

LWA-BB RFI Survey

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1 Introduction

This memo provides an overview of the RFI survey carried out on the Texas State University System (TSUS) lands near the Terlingua Ranch Lodge in the Big Bend area of Texas. The measurements were taken 19 May 2026 starting at about 11 am CDT and continued through 21 May 2026 at about 10 am CDT.

2 Site Description

The TSUS has a variety of properties located near the Terlingua Ranch Lodge in Brewster County, TX ($29^{\circ}27'1$ N, $103^{\circ} 24'$ W). The properties consist of parcels between 5 and 20 acres and include a field station, an old campground (the Bare Bones Campground), and a lot near the Terlingua Ranch Airport. The field station and campground sites have some existing infrastructure including power and fiber. The site near the airport has power and fiber running along the road to the east of the lot. There are three roughly 70 m by 70 m areas on the Terlingua Ranch that are being considered for the Sam Houston State/Texas A&M mini-station: the Bare Bones Campground (proposed site “A”), a portion of a 10 acre lot owned by Jim Spofford that could be leased for a modest fee (proposed site “B”), and the five acre parcel located near the airport (proposed site “C”).

Figures 1, 2, 3, and 4 present annotated satellite imagery from Google Maps. Figure 1 shows the overall site and includes the locations of proposed sites “A”, “B”, and “C” and where the RFI survey was conducted. The RFI survey location is on the Bare Bones Campground area to take advantage of the house, power and network access.

Figures 2, 3, and 4 provide closer views of the three proposed mini-station areas and include labels for nearby buildings and obstacles. For “A” the preliminary plan is to use the Bare Bones Campground house, situated on the west site of the parcel, to house the station electronics. This building has power, fiber, and a few “window unit” style air conditioners. Since the graded area near the house is relatively narrow north–south the array layout would need to extend into the flanking arroyos. This site also has complications from the above

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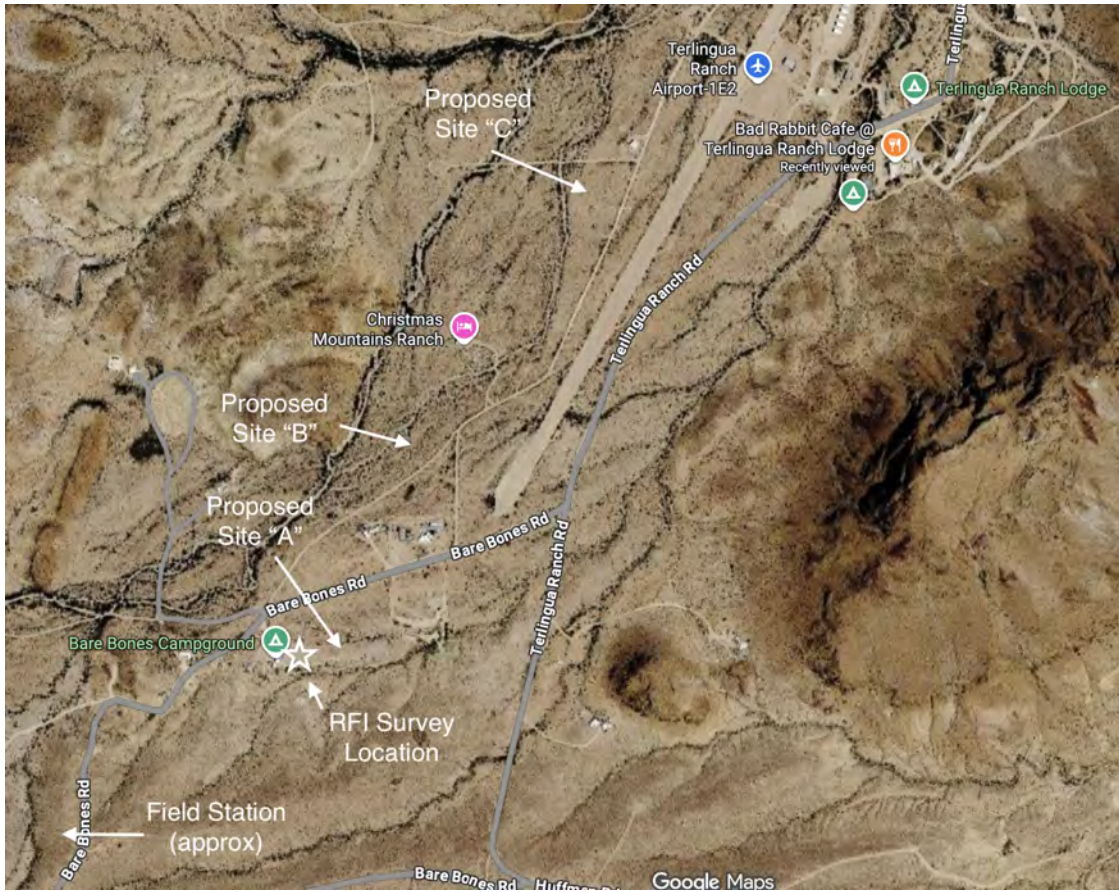


