



**Palo Verde Mesa Solar Project
Palo Verde, California
Obstacle Evaluation Study
September 21, 2010 (Revised February 15, 2011)**

Summary

Capitol Airspace Group conducted a comprehensive airspace and obstacle evaluation for the Palo Verde Mesa Solar Project. The purpose for this study was to identify obstacle clearance surfaces established by the Federal Aviation Administration (FAA) that would limit the height or location of proposed solar towers. At the time of this study, the location of individual solar towers had not been determined. Therefore, this study assessed the height limitations over a 5 square mile “study area” to aid BrightSource Energy in locating optimal tower sites.

14 CFR Part 77 requires that all structures that exceed 200 feet above ground level (AGL) be submitted to the FAA so that an aeronautical study can be conducted. The FAA’s objective in conducting aeronautical studies is to ensure that proposed structures do not have an effect on the safety of air navigation and the efficient utilization of navigable airspace by aircraft. The end result of an aeronautical study is the issuance of a determination of ‘hazard’ or ‘no hazard’ that can be used by the proponent to obtain necessary local construction permits. It should be noted that the FAA has no control over land use in the United States and cannot enforce the findings of its studies.

Based on the findings of this study, Capitol Airspace determined that height limits do exist over the study area, however these limits will not likely restrict the development of a solar tower provided tower heights do not exceed 1,900 feet above mean sea level (AMSL). It should be noted that this study did not consider electromagnetic interference on communications, navigation or surveillance systems.

Methodology

Capitol Airspace studied the proposed solar towers based upon location information provided by BrightSource Energy for the planned study area. Using the latitude and longitude coordinates for the boundaries of the study area, Capitol Airspace generated graphical overlays of the study area to determine proximity to public and military airports, published instrument procedures, military operational areas, en-route airways and military training routes.

Capitol Airspace evaluated all 14 CFR Part 77 imaginary surfaces, published instrument approach and departure procedures, visual flight rules and en-route operations. All formulas, headings, altitudes, bearings and coordinates used during this study were derived from the following documents and data sources:



- 14 CFR Part 77 “Object Affecting Navigable Airspace”
- FAA Order 8260.3B (Change 21) “United States Standard for Terminal Radar Procedures (TERPS)”
- FAA Order 7400.2G “Procedures for Handling Airspace Matters”
- United States Government Flight Information Publication, US Terminal Procedures
- National Airspace System Resource Aeronautical Data

Study Findings

14 CFR Part 77 Imaginary Surfaces

The FAA uses imaginary slopes and level surfaces to determine if a proposed structure is an obstruction to air navigation. Structures that are designated as obstructions are then subject to a full aeronautical study and increased scrutiny. Structures that are not deemed obstructions are, in most cases, automatically issued favorable determinations. Capitol Airspace determined that the study area is located outside of the imaginary surfaces established under 14 CFR Part 77.25. However, planned solar towers that exceed 14 CFR Part 77.23(a)(1) “*A height of 500 feet above ground level at the site of the object*” will be determined to be an obstruction and are subject to greater scrutiny during the aeronautical study process. It should be noted that a penetration of this surface alone will not likely result in a determination of hazard and should not be used as a sole discriminator for tower placement or height.

Departure Procedures

In order to ensure that aircraft departing during marginal weather conditions do not fly into terrain or obstacles, the FAA has established an obstacle clearance surface that extends upward and outward from the end of all runways at public use airports to a distance of 25 nautical miles. Based on the coordinates provided for the study area, Capitol Airspace determined that the closest public use airport is located 8.48 nautical miles north-northeast (Blythe Airport - BLH) of the study area. While the study area does fall within the 25 nautical mile departure area, the obstacle clearance surface height for departures will not be the most limiting surface.



Non-Precision Approaches

Pilots operating during periods of reduced visibility and low cloud ceilings rely on terrestrial and satellite based navigational aids (navaids) in order to navigate from one point to another and to locate runways. The FAA has established published instrument approach procedures that provide horizontal guidance to on-board avionics that aid the pilot in locating the runway. Capitol Airspace determined that there are three public instrument approach procedures in proximity to the study area that support operations into Blythe Airport. These procedures are: 1) the RNAV (GPS) approach to Runway 26, 2) the VOR approach to Runway 26, and 3) the VOR/DME-A approach.

Of these three instrument approach procedures, only the VOR/DME-A approach has an obstacle evaluation area that overlays the study area. The obstacle clearance surface for this approach will be in excess of 2,500 feet AMSL and will not be the most limiting across the study area. Therefore, instrument approach procedures will not limit solar tower development.

