1) A description of the type of technology (cellular, PCS, radio, television, etc.) that will be provided using the telecommunication facility over the next five years, including the radio frequencies to be used for each technology and the types of consumer services (voice, video, data transmission) to be offered;

The site will use LTE in the following bands: PCS1, AWS1, AWS3, L850A, L850B, 850NR, L700, CBRS and CBAND carriers. Unfortunately, Verizon cannot provide future technologies that will be deployed as they have not been developed yet.

(2) A list of all of the applicant's existing telecommunications facility sites within the City and the Flagstaff Metropolitan Planning Organization Area, a list of all of the applicant's proposed telecommunications facility sites within the City and the Flagstaff Metropolitan Planning Organization Area for which the applicant has filed a conditional use permit application, and a map showing location of these sites and service boundaries of other facilities operated by the applicant/provider in the area; and

For the requested maps, Verizon will invite the city to a meeting where we show them the requested information on a net conference. We have provided a RF analysis for this area that the proposed site is going in, please see attached.

(3) If the applicant does not know specific future telecommunications facility site locations but does know of the areas where the telecommunications facilities will be needed within the next five years to provide service, the applicant shall identify the areas

Verizon is unable to provide forward looking information either because it has not yet been developed, or it is sensitive information that we cannot have subjected to open records requests.

WIRELESS NETWORK CONSULTING

AZ10-037 Bullwhip / AZ2_CHESHIRE
Capacity and Coverage Cell Split

RF DESIGN ANALYSIS

2021

Coverage vs Capacity

- **Capacity is providing bandwidth or processing capacity to service the customers in the area.**
  - Areas where large numbers of users are in a specific geographic areas
  - Areas where users are demanding higher data rates for services
  - Areas with a large amount of indoor users
- **Coverage is Providing Service where service does not exist, calls drop, or "no service".**
  - Areas where there are farther apart
  - Areas where terrain or buildings block signals
  - Areas where indoor service is low or nonexistent

Proposed Site

- 70' Monopine Tower
- 5' of appurtenances (branches)
  - 3100 N. Fort Valley Road Flagstaff, AZ 86001
    - Latitude: 35.235898 N (NAD83)
    - Longitude: -111.663558 W (NAD83)
    - Ground Elevation: 7100.4' (NAVD88)
    - Anchor tenant is Verizon
  - Antenna Centerline at 66' AGL

Why here?

- High utilization by wireless subscribers
- Capacity offload of other sites that are overloaded
- Capacity management
- Additional indoor coverage
- Site needs to be in area where subscribers are in order to offload other sites

Objective of new site

- **Capacity**
  - Provide additional bandwidth for customers in the area surrounding the proposed site
  - Provide better throughput for indoor users in the area
  - Offload AZ2_DEVILS-HEAD site
- **Coverage**
  - Provide additional in-vehicle coverage along Highway 180
  - Provide additional indoor coverage in surrounding businesses and homes
- **Why is this site important?**
  - 96% of Americans own a Cellular Phone
  - 57% of American Homes rely exclusively on cellular phones
  - 84% or more of 9-1-1 emergency calls are made from wireless devices