Figure 1: Overview of the area near the Terlingua Ranch Lodge. North is up and east is to the right. The imagery is from Google Maps’ “satellite” layer.



Figure 2: Zoom in of Figure 1 to show the proposed “A” location at the Bare Bones Campground. The orientation is the same as in Figure 1. The imagery is from Google Maps’ “satellite” layer.

ground powerlines that run across the southern edge of the graded area and the fact that the northern property line is relatively close to the northern edge of the graded area.

For area “B” the plan would be to use an American Products Freedom 3-bay telecom shelter to house the electronics, similar to what is done at the LWA-NA (3). Although this area is relatively flat, it has numerous large (~24 inch) rocks on the surface and scrub vegetation. It is also not owned by the TSUS so it would need to be leased from the current landowner.

Area “C” would also need a 3-bay telecom shelter to house the electronics and the property is similarly flat to “B”. However, the rocks, at least on the surface, are smaller than those seen at “B” and the vegetation is thinner. The property is bounded to the east by above ground powerlines, to the west by an arroyo, and to the north by a road.

3 Powerline RFI Survey

A survey for powerline interference was run on the morning of May 19 2026 using the MARC MoRIS (1). Temperatures were hot (mid-90s F) under clear skies and dry conditions. The system was setup using 10 dB of attenuation on polarization 0. Polarization 1 was inoperable due to a bad N-type connector on that cable. Figure 5 shows the strength of the 120 Hz power as a function of position at various points around the Terlingua Ranch Lodge. Although



Figure 3: Zoom in of Figure 1 to show the proposed “B” location on the eastern side of a 10 acre parcel owned by Jim Spofford. The orientation is the same as in Figure 1. The imagery is from Google Maps’ “satellite” layer.



Figure 4: Zoom in of Figure 1 to show the proposed “C” location west of the Terlingua Ranch Airport runway. The orientation is the same as in Figure 1. The imagery is from Google Maps’ “satellite” layer.

