Summary

Capitol Airspace conducted an airspace and obstacle evaluation screening for the Large Events Center/UNLV Stadium project alternate site in Las Vegas, Nevada. 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 structures within the defined study area. This study assessed the height limitations over an approximately 50 acre study area.

14 CFR Part 77 requires that all structures that exceed 14 CFR Part 77.9 criteria 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.

The results of this study indicate that Las Vegas/McCarran International (LAS) instrument approach and departure procedure obstacle clearance surfaces will limit structure heights within the study area. These height constraints range from 2,113 feet to 2,655 feet above mean sea level (AMSL) (Figure 7a). Proposed structures that penetrate these surfaces would necessitate an increase to departure procedure minimum climb gradients or instrument approach minimums. If the FAA determines an impact to constitute a substantial adverse effect it could be used as the basis for the issuance of determinations of hazard. Development will be restricted within Runway Protection Zones (RPZs) in the southeast corner of the study area.

It should be noted that Capitol Airspace applies FAA defined rules and regulations applicable to obstacle evaluation, instrument procedures assessment and visual flight rules (VFR) operations to the best of its ability and with the intent to provide the most accurate representation of limiting airspace surfaces as possible. Capitol Airspace maintains datasets obtained from the FAA which are updated on a 56 day cycle. The results of this analysis/map are based on the most recent data available as of the date of this report. Limiting airspace surfaces depicted in this report are subject to change due to FAA rule changes and regular procedure amendments. Therefore, it is of the utmost importance to obtain FAA determinations of no hazard prior to making substantial financial investments in this project.
Methodology

Capitol Airspace studied the proposed development area based upon location information provided by the University of Nevada, Las Vegas. Using this information, Capitol Airspace generated graphical overlays to determine proximity to public and military airports, published instrument procedures, military operational areas, enroute airways, civil minimum vectoring altitude charts and military training routes.

Capitol Airspace evaluated all 14 CFR Part 77 imaginary surfaces, published instrument approach and departure procedures, visual flight rules, civil minimum vectoring altitudes and enroute 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 “Safe, Efficient Use, and Preservation of the Navigable Airspace”
- FAA Order 8260.3B “United States Standard for Terminal Instrument Procedures”
- FAA Order 7400.2J “Procedures for Handling Airspace Matters”
- National Airspace System Resource Aeronautical Data

![Figure 1: Las Vegas/McCarran International (LAS) and UNLV study area (red)](image-url)
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.

The study area is located inside the lateral boundaries of the Las Vegas/McCarran International (LAS) 14 CFR Part 77.17(a)(2) and 77.19 approach, transition, and horizontal imaginary surfaces. The imaginary surface heights overlying the study area range from 2,113 feet AMSL to 2,331 feet AMSL (Figure 2).

Structures that exceed these surfaces will be identified as obstructions. However, this does not automatically determine them to be hazards to air navigation. The FAA must determine the proposed structures to have a significant adverse effect on aviation operations to warrant the issuance of determinations of hazard.

![Figure 2: Las Vegas/McCarran International (LAS) 14 CFR Part 77.19 imaginary surface heights overlying study area](image)
**Visual Flight Rules Traffic Patterns**

VFR traffic patterns are used by pilots operating during visual meteorological conditions. The size and dimensions of these patterns are based upon the category of aircraft which, in turn, is based upon the approach speed of the aircraft. The obstacle clearance surface for these traffic patterns is tied directly to the height of imaginary surfaces defined under 14 CFR Part 77.

The study area is located within Las Vegas/McCarran International (LAS) VFR traffic pattern airspace. However, given the air carrier nature of operations at the airport it is unlikely the FAA will protect for VFR traffic patterns. Therefore, VFR traffic patterns should not limit development within the study area.

**Runway Protection Zones**

The FAA has established Runway Protection Zones (RPZs) to designate areas located along the extended runway centerline where the protection of people and property on the ground is enhanced. In order to ensure enhanced safety the FAA recommends airport control of this area to guarantee the RPZ remain clear of incompatible objects and activities. The size of RPZs is directly related to the aircraft approach categories the runway is expected to serve and the visibility minimums associated with instrument approach procedures.