2021

Ionizing vs Non-Ionizing

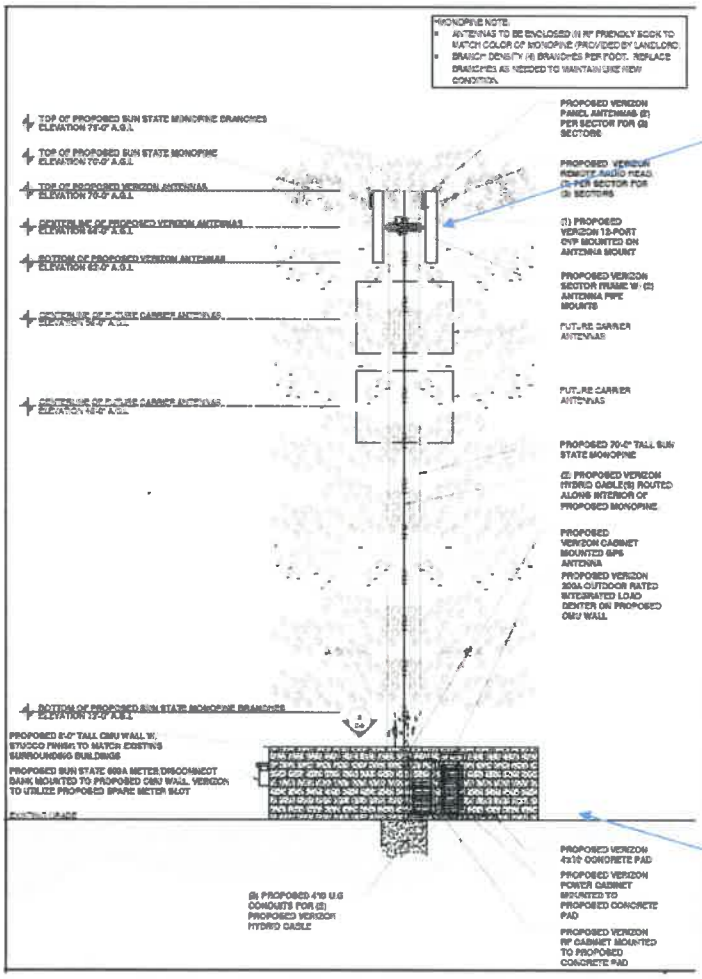
- There are two (2) types of Energy/Radio Waves
  - **Ionizing**
    - These are waves that can effect human DNA
    - Examples are:
      - Gamma rays
      - X-Rays
    - This is one of the reasons the nurse steps out of the room and you wear a lead overcoat when you get X-Rays at the dentist.
  - **Non- Ionizing**
    - These are waves do not effect human DNA
    - Examples are:
      - Car Radios
      - Television
      - Wi-Fi Access points and routers
      - Bluetooth headsets
      - Cellphones and Smartphones
      - Lightbulbs
      - Wireless Baby Monitors
      - TV remotes
  - Absorption of waves is proximity based, the closer you are to the antenna the more non-ionizing energy is absorbed. You will absorb 50% of the FCC's General Public limit with your smartphone next to your ear versus less than 10% of the FCC's General Public limit from the antennas when you are standing 20' away from the proposed tower.
  - The further you walk away from the tower it decreases even more.

2021

General Public & Occupational limits

- The FCC isolated two (2) groups relative to access around wireless antennas
- The first group is called Occupational
  - This refers to areas where workers would be allowed (general public cannot access) but the workers would not have knowledge about antennas (An example would be an Air Conditioner Repair Technician). Barriers or signage may be needed to alert the worker when close to the antennas.
    - Examples are:
      - Rooftop access behind a locked door
      - Compound access behind a locked gate
  - The FCC determined the safe value and then lowered by a factor of 10 and that is the value the wireless carriers use in the studies
  - The exposure levels are averaged over 6 minutes
- The second group is called General Public
  - Uncontrolled access (General Public)
    - This group is for areas with general public access, the public would not have a knowledge of an antenna being close to them
    - Examples are:
      - Sidewalks
      - Parks
      - Public accessed buildings
  - The FCC determined the safe value and then lowered by a factor of 50 and that is the value the wireless carriers use in the studies
  - The exposure levels are averaged over 30 minutes
- Compare the value for a tower which is 1mW to the power of a smartphone which is 200mW of power.

Power Levels below a tower



Main beam of the antenna

- Power levels on the ground around the tower are much less than what is at the antennas
- Power on the ground adjacent to the tower is 1/1000 of the power compared to what is at the antenna