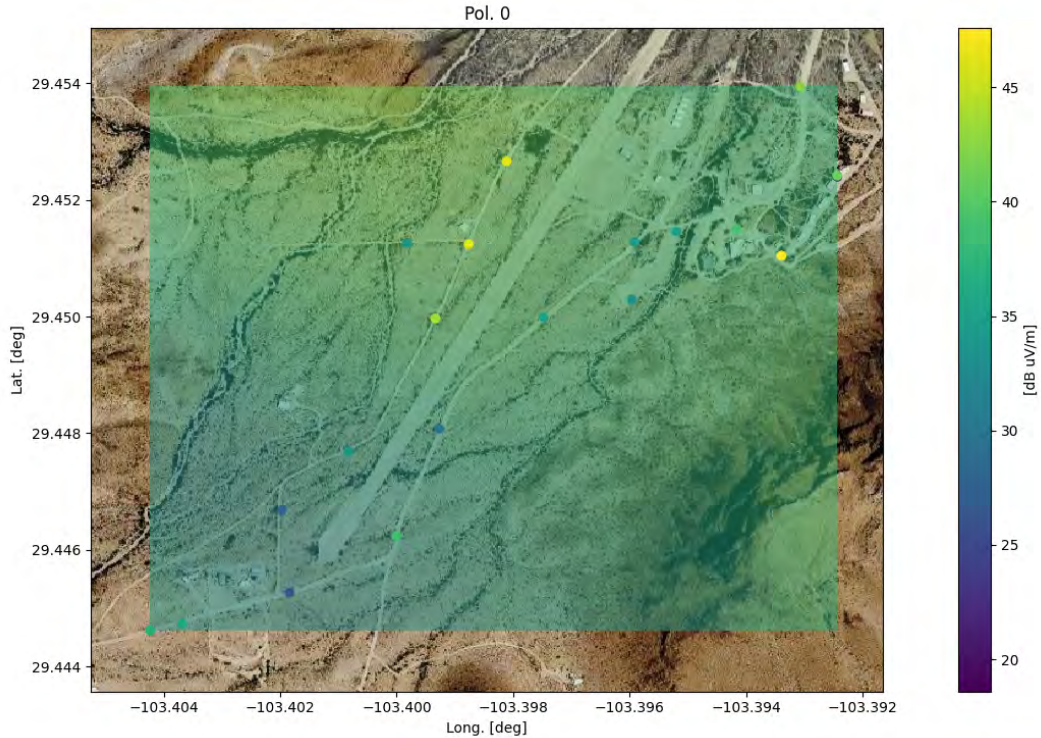


Figure 5: Power of the 120 Hz signal as function of position around the Terlingua Ranch Lodge. Points denote where measurements were taken and the background colormap is an interpolation between those measurements. The values have been roughly converted to dB $\mu\text{V}/\text{m}$.

powerlines are abundant in the area, most are fairly quiet. The strongest 120 Hz emission was seen near area “C”. Further investigation of these powerlines with the Radar Engineers Model M331 handheld receiver showed that the pole closest to the collapsed shed was the loudest. Striking that pole caused the noise picked up by the receiver to change further implicating that pole.

4 Strong RFI Survey

A strong RFI survey was also carried out at the site starting the afternoon of 2026 May 19 and ending the morning of May 21. Temperatures ranged from low 60s to ~ 100 F under clear to partly cloudy skies. A thunderstorm moved in during the afternoon of May 20.

This survey used a combination of a LWA antenna and front end (FEE) for 10 to 120 MHz and a Diamond D130J discone antenna for 80 MHz to 1 GHz. The two antennas were placed about 25 m to the North of the spectrum analyzer and computers. The computers were located inside the Bare Bones Campground house. A block diagram of the measurement setup is shown in Figure 6. An image of the discone and LWA antenna on the graded area of the campground is shown in Figure 7. Data were captured for 2 s every minute with the Rohde & Schwarz FSH3 spectrum analyzer using a 100 kHz resolution bandwidth. In order to capture