The southeast corner of the study area is located within the lateral boundaries of the RPZ (Figure 3) associated with Runway 01L/19R at Las Vegas/McCarran International (LAS). The airport will likely oppose any development within the lateral boundaries of RPZs.
Departure Procedures
In order to ensure that aircraft departing during marginal weather conditions do not fly into terrain or obstacles the FAA has established departure procedures to provide obstacle clearance to pilots as they transition between the terminal and enroute environments. These procedures authorize diverse departures or contain specific routing and minimum climb gradients to ensure clearance from terrain and obstacles.

The study area is located within the lateral boundaries of multiple Las Vegas/McCarran International (LAS) instrument departure procedures. The most limiting obstacle clearance surface across the eastern portion of the study area is associated with the Runway 01L obstacle departure procedure initial climb area (Figure 4). This surface has heights ranging from 2,142 feet AMSL to 2,201 feet AMSL across the study area.

At a minimum, proposed structures that exceed this surface would require a note on the obstacle departure procedure. Structures that exceed these surfaces and require a nonstandard minimum climb gradient (greater than 200 feet per nautical mile) to a height 200 feet above the departure end of the runway or greater could not simply be notated. These structures would necessitate an increase to the minimum climb gradient; this impact could be used as the basis for the issuance of determinations of hazard. Mitigation options include the application of a 35 foot adjustment allowed by Airport Obstructions Standards Committee (AOSC) Decision Document #02b. This adjustment would increase the obstacle clearance surface 35 feet at its origin and therefore increase the heights along the eastern edge of Figures 7a/b by 35 feet.
One Engine Inoperative (OEI) Obstacle Identification Surface (OIS)
The FAA requires that airlines develop one engine inoperative (OEI) procedures that allow for the clearance of all terrain and obstacles by 300 feet horizontally or 35 feet vertically should an aircraft lose an engine during departure. Aircraft performance calculations based on the loss of one engine ensure that aircraft meet these clearance requirements. The introduction of new obstacles to existing OEI procedures can impact aircraft loading by decreasing the number of passengers or amount of fuel and cargo an aircraft can carry. While this impact is not currently considered by the FAA during aeronautical study it will likely result in airline objections. Further, the FAA is working to develop an OEI policy that may consider impact on OEI procedures during aeronautical study of proposed structures.

OEI procedures vary by airline, aircraft type, and runway end and are proprietary airline information. Since these procedures are not available to the public, Capitol Airspace applied the OEI obstacle accountability areas (OAA) defined in FAA Advisory Circular 120-91 “Airport Obstacle Analysis” to determine the likelihood of proposed structures impacting Las Vegas/McCarran International (LAS) OEI operations.

The far southeastern corner of the study area is located inside the straight-out OEI obstacle accountability area for Runway 01L (Figure 5), although existing obstacles within the Runway 01L track may shield structures within the study area and mitigate any impact. However, if a proposed structure becomes the controlling obstacle for Runway 01L OEI procedures it could impact aircraft loading. It is likely that this impact would result in objections to proposed structures from airlines operating at Las Vegas/McCarran International (LAS).
Figure 5: Las Vegas/McCarran International (LAS) Runway 01L/R OEI obstacle accountability areas (OAA) and existing obstacles
**Instrument 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 assessed a total of eight instrument approach procedures at one airport in proximity to the study area.

The study area is located within the lateral boundaries of multiple instrument approach procedures at Las Vegas/McCarran International (LAS). The most limiting surface overlying the study area is associated with the missed approach segment of the ILS Approach to Runway 01L (**Figure 6**) into Las Vegas/McCarran International (LAS). The associated obstacle clearance surface ranges from 2,611 feet AMSL to 2,655 feet AMSL across the study area and is the most limiting surface over the majority of the study area.

Proposed structures that exceed these surfaces would have an impact on Las Vegas/McCarran International (LAS) decision altitudes and minimum descent altitudes. These altitudes are the lowest an aircraft can descend during an instrument approach until visually acquiring the runway. Due to the critical nature of these altitudes it is likely that the FAA would issue determinations of hazard to any structure necessitating an increase to decision altitudes or minimum descent altitudes.

