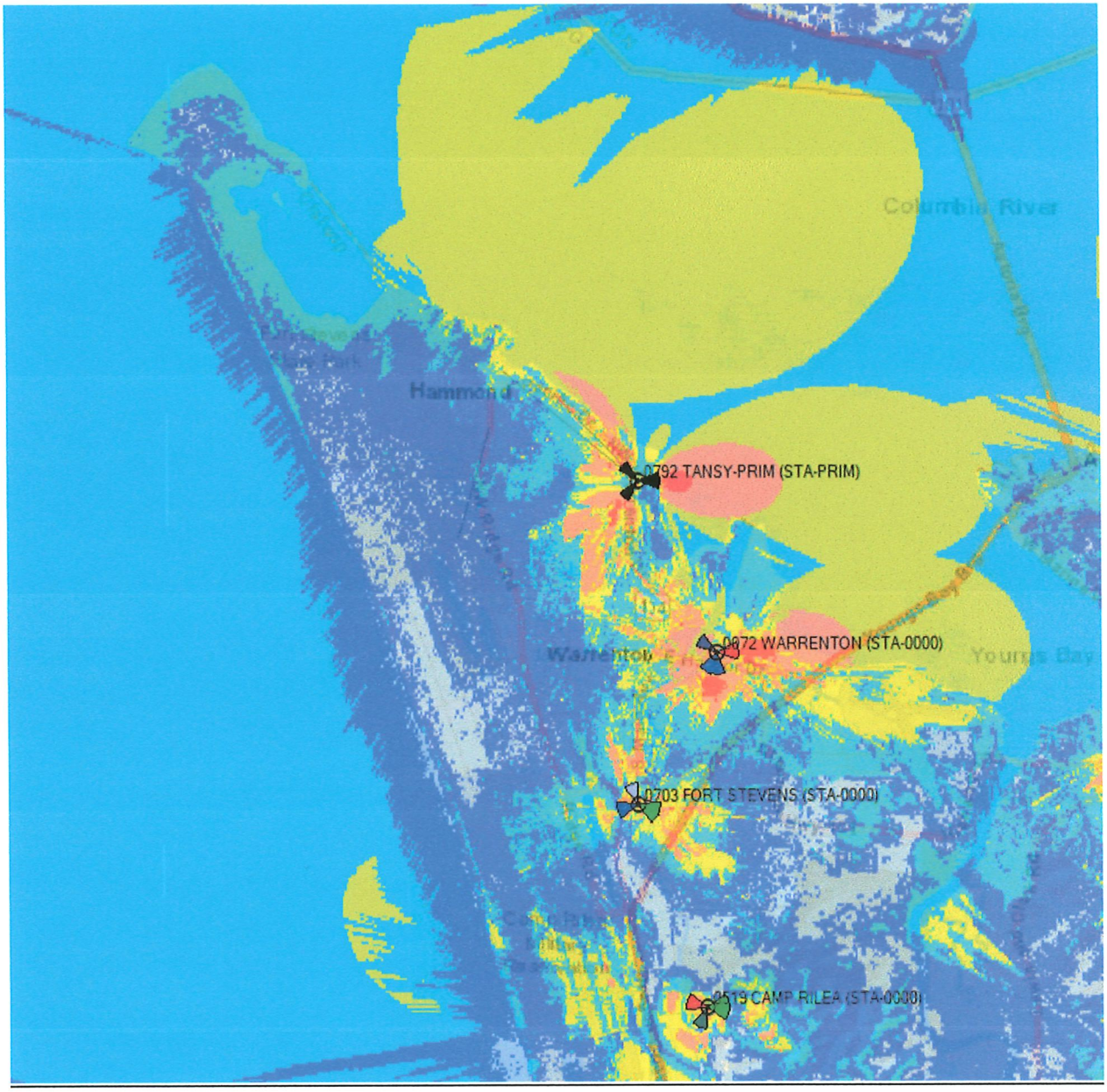


FIG 3: After Bakers Creek



The proposed site will offload the existing sites to provide additional capacity in the Verizon Wireless network as well as add needed coverage between existing sites in our target service area.