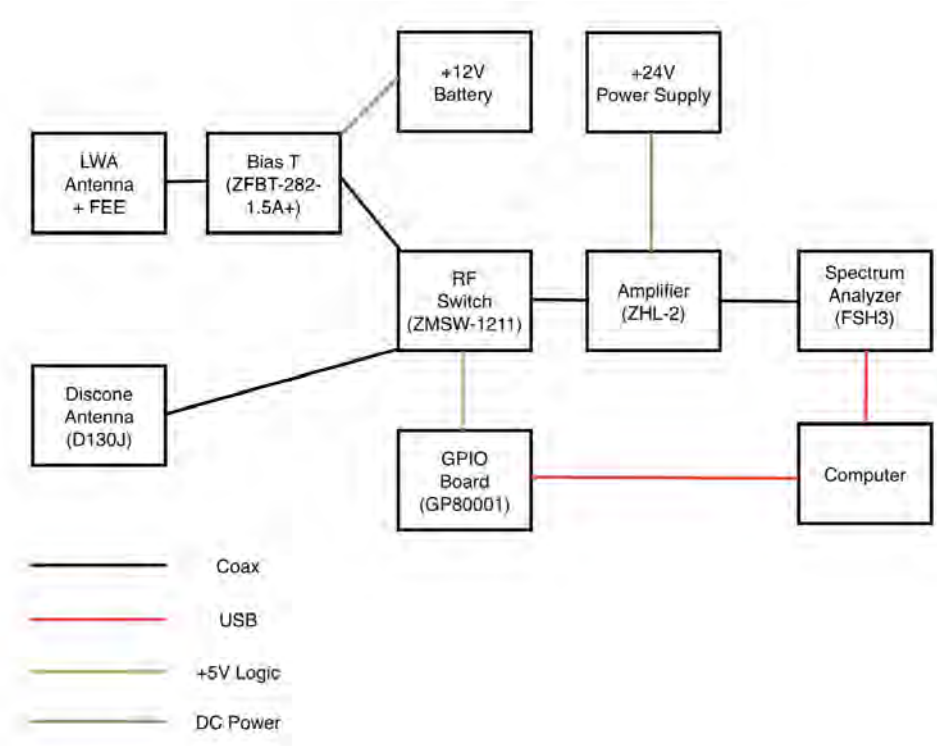


Figure 6: Block diagram of the setup for the strong RFI survey.

from both frequency ranges the RF switch was toggled before every capture.

For the first few hours of the survey the data quality was poor due to a combination of intermodulation caused by strong signals in the CB band and the RF switch. Around 8 pm on the May 19 the setup was changed to remove the RF switch and focus on the spectrum below 120 MHz using only the LWA antenna at a 1 minute cadence. Several follow on captures were taken with the discone antenna on the May 20 but they did not show any strong signals.

The results for the 10 to 120 MHz survey are shown in Figure 8. There are two notable gaps in the data, one near 15 hr when the antenna was disconnected for testing the eCallisto setup and another longer one starting at about 20 hr from a power outage from thunderstorms in the area. The data taken before the setup change at 8 pm on May 20 have also been excluded. Overall the site appears to be clean with few signals outside of the HF and FM bands. In the FM band only a couple of channels are consistently seen. This low level of FM likely due to a combination of the distance of the site from population centers and terrain shielding from the nearby mountains. This is better than the LWA-SV site where FM is $\approx +50$ dB above the spectrum around 50 MHz (2).

4.1 Local Amateur Radio

In conversations with Lindsey Bredemeyer we learned that there is an active amateur radio community in the Big Bend region and that a 2 m (144 to 148 MHz) repeater is hosted by the Terlingua Ranch Lodge. The community is active in the 2 m and lower frequency bands



Figure 7: The discone antenna and LWA antenna outside of the house at the Bare Bones Campground.

and use transmitters up to ~ 1 kW in power. Although no activity was seen in the amateur radio bands during the strong RFI survey, we include this note for future reference.

5 Site Discussion

The three sites studied during this survey have different strengths and weaknesses that are detailed below.

5.1 Area “A” - Bare Bones Campground

Before examining the sites in person, the Bare Bones Campground was the preferred site for the LWA mini-station. The house had power and fiber already installed. The RV area had already been leveled and there appeared to be enough space for a mini-station with a 66 m by 72 m footprint without placing antennas too far into the flanking arroyos (see Figure 9). However, the property became less appealing after further investigation. There is a powerline that runs over the south side of the graded area which would have crossed over a large fraction of the array. A well was drilled for the field station near the house that had a large pump control panel. The northern boundary of the property was too close to the graded area to position the array without moving it significantly farther south and into the arroyo. For these reasons the campground site became disfavored.