1/1000 of the power on the ground around the site

Sites


AZ22 KINLANI DORMATORY SC
AZ22 RABBIT
AZ22 GUARDIAN
Google Earth

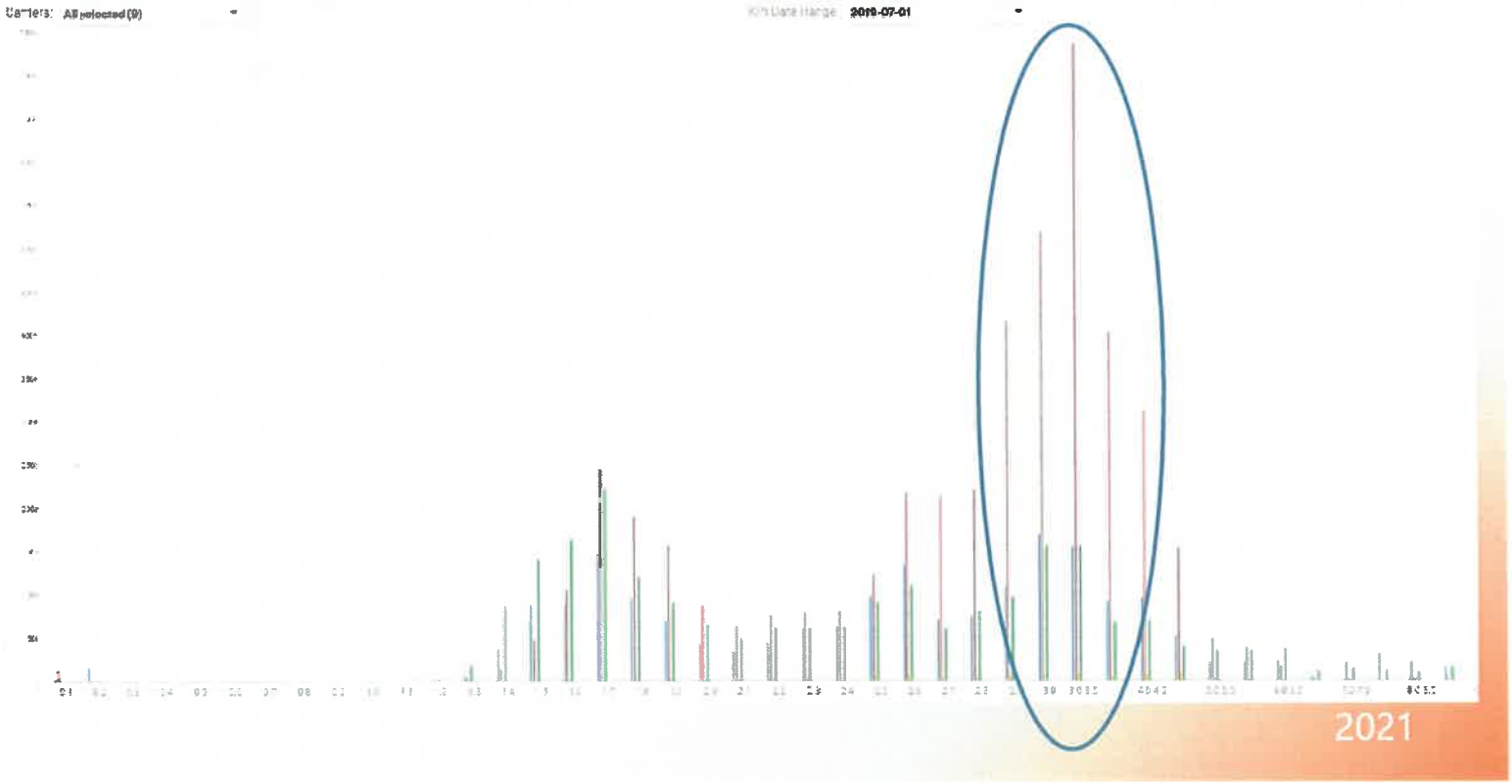
2021

AZ2_DEVILS-HEAD gamma sector

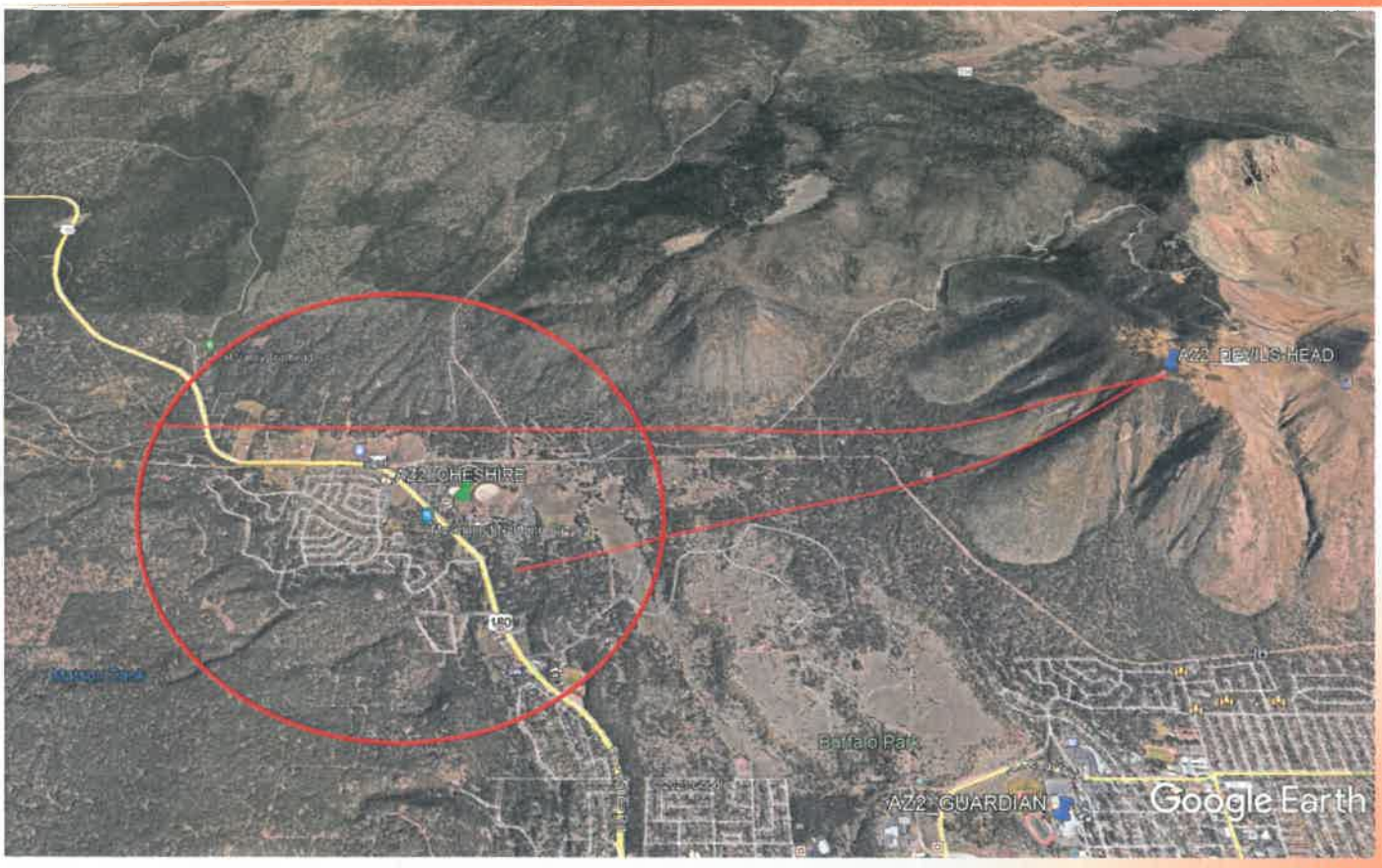
- Sector covering Hwy 180, surrounding suburban show need for additional capacity due to amount of data utilized by customers

