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UCLA GEOG XL 181B
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Unit 3 - Viewshed Analysis
T-Mobile U.S. Service Coverage Expansion Report

This report serves as a preliminary evaluation of the best course of action regarding T-Mobile U.S.'s three proposed plans to expand cellular service in Los Angeles County.

T-Mobile U.S. currently offers service reaching approximately 4,926 square kilometers of Los Angeles County, which has a total area of approximately 12,299 square kilometers. This 40.1% coverage is produced by 105 individual towers of varying height, which can emit signal across a 25km line-of-sight range.

Three plans are proposed for coverage expansion:

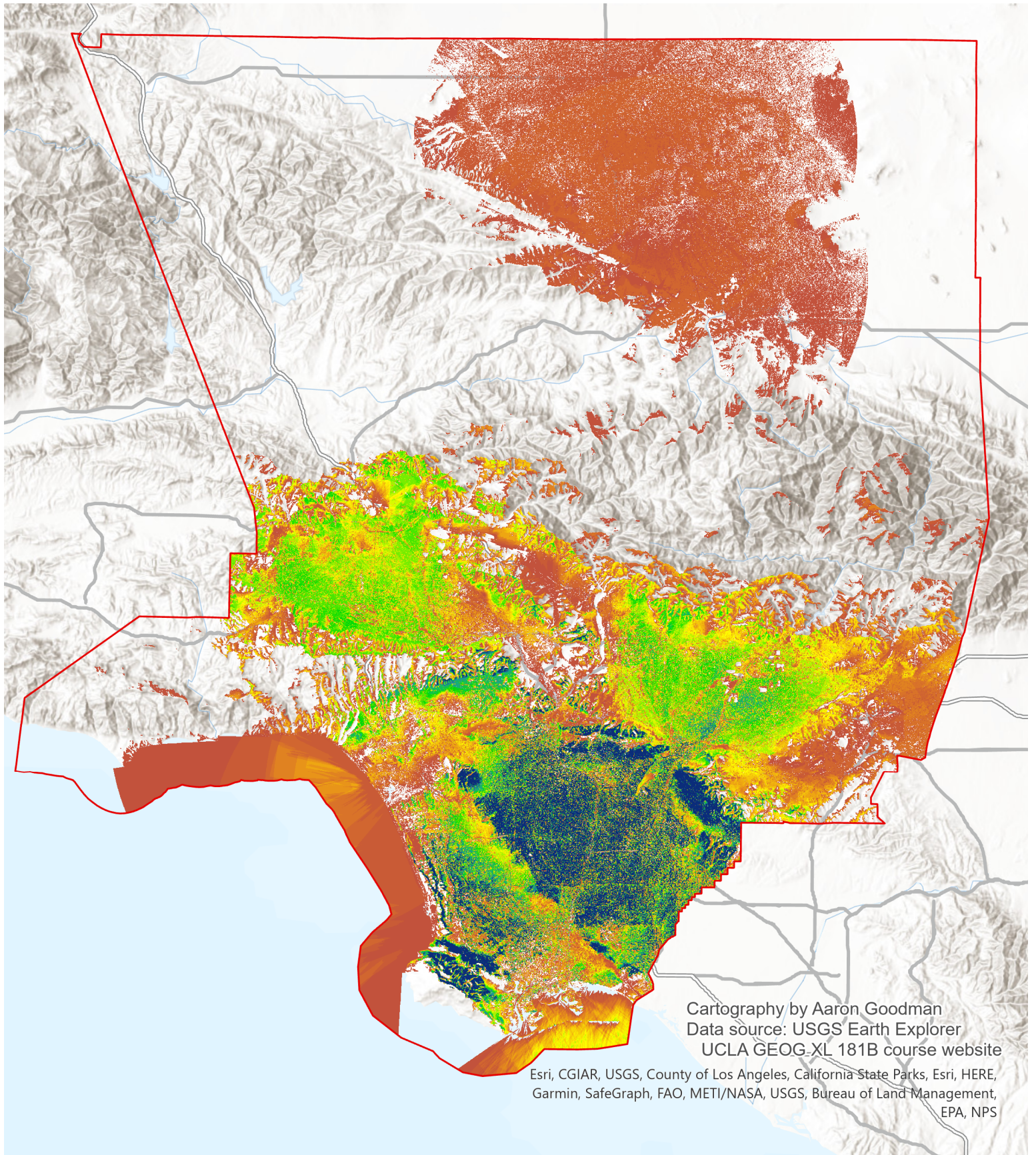
1. Raise height of all towers by 10m
2. Extend range of all towers by 5km (range is now 30km)
3. Construct 3 new cellular service towers