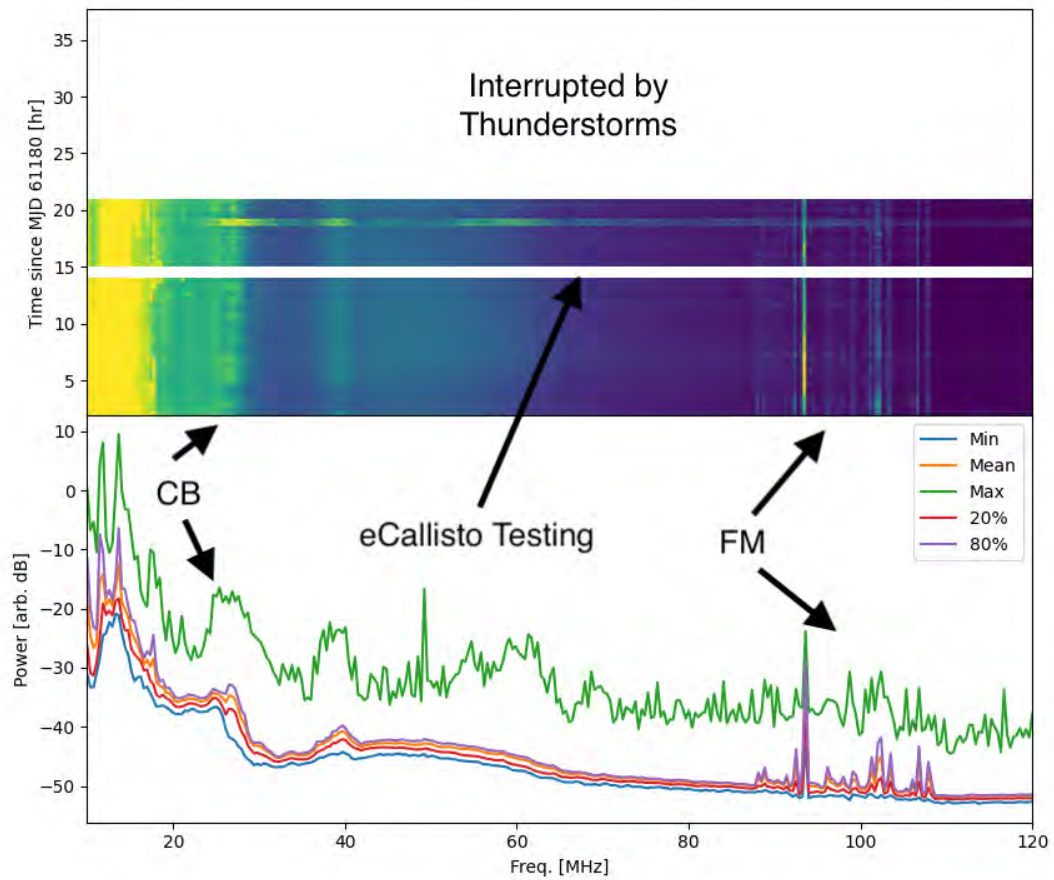


Figure 8: Results from the strong RFI survey. The top panel shows the waterfall of all of the data and the bottom panel shows spectra that correspond to the minimum, mean, maximum, 20th, and 80th power percentiles. A few features in both panels have been labeled.