Where are the users that need to be offloaded?

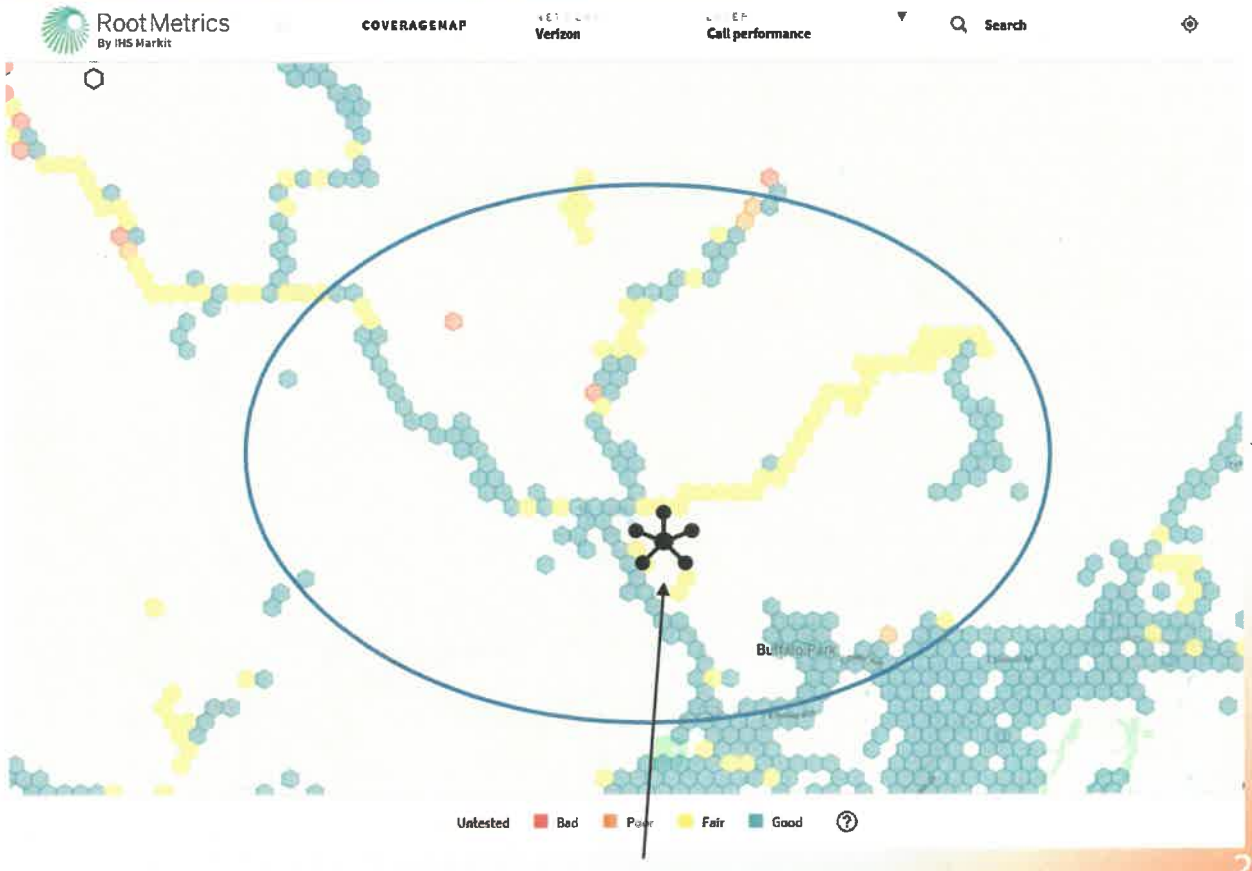
- Heaviest users are located from 2.9 miles to 4.5 miles away from AZ2_DEVILS-HEAD