Using viewshed analysis available in ArcGIS Pro, the resulting coverage from each of these developments can be predicted. These results, along with current coverage statistics, appear below:

CURRENT COVERAGE	4,926 / 12,299 sq km	40.1% coverage
PROPOSAL 1 - new height	4,996 / 12,299 sq km	40.6% coverage
PROPOSAL 2 - new range	5,206 / 12,299 sq km	42.3 % coverage
PROPOSAL 3 - new towers	5,242 / 12,299 sq km	42.6% coverage

If greater coverage AREA is the most emphasized metric of success in service expansion, then constructing 3 new towers produces the best results (#3). For this report, one tower was added to uncovered hills in Glendale, and two more were added to the largely uncovered Santa Clarita valley. These additions increased the coverage area more so than the proposed tower modification scenarios did, with the 3 new towers serving relatively dense metropolitan areas. The new towers would produce similar if not better results in different arrangements; all 3 towers serving Santa Clarita may be the best course of action for expanded and reliable service. Alternatively, towers can be placed elsewhere to facilitate maximum area covered, although larger land areas may not ultimately be "metro" areas in need of service.

Increasing the range of existing towers is also a promising proposal (#2). This option produces coverage area results comparable to that of the Proposal #3, with an additional benefit; as referenced in Proposal 2's detailed map, the maximum number of towers serving a single location increases considerably with an extended signal range, from 64 to 71 towers. It can be assumed that this greater degree of overlap in service areas would account for greater signal strength in affected areas.

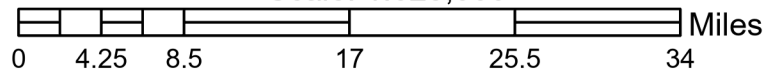


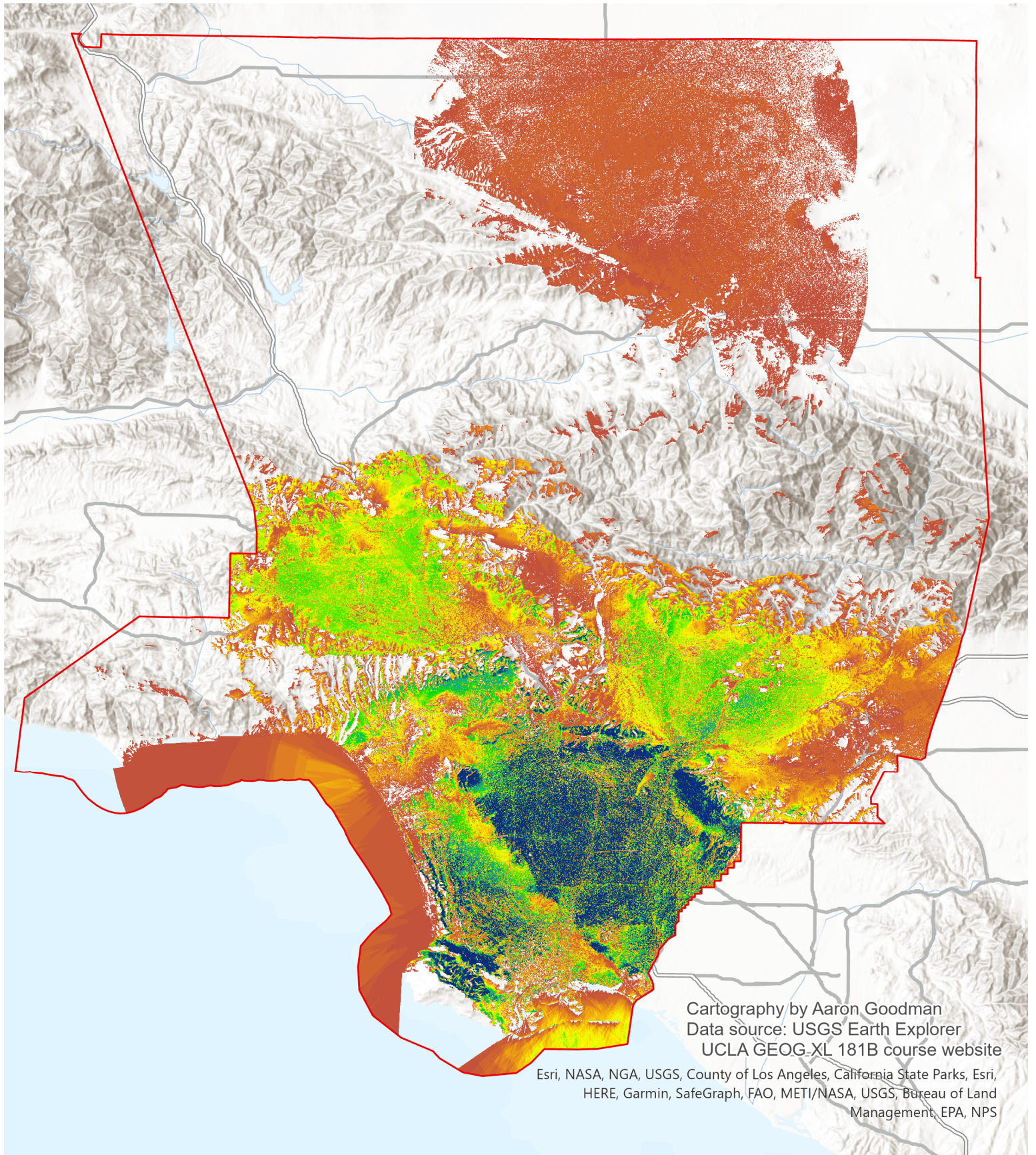
T-Mobile Cellular Coverage in Los Angeles County

