



November 30, 2021

BY ELECTRONIC FILING

Kerry E. Murray
Federal Communications Commission
45 L Street, N.E.
Washington, DC 20554

Re: Amendment for SES-LIC-20210729-01285; Callsign E210298; Elbert, CO

Dear Ms. Murray:

This letter is to provide detail for an amendment to SES-LIC-20210729-01285, the license application for the Starlink earth station in Elbert, CO. This letter is also a response to requests from the Federal Communication Commission to provide supplemental information with regard to this earth station application.

The contents of this letter are as follows:

1. Correction of clerical error related to earth station coordinates
2. Addition of county boundaries and distance/mileage scale to PFD contour plots
3. .kml file with PFD contour and census block boundaries
4. Clarification of power density ("clear sky power" value)
5. Confirmation that PFD contour will not cross any roads classified as "Other Freeways and Expressways or Other Principal Arterials," with details on related analysis and assumptions
6. Clarification of discrepancy in height above ground level
7. Explanation of changes in antenna sidelobe levels
8. Explanation of clutter assumptions
9. Technical details related to site shielding

1) Correction of clerical error related to earth station coordinates

The coordinates listed in the initial license application (SES-LIC-20210729-01285) and the Comsearch report submitted with the initial license application were incorrect due to clerical error. The correct coordinates, as well as an updated coordination report, have been submitted with this amendment filing.

Initial (incorrect) coordinates: 45° 5' 29.9" N, 93° 23' 27.1" W

Updated (correct) coordinates: 39° 17' 33.1" N, 104° 30' 17.1" W

SpaceX would like to emphasize that this is a clerical error, and apologize for any inconvenience this may have caused. SpaceX kindly requests that the Federal Communication Commission restart public notice period for this earth station, and proceed with expeditious license grant shortly thereafter.

SpaceX does not anticipate this change in coordinates to have any impact on the earth station's compliance with CFR 25.136(a)(4). The analyses submitted with the initial license application was done for the correct coordinates, and therefore remains relevant and applicable.

2) Addition of county boundaries and distance/mileage scale to PFD contour plots

In accordance with 47 CFR § 25.136(a)(4)(ii), county boundaries and map legends with distance/mileage scale for measuring the relative size of the proposed PFD contour are included as Figures 1-3 in the appendix of this document.

2) .kml files for PFD contours

The Federal Communications Commission has requested that a .kml file representing the PFD contour and relevant census block boundaries be submitted. This .kml file has been submitted as part of a supplemental pleading for this earth station.

3) Clarification of power density

To ensure compliance with 47 CFR § 25.136(a)(4)(ii) for the earth station related to this amendment, SpaceX used worst-case input power density. SpaceX did not change maximum power during rain fade conditions, so clear-sky maximum power is the same as during rain fade for this earth station application. This SpaceX license application is conservative and currently accounts for worst-case antenna input power density of -19.7 dBW/MHz.

4) Confirmation that PFD contour will not cross any roads classified as "Other Freeways and Expressways or Other Principal Arterials," with details on related analysis and assumptions

In accordance with 47 CFR § 25.136(a)(4)(iii), SpaceX certifies that the PFD contour of the earth station related to this amendment will not cross any roads classified as "Other Freeways and Expressways or Other Principal Arterials:"

To make this certification, SpaceX uses QGIS software to conduct an analysis of a comprehensive dataset of roadways obtained from the 2017 release of the HPMS¹ ARNOLD² dataset, belonging to the Federal Highway Administration of the Department of Transportation. To ensure compliance with 47 CFR § 25.136(a)(4)(iii), SpaceX analysis considers the following categories within the dataset: “Interstate,” “Principal Arterial – Other Freeways and Expressways,” and “Principal Arterial – Other”. SpaceX uses QGIS and the comprehensive dataset of roadways to ensure that the PFD contour does not cross any roads classified as “Other Freeways and Expressways or Other Principal Arterials.” According to the website from which the dataset is obtained³: “[the dataset] derives and is collected from State DOT road data. ARNOLD consists of locations of all roads in the U.S.” Therefore, relevant state roadways are considered in our analysis.