Where are the users located that need offloading?



RootMetrics – Coverage Map



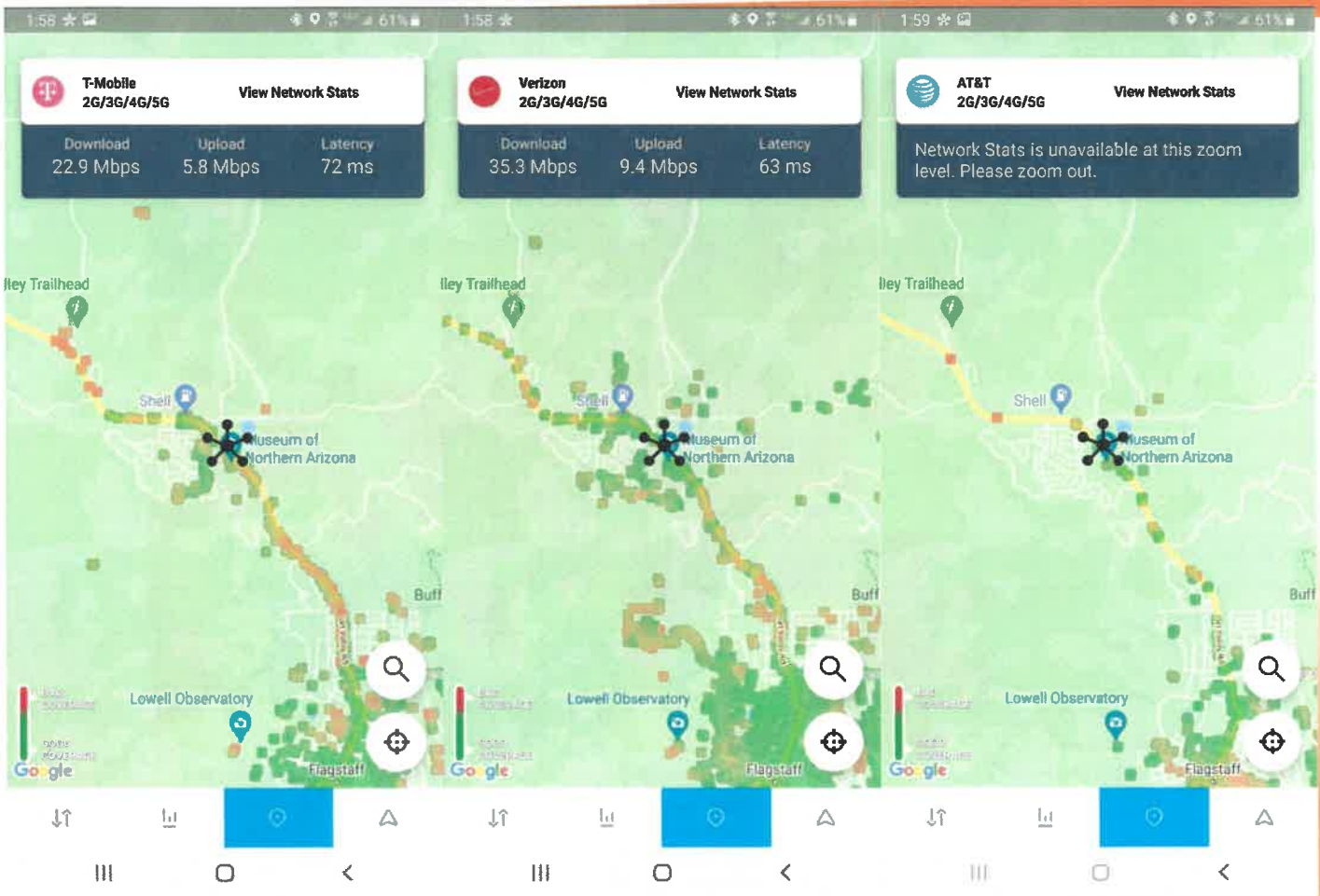
Area where new site will help coverage and capacity