CURRENT COVERAGE: 105 towers, standard height, 25km range

Signal Strength: Number of Active Towers

Scale: 1:625,000





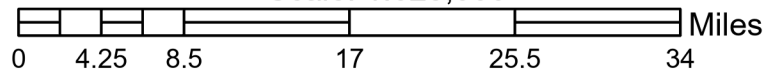
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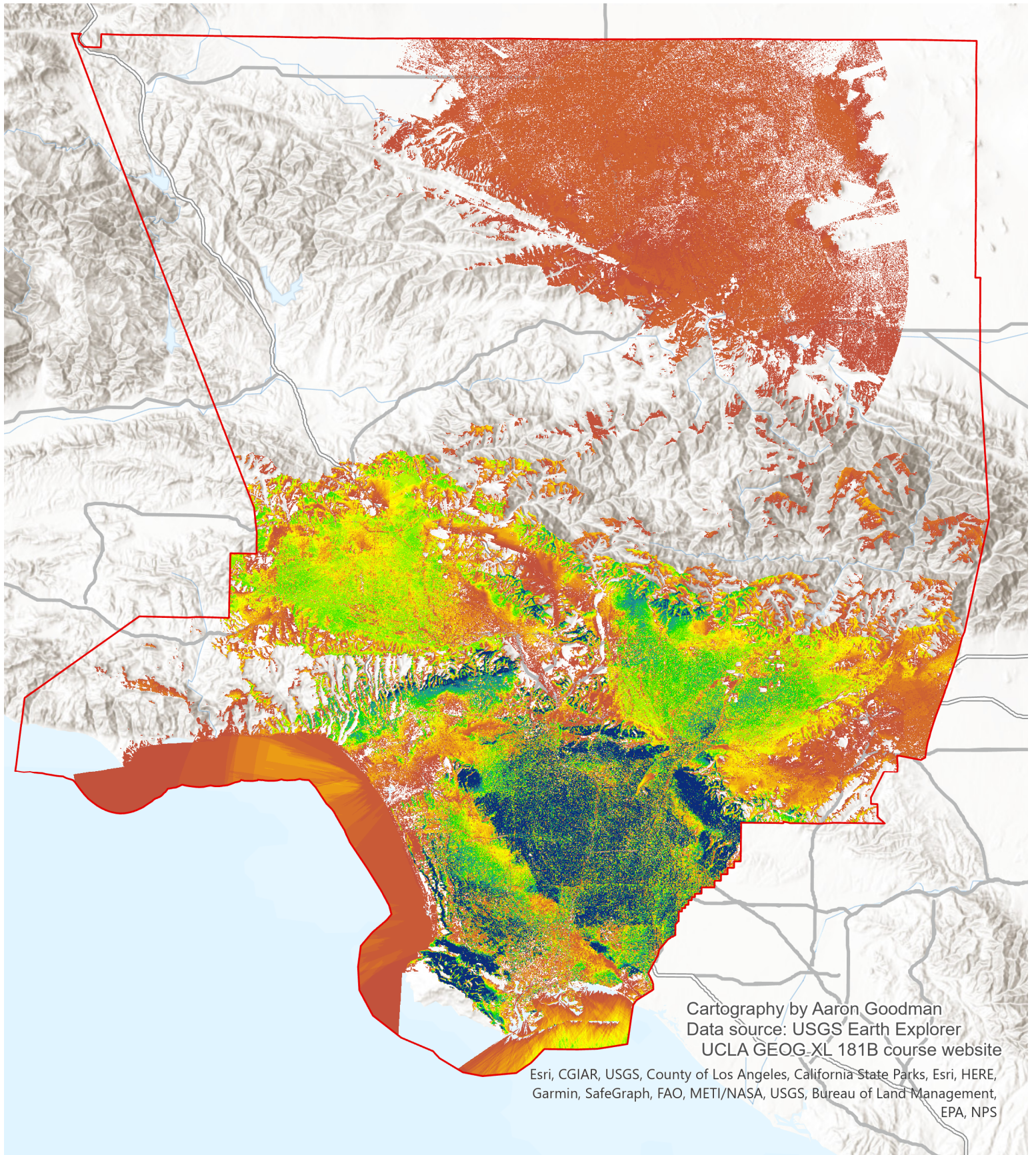
*PROPOSED COVERAGE 1: 105 towers, *RAISED height, 25km range*