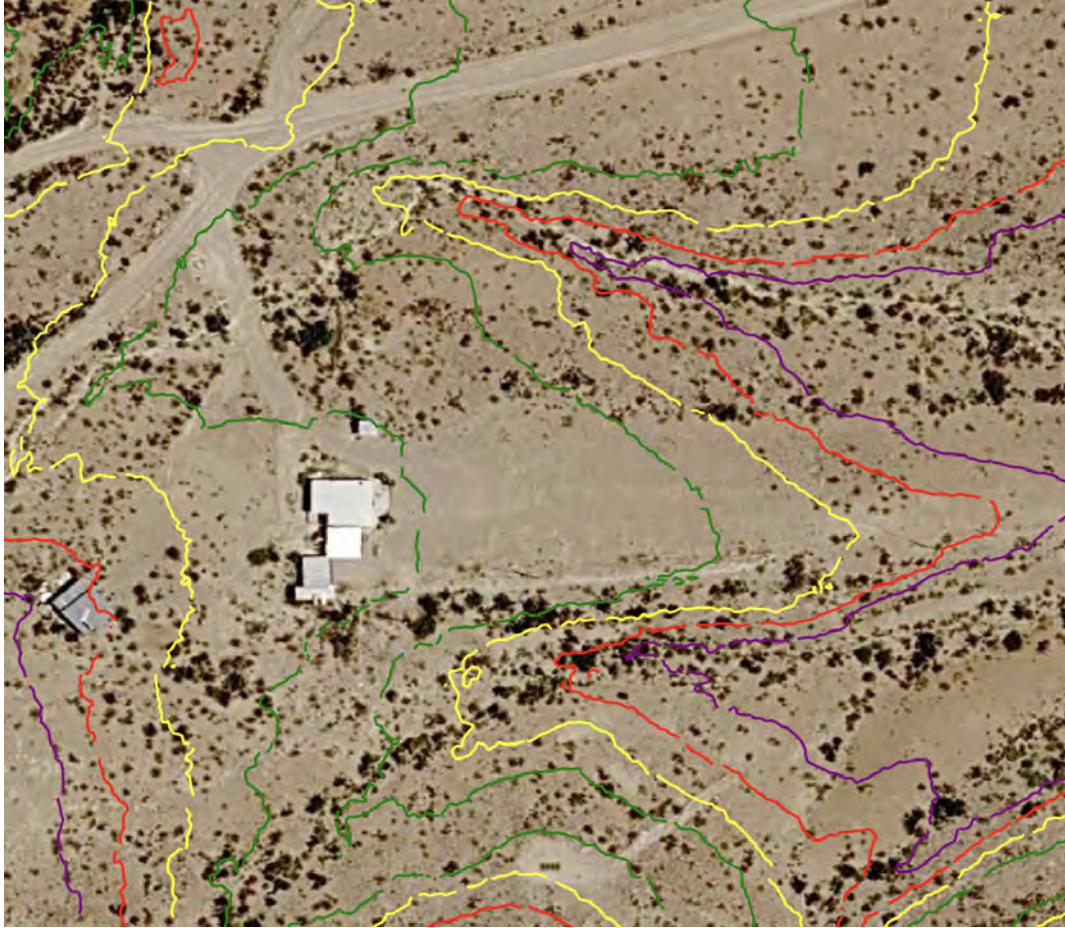


Figure 9: Relative topology contours for a 200 m by 200 m area centered on the proposed “A” area derived from United States Geological Survey (USGS) LiDAR point cloud data¹. Green contours are ± 1 m, yellow are ± 2 m, red are ± 3 m, and purple are ± 4 m relative to the center elevation. The imagery is from Google Maps’ “satellite” layer.

The TSUS also owns the 5 acre parcel to the west of the campground. We also investigated that area as well but the terrain there was much steeper (see the lower left corner of Figure 9) and there were concerns about building the array over the water pipeline to the field station if maintenance was ever needed on that.

5.2 Area “B” - Eastern Edge of 10 Acre Parcel

While looking at sites we had various discussions with local landowners and employees of the Terlingua Ranch Lodge. After expressing frustration with the Bare Bones Campground and the difficulty in establishing the property lines one landowner, Jim Spofford, offered to lease part of a 10 acre tract he owned to the TSUS for the array. This land was located between the campground and the airport off Smith Road. The property had access to power and fiber but the land had large rocks on the surface and denser scrub vegetation. The large