2021

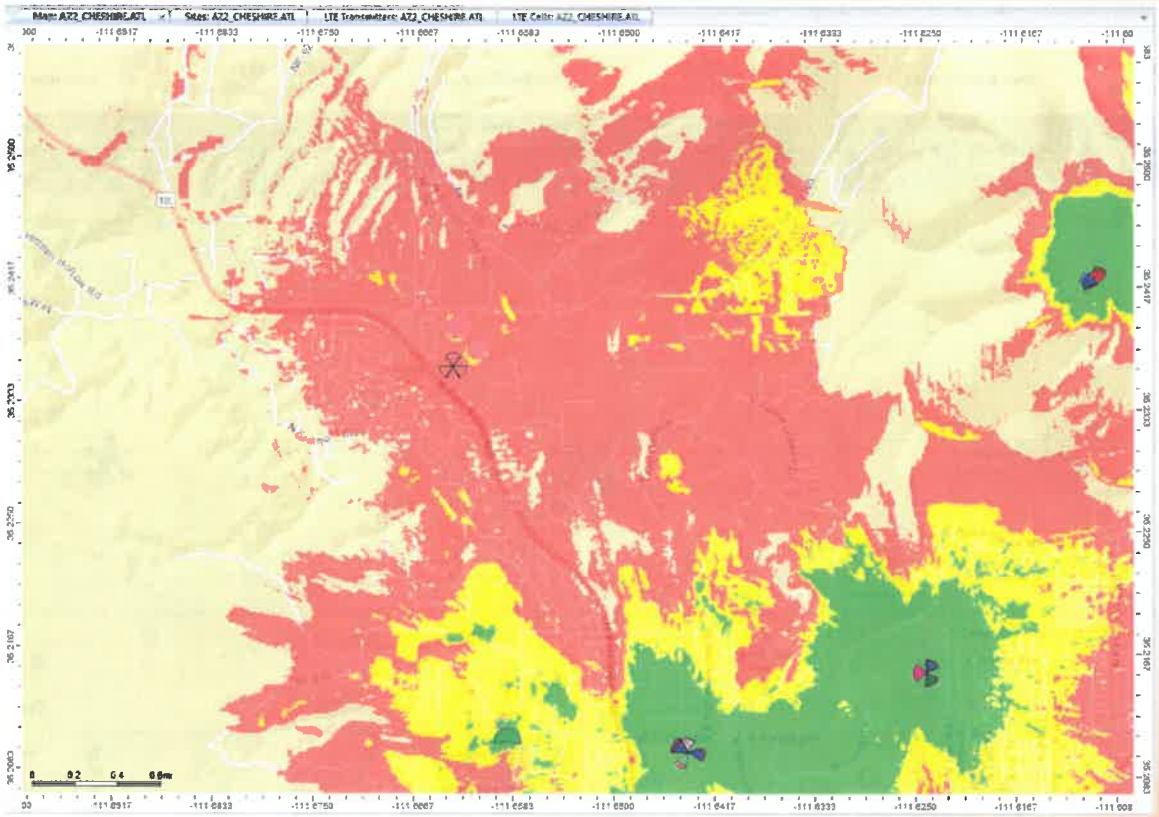
RootMetrics – Throughput Map

2021

Open Signal – Quality Map



RSRP - Current Coverage



LTE: RSRP - Coverage (0)