Signal Strength: Number of Active Towers



Scale: 1:625,000





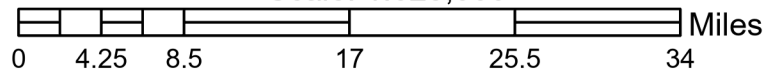
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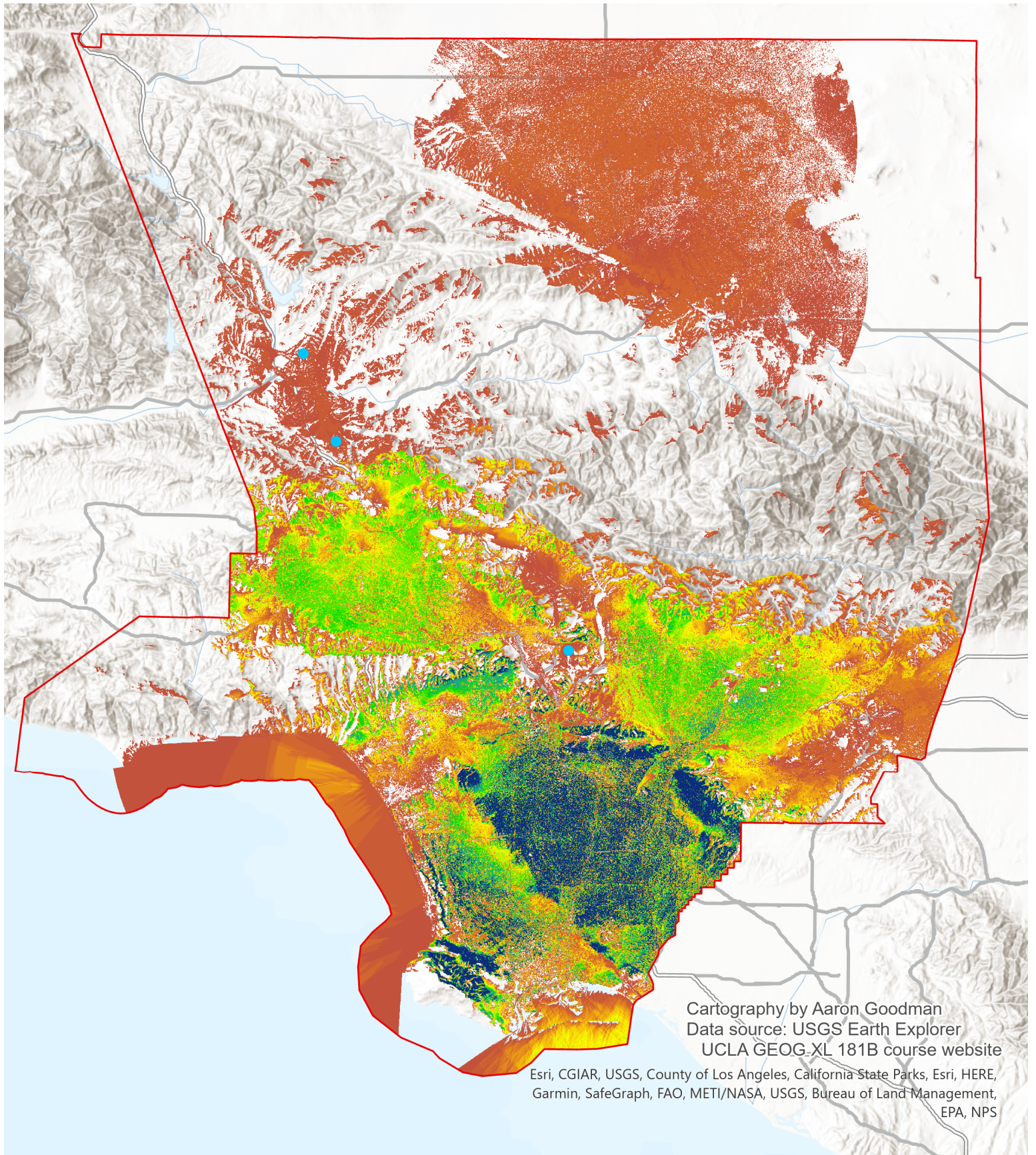
*PROPOSED COVERAGE 2: 105 towers, standard height, *30km range*