5) Clarification of discrepancy in height above ground level

In accordance with 47 CFR § 25.136(a)(4)(iv), the “height above ground level” in all earth station applications (1.7m), is the true centerline height of the antennas, and the value SpaceX uses to calculate the PFD contours. The “Antenna Centerline (AGL)” value previously used in Comsearch (0.91m) has been found to be a clerical error, and will be changed to 1.7m in all future Comsearch reports. Comsearch has informed us that it is not necessary to re-do coordination or update Comsearch reports based on this change, because the change is not expected to impact any relevant analyses. Related email correspondence with Comsearch has been added as a supplemental pleading for this earth station.

6) Explanation of changes in antenna sidelobe levels

The antenna sidelobe level toward the horizon used in the license application for this gateway is -8 dBi. Previous applications for other gateway sites may have featured a different value for the antenna sidelobe level toward the horizon. This difference is due to improvements in SpaceX gateway antenna design over time – newer antennas have a lower antenna sidelobe level toward the horizon. See appendix Figure 4 for detail on antenna sidelobe measurements and related methodology.

7) Explanation of clutter assumptions

The PFD analysis in the initial application (and featured again in this amendment) use the ITU P.452 clutter attenuation model, per recommendation from the Federal Communications Commission. The initial license application did not specify which ITU P.452 clutter category was used for PFD contour analysis.

¹ Highway Performance Monitoring System

² All Road Network of Linear Referenced Data

³ Source: <https://www.bts.gov/geography/geospatial-portal/NTAD-direct-download>

The ITU P.452 clutter category of “high crop fields” was used for PFD contour analysis. According to the ITU P.452 model, this category translate to clutter assumptions of 4 meters nominal height and 0.1 kilometers nominal distance.

This clutter categories was determined to be most appropriate based on measurements and analysis via Google Earth software and in-person site survey. This is also the most conservative clutter assumption available in the ITU P.452 model.

8) Technical details related to site shielding

Most ground-based SpaceX gateway antenna sites in the US are surrounded with a solid metal panel fence, which is 8 feet in height and is set 11 feet and 6 inches from the centerline of the outermost antennas. Each earth station is analyzed independently to determine the shielding value required to comply with 47 CFR § 25.136(a)(4)(iii), based on PFD contours. The independent nature of the analysis explains the variation in shielding values between applications. SpaceX installs shielding at all sites with effectiveness equal to or greater than the value required to remain in compliance with 47 CFR § 25.136(a)(4)(iii). This particular earth station does not require any additional shielding.