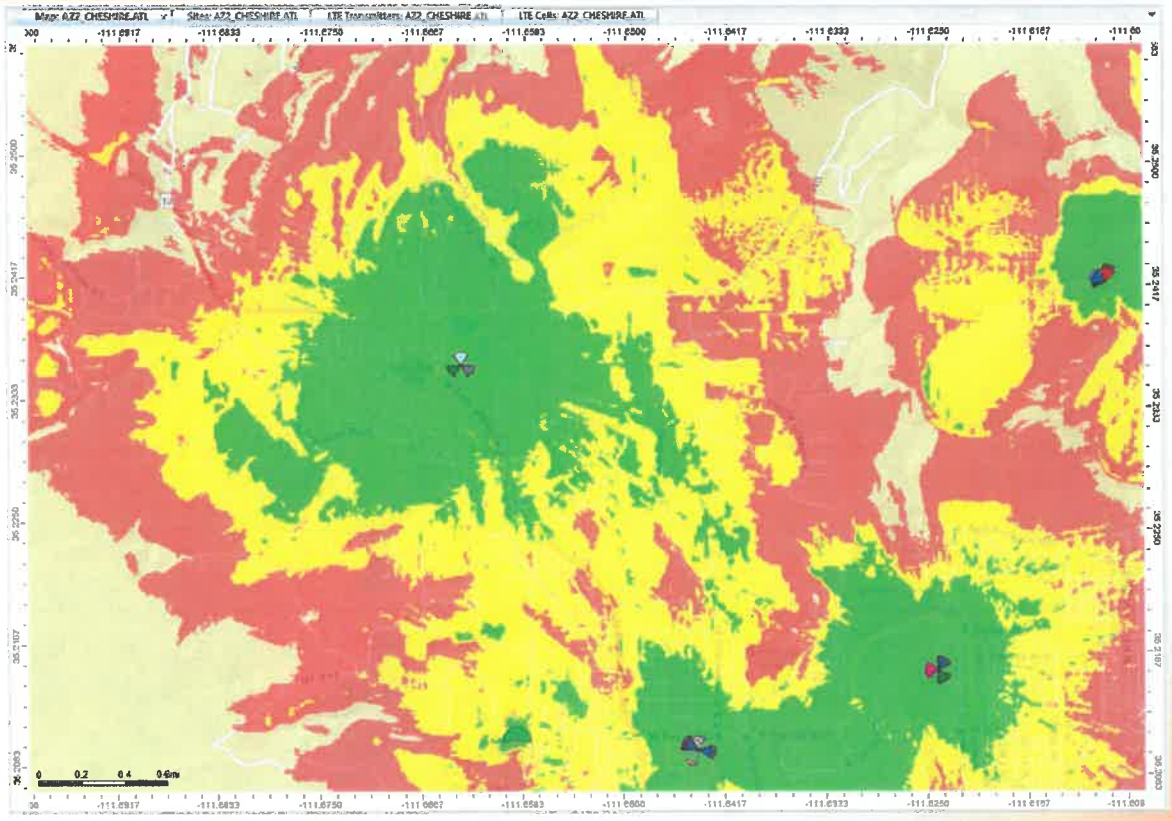
RSRP Level (DL) (dBm) >= -75

RSRP Level (DL) (dBm) >= -85

RSRP Level (DL) (dBm) >= -95

2021

RSRP – Proposed Coverage

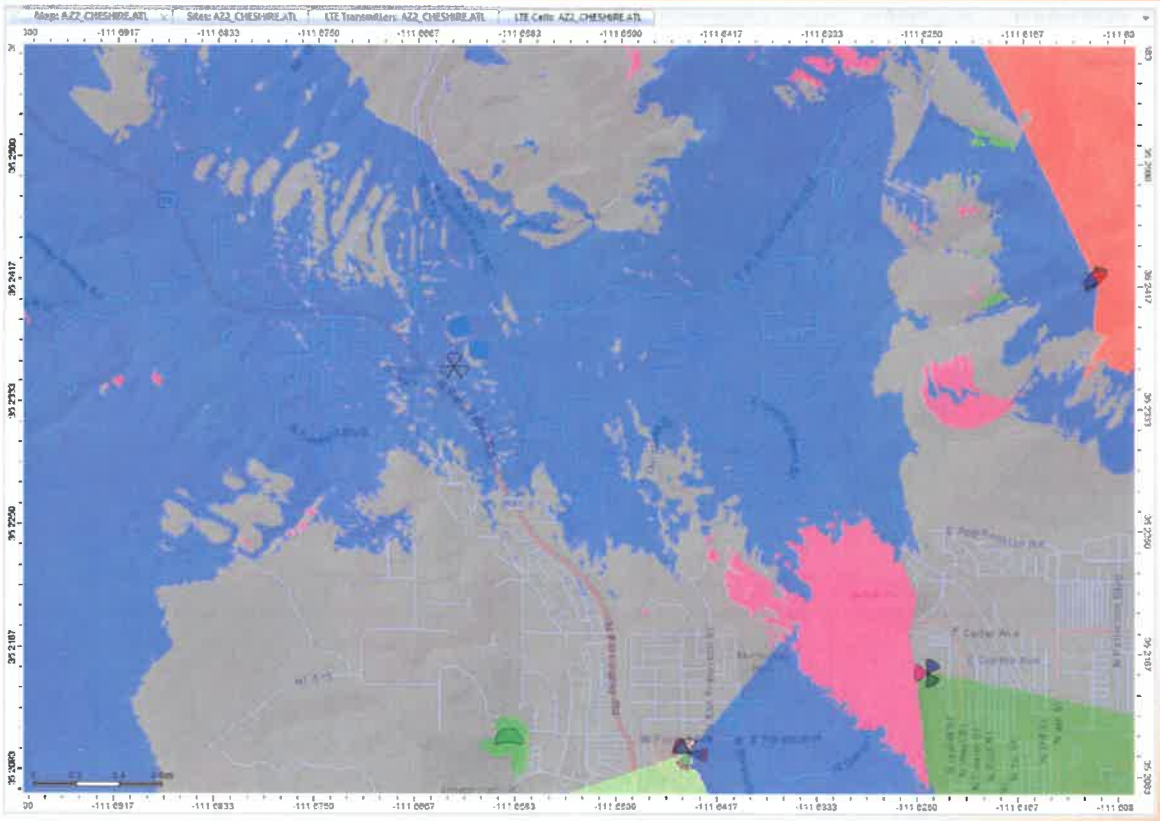


LTE: RSRP - Coverage (0)