Signal Strength: Number of Active Towers



Scale: 1:625,000





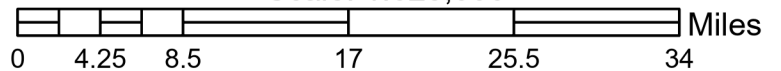
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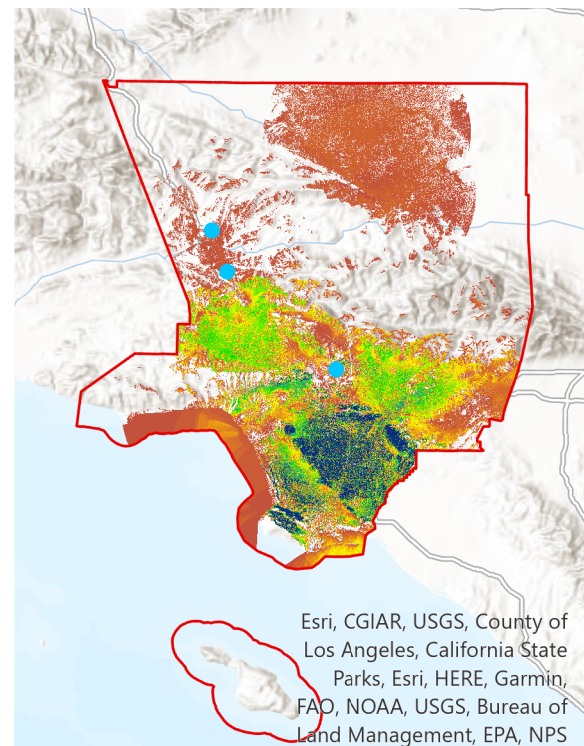
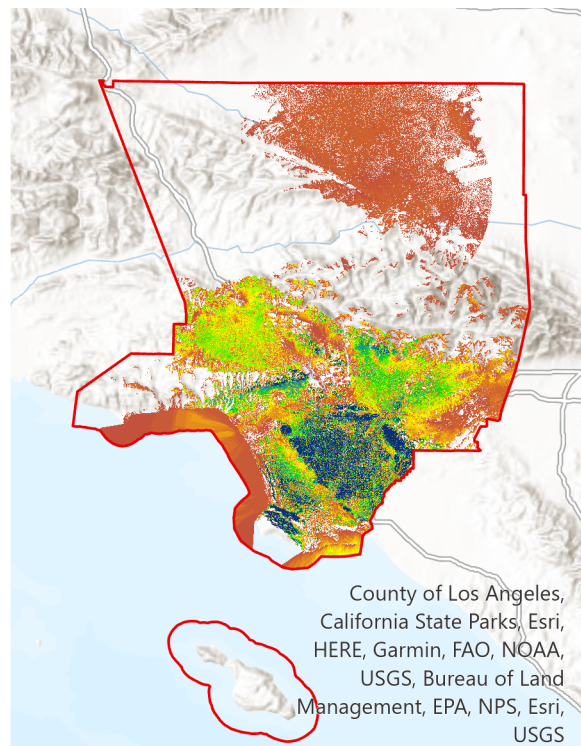