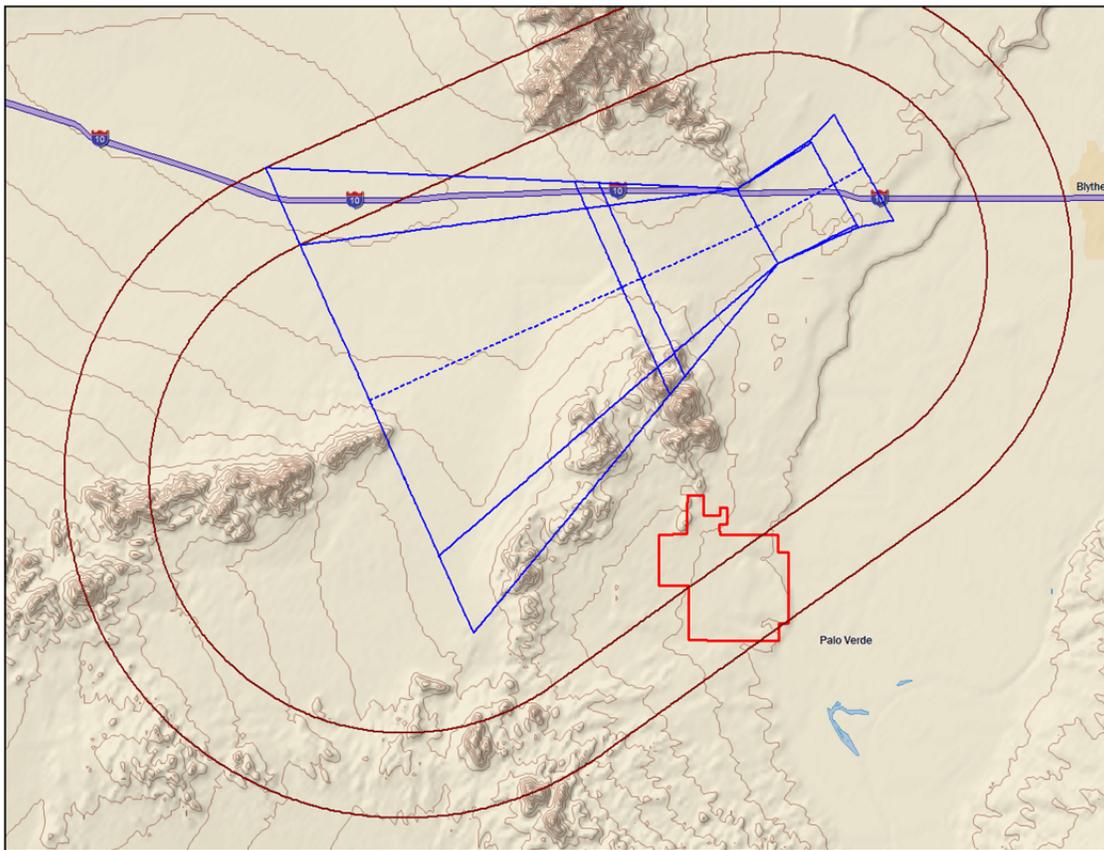


Figure 1: VOR/DME-A Approach to Blythe Airport (BLH) and study area



Visual Flight Rules Operations

In addition to assessing obstacle identification surfaces, Capitol Airspace also considered the impact of the proposed towers on civil Visual Flight Rules (VFR) operations. The FAA has established guidelines for determining impact on VFR operations that include the assessment of VFR routes and VFR traffic patterns at airports. Capitol Airspace found no VFR routes in proximity to the study area. VFR traffic patterns for Blythe Airport (BLH) were also considered. The planned study area is located well outside of the VFR traffic pattern for all approach categories of aircraft and therefore will not be limited by this type of operation.

Long Range Radar

Capitol Airspace utilized the FAA/DOD preliminary screening tool to determine likely electromagnetic interference on long range and NEXRAD radars. According to the Long Range Radar tool, the study area is located in an area designated as ‘Yellow’ (Figure 2). The FAA defines this area as having “likely [impact] on Air Defense and Homeland Security radars”. It should be noted that the preliminary screening tool does not take into consideration tower height nor does it consider the cumulative impact of existing or approved towers in proximity to the area studied. Also, the primary focus of this tool is the assessment of proposed wind turbine development. Since solar towers do not generate Doppler interference like a wind turbine generator, it is unlikely that the FAA or DOD will object to a solar tower based on long range radar interference.