¹<https://apps.nationalmap.gov/downloader/>

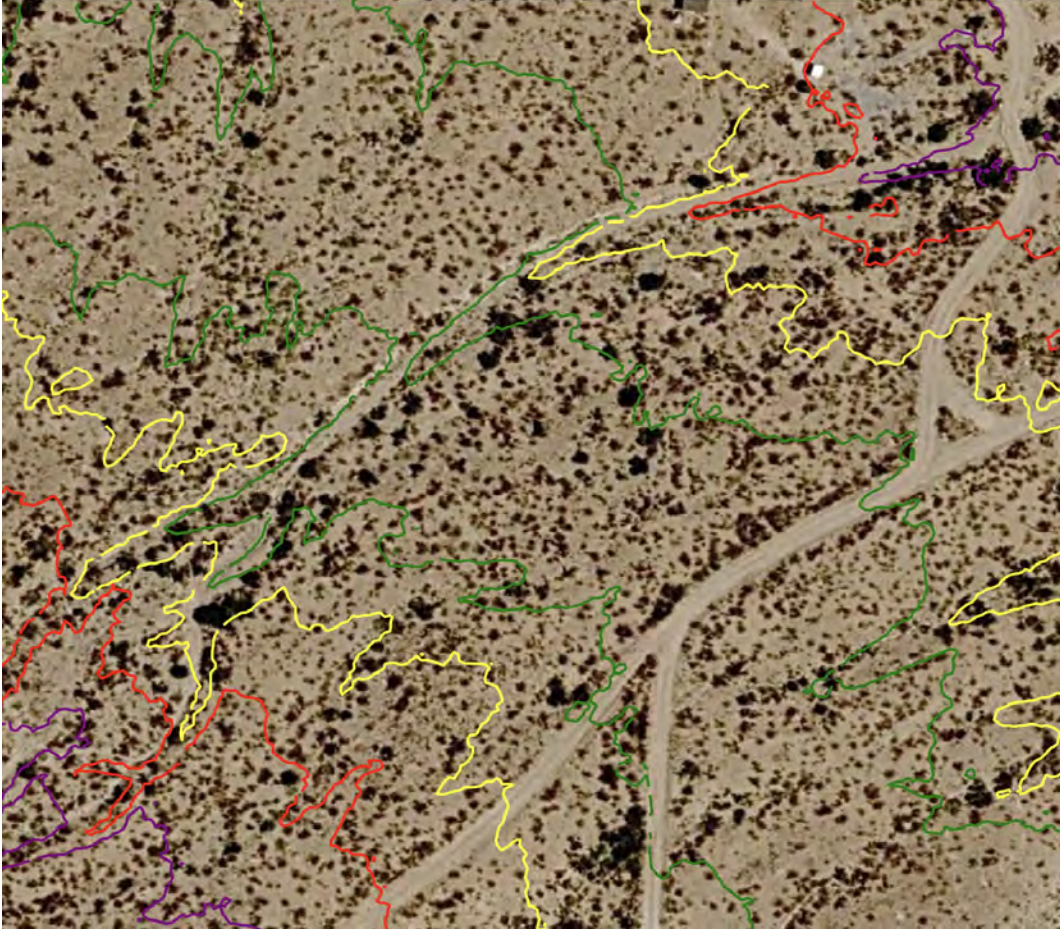


Figure 10: Relative topology contours for a 200 m by 200 m area centered on the proposed “B” area derived from USGS LiDAR point cloud data. Green contours are ± 1 m, yellow are ± 2 m, red are ± 3 m, and purple are ± 4 m relative to the center elevation. The imagery is from Google Maps’ “satellite” layer.

rocks on the surface were viewed as a bad omen for trenching the cables in in that area. In addition, the land appeared to have more topographic variation than is preferred for a LWA mini-station (see Figure 10).

5.3 Area “C” - 5 Acre Airport Parcel

The property near the airport initially had a lower preference compared to the Bare Bones site since it was completely undeveloped and closer to the airport. However, after looking at areas “A” and “B” it was clear that it had many advantages over both. First, although it was not developed, there was easy access to power and fiber. Second, the ground had a fairly constant slope to it (see Figure 11) and the rocks on the surface were much smaller than those in area “B”. Third, the vegetation on the property was thinner and consisted of small scrub and cactus. Figure 12 provides a picture of typical surface rocks and vegetation at this site. The disadvantages of this site include that it has the noisiest powerlines identified in the