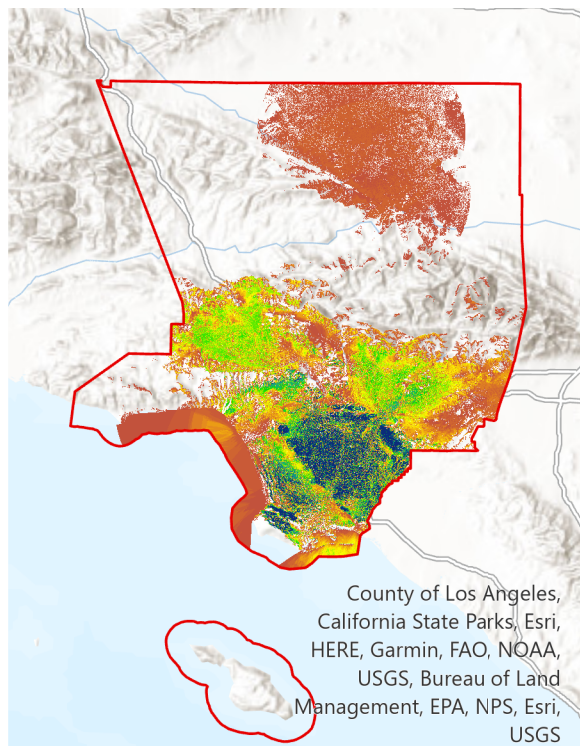
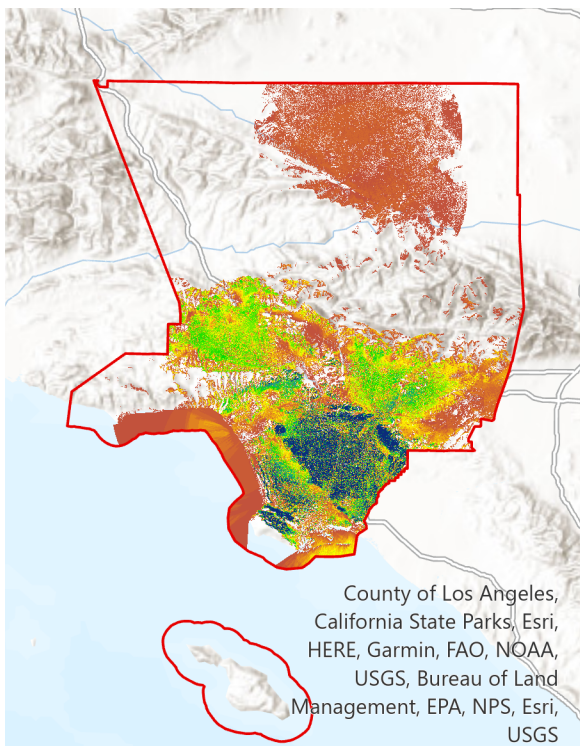
*PROPOSED COVERAGE 3: *108 towers, standard height, 25km range*

Signal Strength: Number of Active Towers



Scale: 1:625,000





CURRENT COVERAGE

105 towers
unmodified height
standard range (25km)