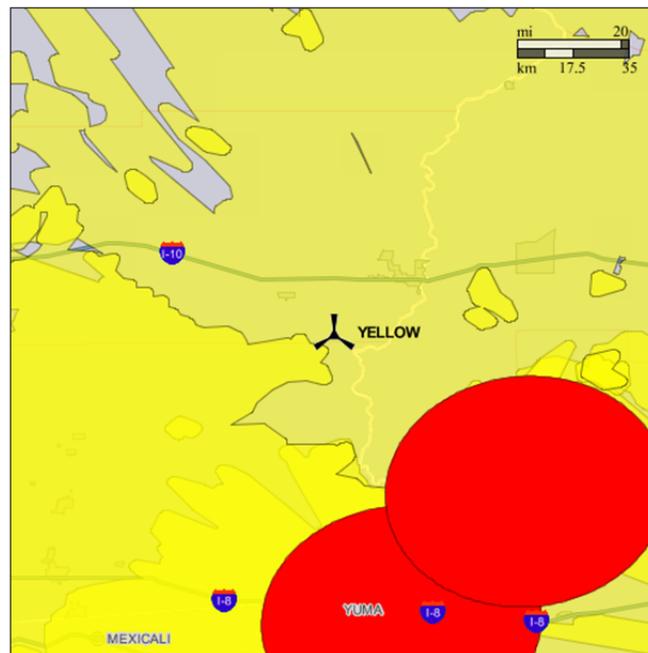


Figure 2: FAA/DOD Long Range Radar preliminary screening tool



En-Route Airways

Capitol Airspace assessed potential height limitations due to en-route airways. These airways provide pilots a means of navigation when flying from airport to airport and are defined by radials between Very High Omni-directional Radio Beacons (VOR). The FAA publishes minimum en-route altitudes for airways to ensure clearance from obstacles and terrain. The FAA requires that each airway have a minimum of 1,000 feet of obstacle clearance in non-mountainous areas and 2,000 feet in designated mountainous areas.

The Palo Verde Mesa study area is located within the obstacle evaluation area for V135 which has a minimum obstacle clearance altitude of 3,900 feet AMSL. Applying 2,000 feet of required obstacle clearance, the maximum developable height based on the limitations from this route is 1,900 feet AMSL. This obstacle clearance surface will be the most limiting across the entire Palo Verde Mesa study area. Considering ground elevations within the study area do not exceed 600 feet AMSL, solar tower development should be feasible throughout the Palo Verde Mesa site.

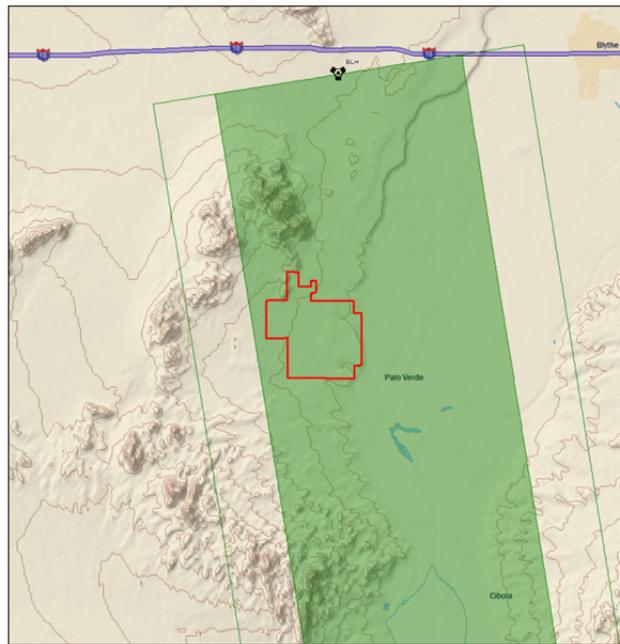


Figure 3: Palo Verde Mesa study area and V135



Military Airspace and Training Routes

Capitol Airspace determined that the study area is located within the lateral boundaries of VR-296, a visual military training route used for terrain following operations originating at March Air Reserve Base, California. This route may be used by military pilots to conduct operations as low as 300 feet above ground level.

Since the FAA does not protect for military training routes it is highly unlikely that a determination of hazard will be issued based on proximity to this route. However, if the planned solar tower development is located on federal land, proximity to these training routes may result in the denial of permits by the Bureau of Land Management.