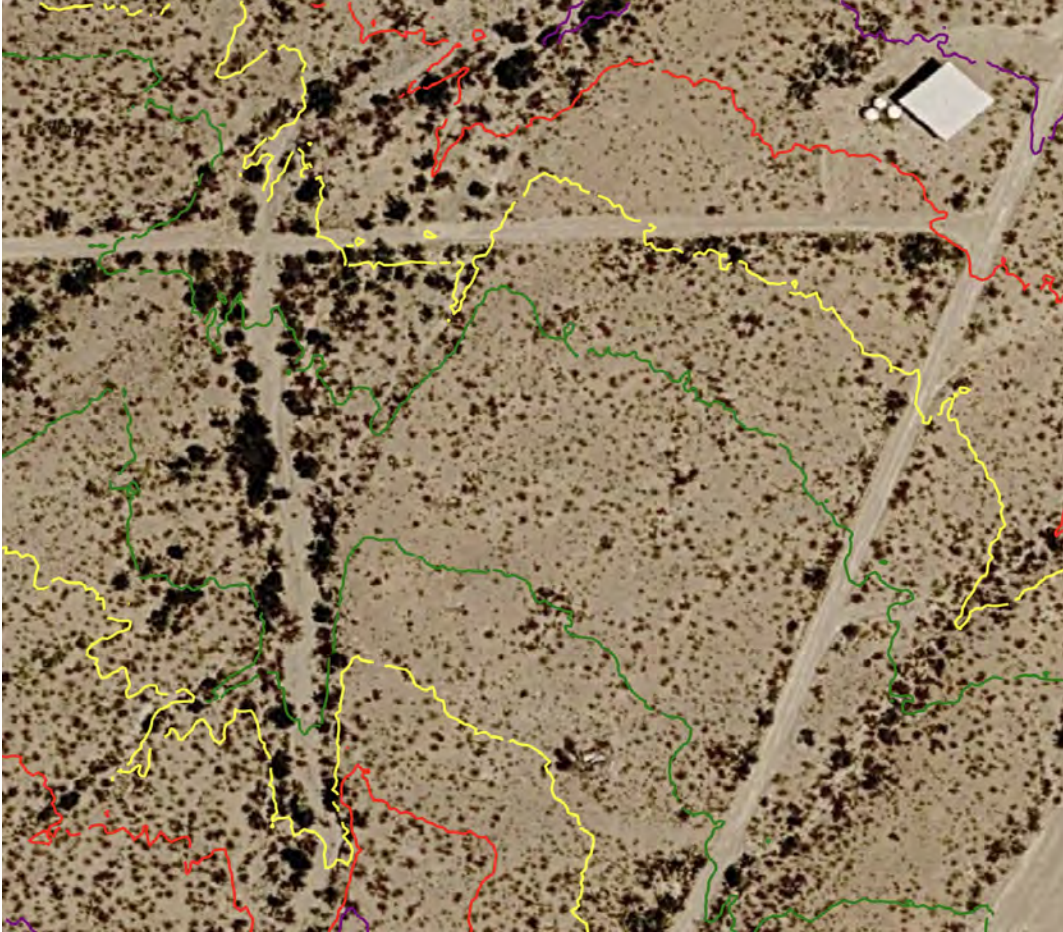


Figure 11: Relative topology contours for a 200 m by 200 m area centered on the proposed “C” area derived from USGS LiDAR point cloud data. Green contours are ± 1 m, yellow are ± 2 m, red are ± 3 m, and purple are ± 4 m relative to the center elevation. The imagery is from Google Maps’ “satellite” layer.

area (see Figure 5), there is a large arroyo that runs on the western side of the property, and it is located near a cabin that sits on the adjacent property. The cabin is lightly used and Jim Spofford reported that the owner had not been seen in the past 3 years. Furthermore, the airport is reported to have very minimal use. No planes were in evidence at any time during the period of the survey.

6 Summary

We have made measurements of powerline and strong RFI at the proposed LWA mini-station sites on the TSUS land in Brewster County, Texas. Based on our measurements of this site, and the existing infrastructure of the site, this site appears to be good candidate for a LWA station. Of the three areas that we investigated during the survey the most promising is area “C”, the 5 acre plot near the Terlingua Ranch Airport.



Figure 12: Picture taken at area “C” facing to the northwest that shows the typical terrain and vegetation at this site. The roof of the cabin on the adjacent property labeled in Figure 4 be seen near the right edge of the image.

Acknowledgement

We thank Jim Spofford and Lindsey Bredemeyer for lending their time and extensive knowledge of the area.

References

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