■ No Service 59.9%
■ T-Mobile Service 40.1%

4.926 Mil sq m
12.299 Mil sq m

PROPOSAL 1 COVERAGE

105 towers
*RAISED height (+10m)
standard range (25km)

■ No Service 59.4%
■ T-Mobile Service 40.6%

4.996 Mil sq m
12.299 Mil sq m

PROPOSAL 2 COVERAGE

105 towers
unmodified height
*EXTENDED range
(30km)

■ No Service 57.7%
■ T-Mobile Service 42.3%

5.206 Mil sq m
12.299 Mil sq m

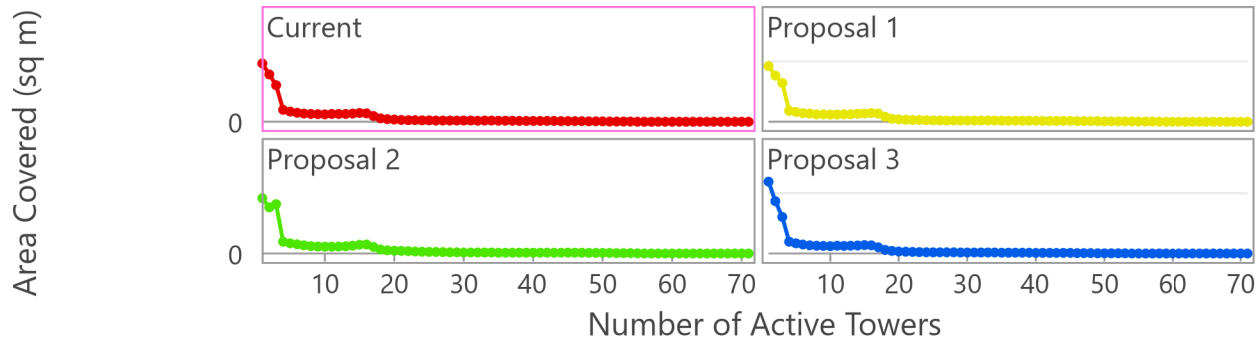
PROPOSAL 3 COVERAGE

*108 towers (+3)
unmodified height
standard range (25km)

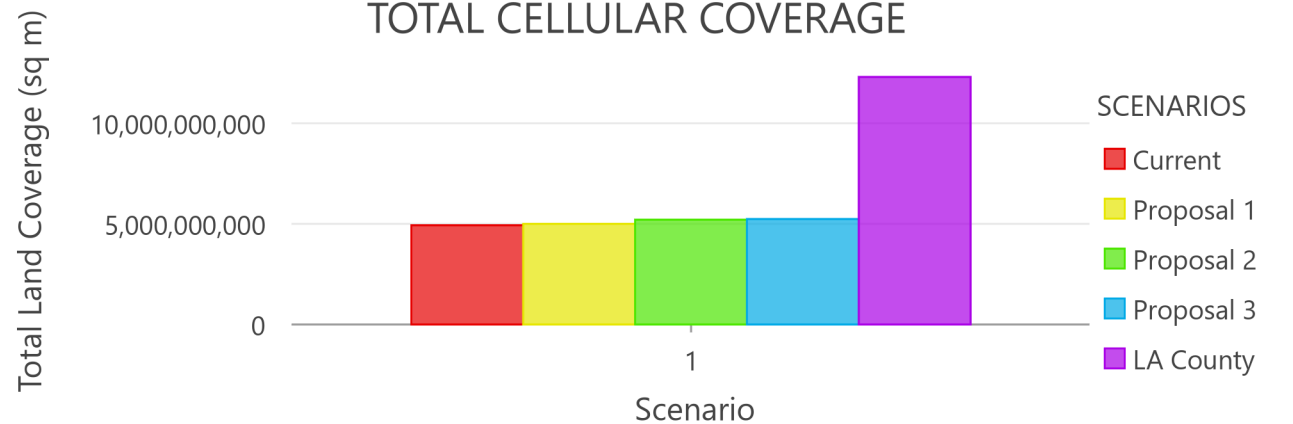
■ No Service 57.4%
■ T-Mobile Service 42.6%

5.242 Mil sq m
12.299 Mil sq m

SIGNAL STRENGTH



TOTAL CELLULAR COVERAGE



Signal strength represented by area covered by multiple towers.