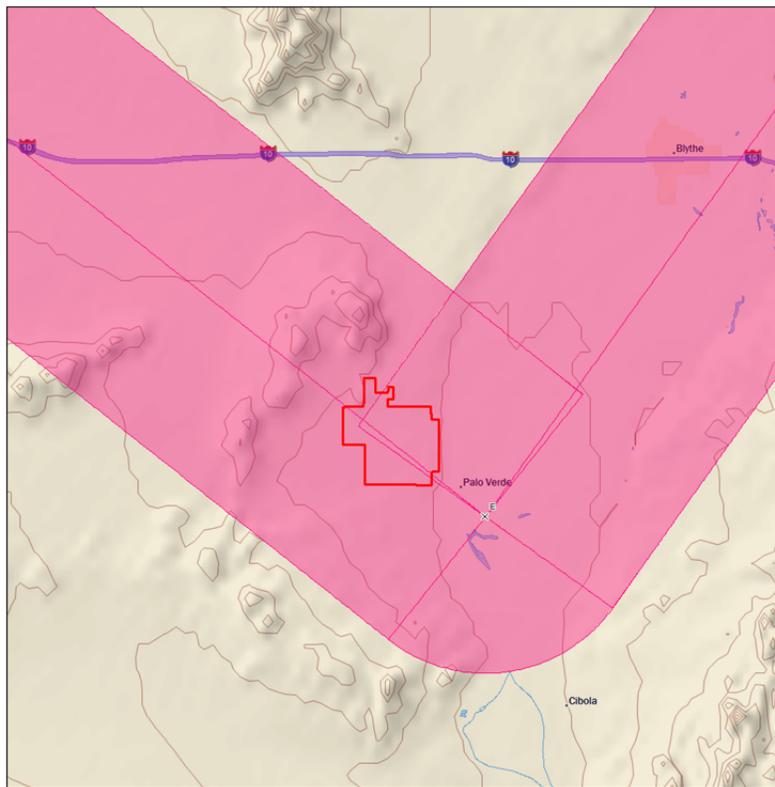


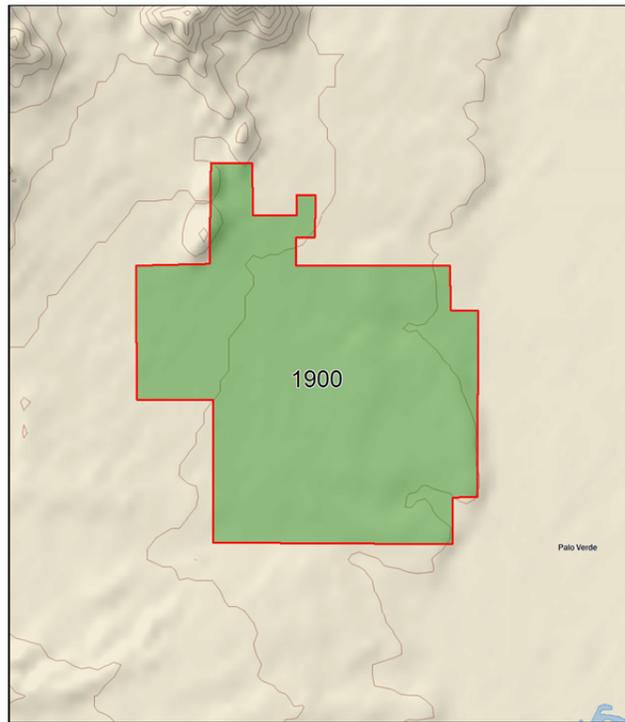
Figure 4: Proximity of Palo Verde Mesa Study area to VR-296



Conclusion

The results of this study show that tower development below 1,900 feet AMSL within the study area would not likely result in a hazard determination assuming the FAA finds no substantial electromagnetic interference with communications, navigation or surveillance systems. Given the proximity of the study area to the military training route, the DOD may opt to object to a planned tower in this area. However, the FAA will not likely issue a hazard determination based on DOD objections.

Over the past year, the DOD has been objecting to renewable energy projects via the environmental review and local permitting processes. For planned structures located on land owned by the Bureau of Land Management, objections by the DOD can result in a denial of the issuance of a *notice to proceed*. It is therefore recommended that BrightSource Energy enter into discussions with the FAA and DOD as early as possible in the development process to identify and overcome unforeseeable objections from the military.



*Figure 5: Palo Verde Mesa
height constraint map*

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