Sincerely,

David Liptsyn

David Liptsyn
Gateway Site Acquisition Analyst
SpaceX

Appendix

Figure 1: PFD Contour with county boundaries

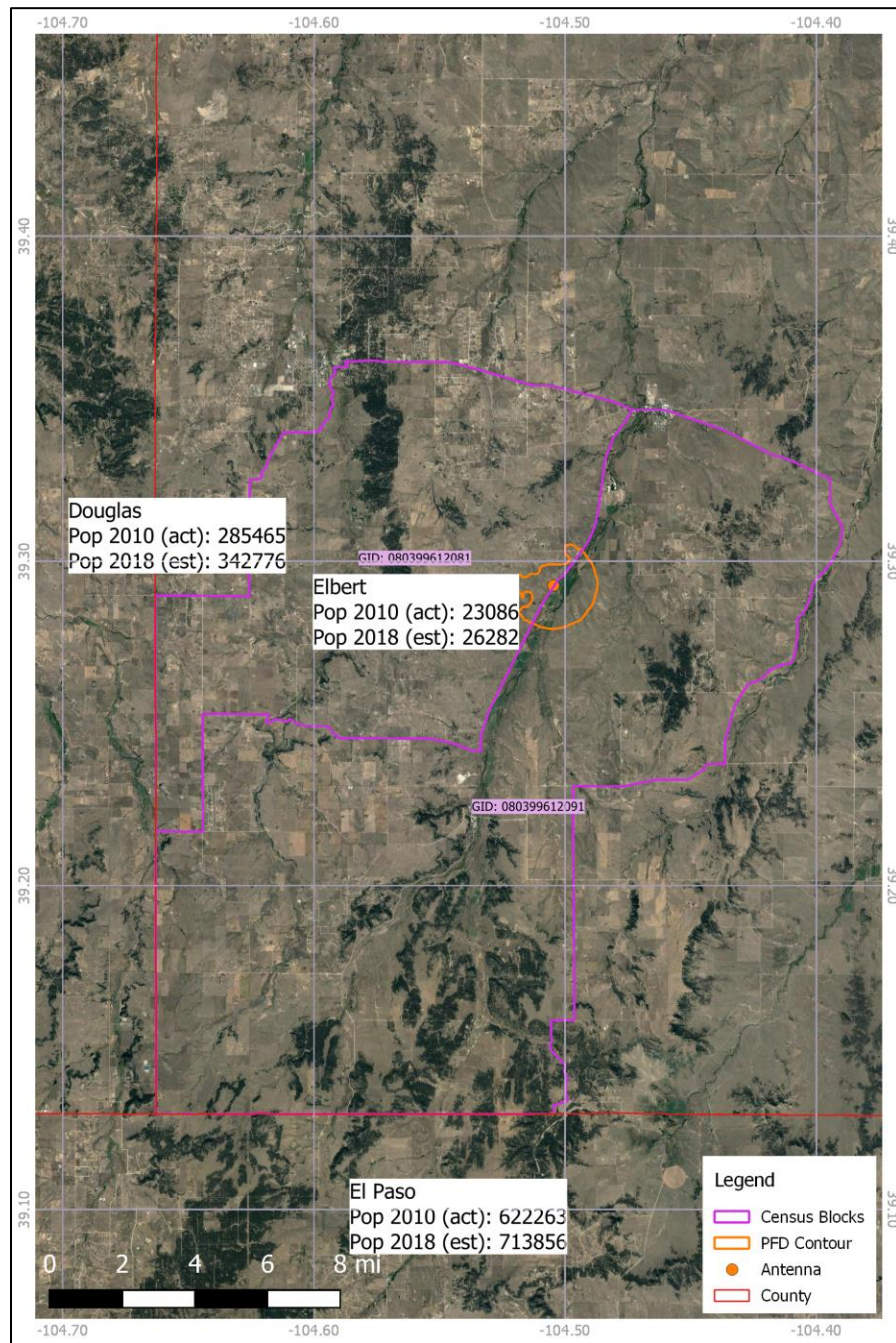


Figure 2: PFD Contour with population coverage data

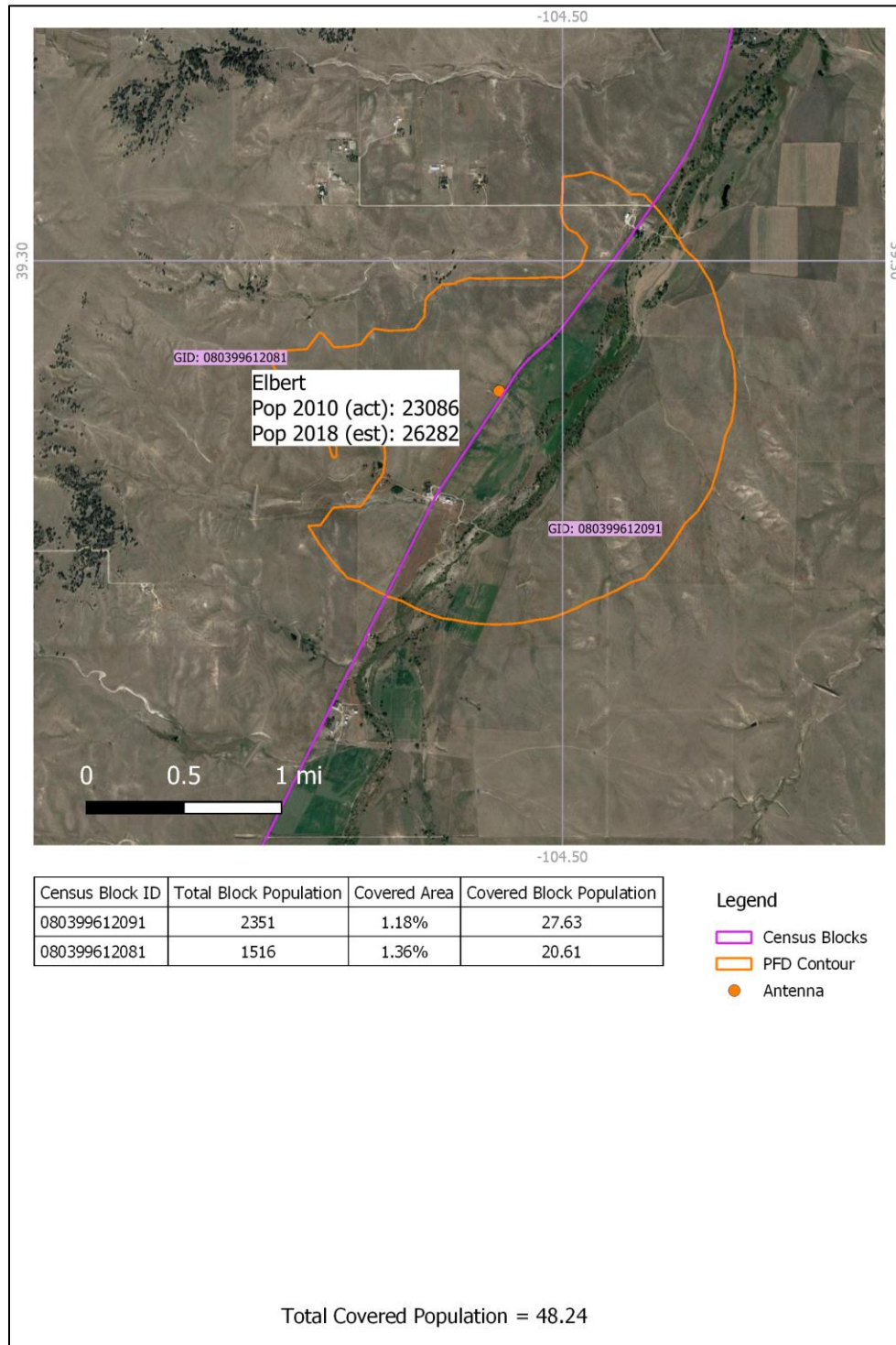


Figure 3: PFD Contour with population density