- RSRP Level (DL) (dBm) > = -75
- RSRP Level (DL) (dBm) > = -85
- RSRP Level (DL) (dBm) > = -95

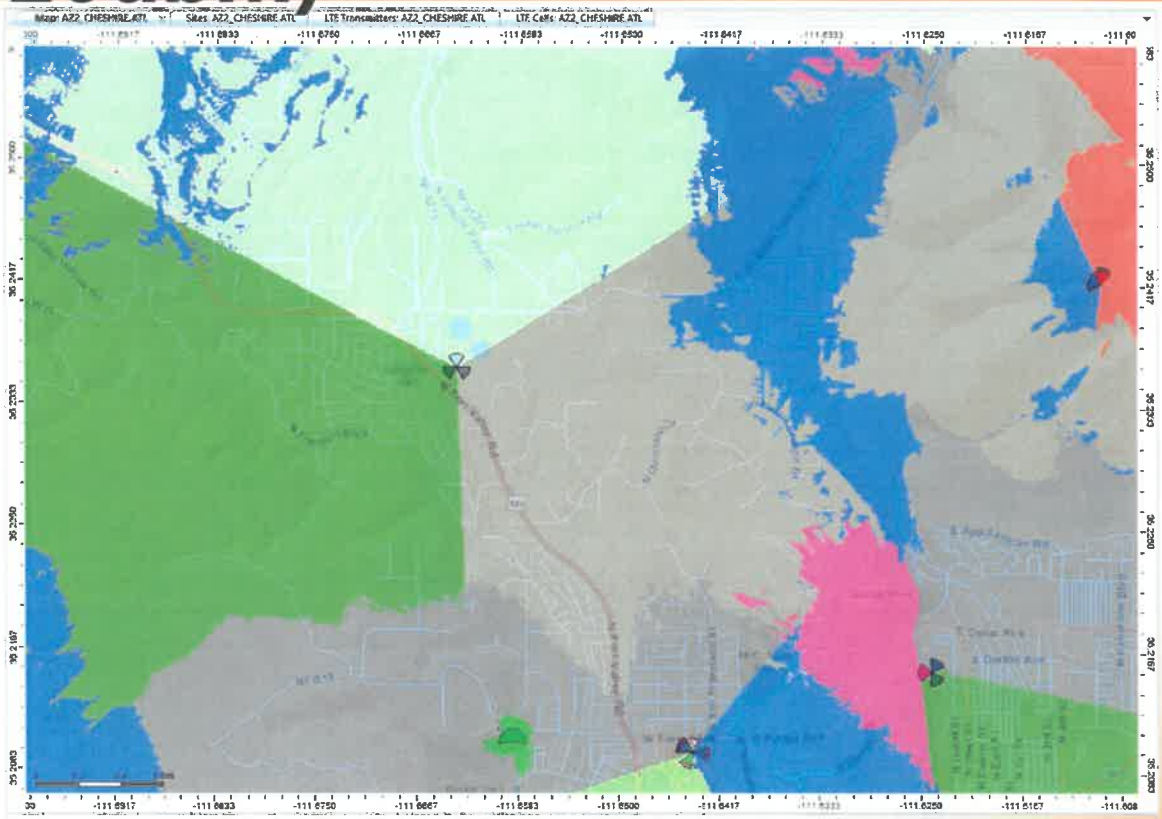
2021

Best Server - Current (-120dbm)



2021

Best Server – with new site (-120dbm)



2021