**Instrument Approach procedures assessed:**

**Las Vegas/McCarran International (LAS)**
- ILS or Localizer Approach to Runway 25L
- ILS or Localizer Approach to Runway 25R
- ILS or Localizer/DME Approach to Runway 01L
- RNAV (GPS) Approach to Runway 01R
- RNAV (GPS) Approach to Runway 19L
- RNAV (GPS) Approach to Runway 19R
- VOR Approach to Runway 25L/R
- VOR/DME-A Circling Approach
Figure 6: Las Vegas/McCarran International (LAS) ILS Approach to Runway 01L
final (red) and missed approach (black) segments
**Minimum Vectoring Altitudes**
The FAA has created minimum vectoring altitude (MVA) charts that define sectors with the lowest altitudes at which air traffic controllers can issue radar vectors to an aircraft. The FAA requires that sectors have a minimum of 1,000 feet of obstacle clearance in non-mountainous areas and normally 2,000 feet in mountainous areas.

Minimum vectoring altitude obstacle clearance surfaces are in excess of other more limiting surfaces. Therefore, minimum vectoring altitudes will not result in the most limiting height constraint overlying the study area.

**Enroute Airways**
Capitol Airspace assessed potential height limitations due to the obstacle clearance requirements for 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 Frequency 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 mountainous areas.

Enroute airway obstacle clearance surfaces are in excess of other more limiting surfaces. Therefore, enroute airways will not result in the most limiting height constraint overlying the study area.

**Military Airspace and Training Routes**
Since the FAA does not protect for military training routes, proximity to a training route will not likely result in a determination of hazard. However, proximity to training routes will be considered by the Bureau of Land Management. If the planned development area is located on federal land, proximity to these routes may be an issue.

The study area is located outside the lateral boundaries of military airspace and training routes.
Conclusion

Proposed structures that exceed 14 CFR Part 77 obstacle identification surface heights will be identified as obstructions and issued Notices of Presumed Hazard. These imaginary surface heights range from 2,113 to 2,331 feet AMSL across the study area. However, exceeding a 14 CFR Part 77 imaginary surface does not automatically result in a determination of hazard. Structure heights that exceed 14 CFR Part 77 obstacle identification surface heights are feasible as long as they do not penetrate FAA obstacle clearance surfaces. Obstacle clearance surface heights overlying the study area range from 2,113 to 2,655 feet AMSL (Figure 7a).

The Las Vegas/McCarran International (LAS) Runway 01L obstacle departure procedure initial climb area will limit structure heights across the eastern quarter of the study area. Structures exceeding this surface would necessitate either the addition of a note to obstacle departure procedure publications or an increase to the minimum climb gradient. The FAA could use impact on the minimum climb gradient as the basis for determinations of hazard.

Structure heights will be limited across the remainder of the study area by the missed approach segment of the ILS Approach to Runway 01L into Las Vegas/McCarran International (LAS). Structures that exceed these height constraints would have an impact on Las Vegas/McCarran International (LAS) instrument approach procedure decision altitudes and minimum descent altitudes. It is likely that the FAA would determine this impact to constitute a substantial adverse effect, which could be used as the basis for determinations of hazard.

Proposed development within the Las Vegas/McCarran International (LAS) Runway 01L/19R Runway Protection Zones (RPZ) will not be feasible. The airport will likely object to proposed structures in these areas to ensure compliance with FAA standards defined in FAA Advisory Circular 150/5300-13.

Additionally, it is likely that structures proposed within the far southeast corner of the study area will be located within Las Vegas/McCarran International (LAS) Runway 01L one engine inoperative (OEI) tracks. If proposed structures have an impact on aircraft loading they will likely result in airline objections during the FAA aeronautical study process.

The AGL Clearance Map (Figure 7b) is based on USGS National Elevation Dataset (NED) 1/3 Arc Second data. The vertical accuracy of this dataset is generally +/- 7 meters. Therefore, the AGL clearance map should only be used for general planning purposes and not exact structure siting. In order to avoid the likelihood of a determination of hazard, structure heights must adhere to the height constraints depicted in the composite map (Figure 7a).

If you have any questions regarding the findings in this study, please contact Rick Coles or Lee Smith at (703) 256-2485 or via email at rick.coles@capitolairspace.com or lee.smith@capitolairspace.com.
The USGS 1/3 Arc Second Digital Elevation Model used to create this map has a vertical accuracy of +/- 7 meters. Therefore this map should only be used for general planning purposes and not exact structure siting.