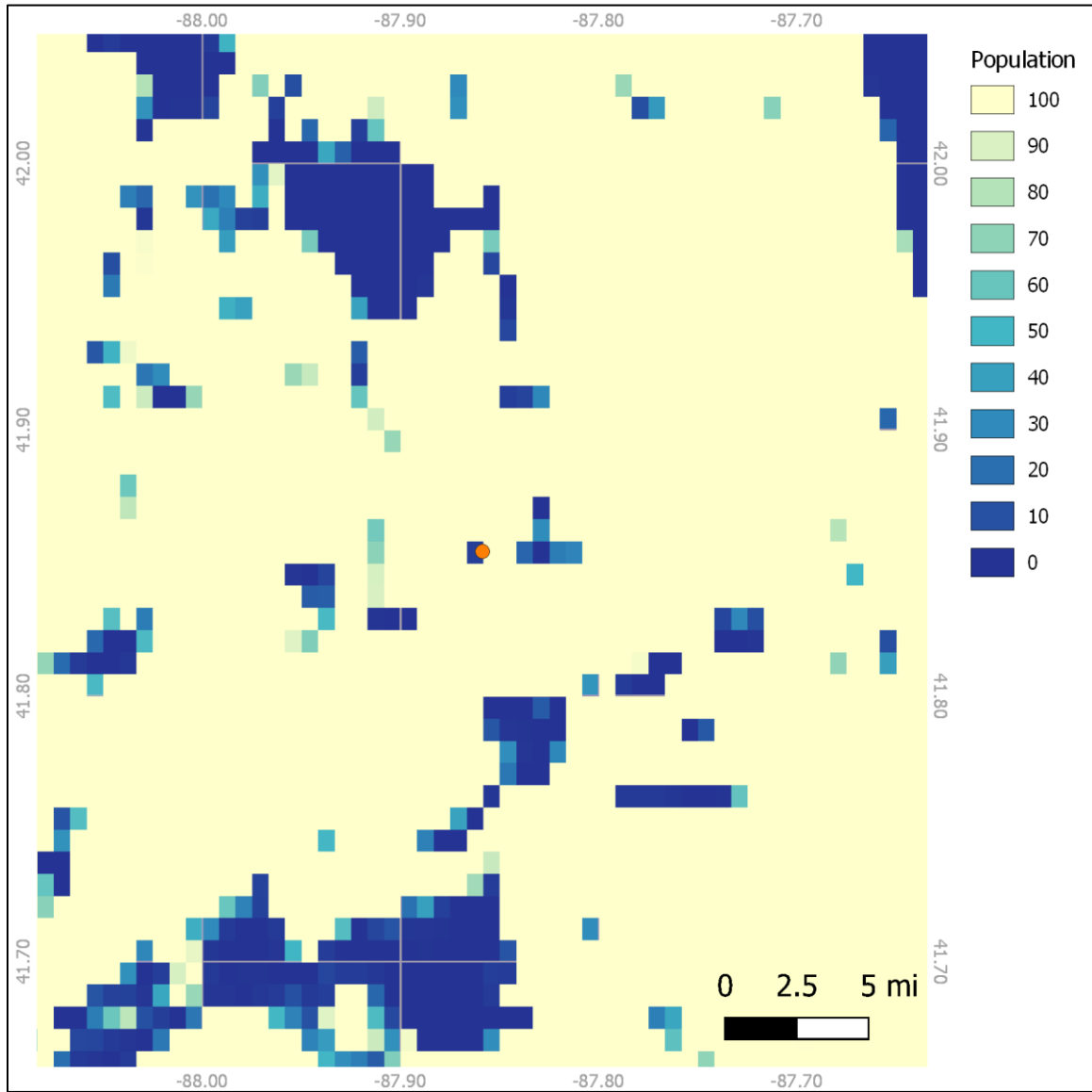
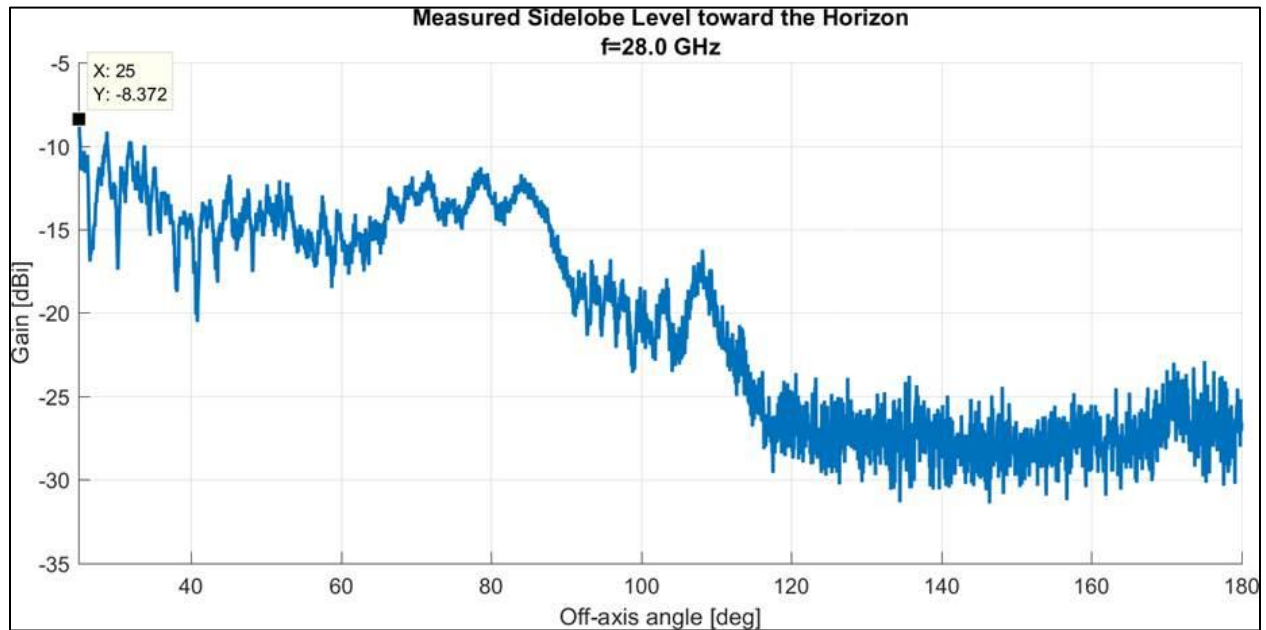


Figure 4: A measured antenna pattern is shown below for relevant off-axis angles that intersect the horizon. The maximum observed sidelobe level is -8.37 dBi. This measurement was completed by an independent third party (NSI-MI Technologies) at the NSI-MI Compact Antenna Test Range at the NSI-MI Technologies facilities in Atlanta, GA. All measurement equipment was also manufactured by NSI-MI to ensure accuracy and precision. The test report can be made available upon request.



Sincerely,

David Liptsyn
Gateway Site Acquisition Analyst
SpaceX