Project Condor

Wilson Meany

Inglewood, California

Obstruction Evaluation & Airspace Analysis

September 13, 2017

Capitol Airspace Group

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Summary

Capitol Airspace conducted an obstruction evaluation and airspace analysis for Project Condor in Inglewood, California. The purpose for this analysis was to identify obstacle clearance surfaces established by the Federal Aviation Administration (FAA) that could limit 150 foot above ground level (AGL) buildings and 300 foot AGL temporary construction equipment at the proposed location (*Figure 1*).

14 CFR Part 77.9 requires that all structures exceeding 200 feet 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.

Height constraints overlying Project Condor range from 290 to 424 feet above mean sea level (AMSL) and are associated with Los Angeles International Airport (LAX) instrument departure and approach procedures. Proposed structures that exceed these surfaces would require an increase to instrument departure procedure climb gradients and/or instrument approach procedure minimum descent altitudes.

At 150 feet AGL, USGS elevation data indicates that these surfaces should not limit the proposed buildings within the defined study area. However, USGS elevation data indicates that temporary construction equipment, as high as 300 feet AGL, would exceed these surfaces. Unless mitigation options are identified and approved by the FAA, impact on these altitudes could be used as the basis for determinations of hazard.

Lastly, the FAA is in the process of designing and modifying multiple instrument procedures for Los Angeles International Airport. At the time of this report, associated design documentation was not publicly available. Although unlikely, it is possible that the associated obstacle clearance surfaces are lower than those described in this report.

Methodology

Capitol Airspace studied the proposed project based upon location and elevation information provided by Wilson Meany. Using this information, Capitol Airspace generated graphical overlays to determine proximity to airports (*Figure 1*), published instrument procedures, FAA minimum vectoring altitude and minimum instrument flight rules (IFR) altitude charts, enroute airways, and military airspace and training routes.

Capitol Airspace evaluated all 14 CFR Part 77 imaginary surfaces, published instrument approach and departure procedures, visual flight rules operations, FAA minimum vectoring altitudes, minimum IFR 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 7400.2L Procedures for Handling Airspace Matters
- FAA Order 8260.3C United States Standard for Terminal Instrument Approach Procedures
- FAA Order 8260.58A United States Standard for Performance Based Navigational (PBN) Instrument Procedure Design
- United States Government Flight Information Publication, US Terminal Procedures
- National Airspace System Resource Aeronautical Data

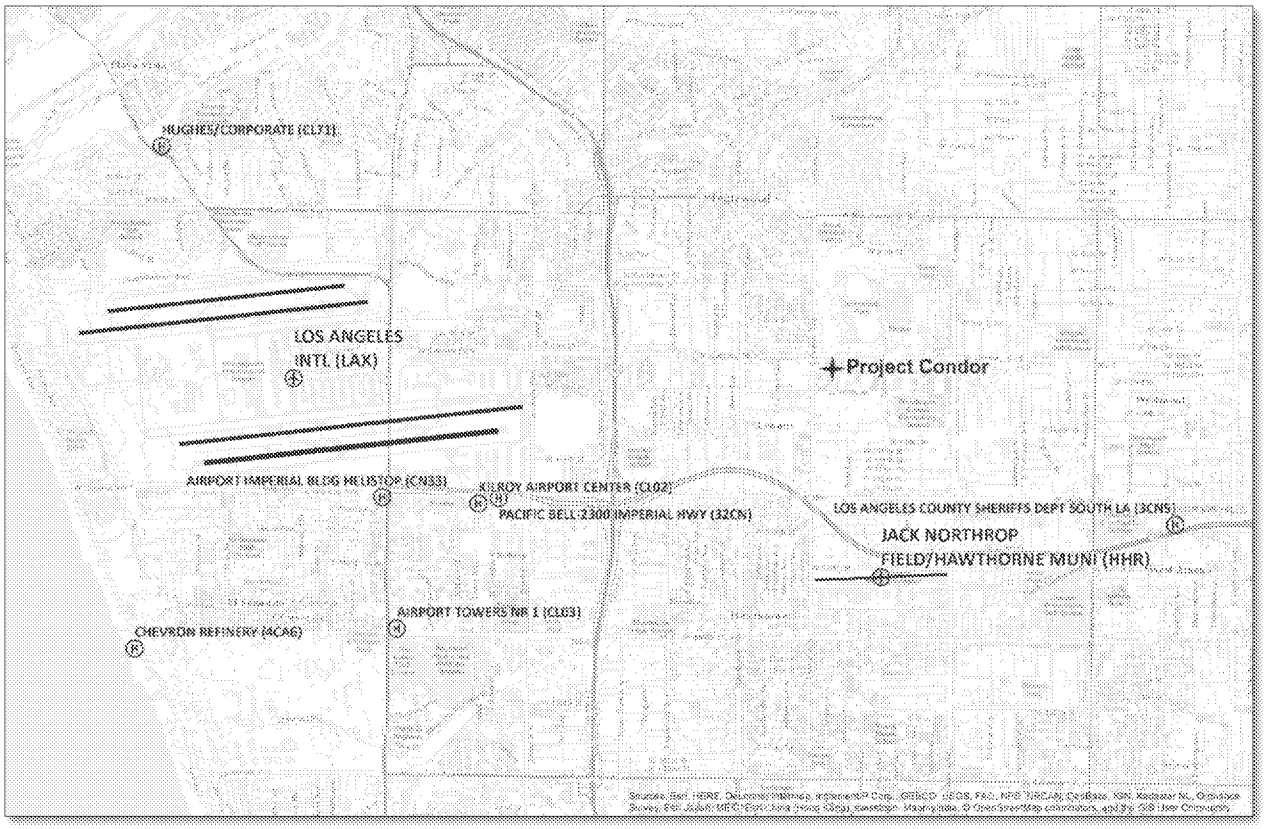

Figure 1: Public-use (blue) and private-use (red) airports and heliports in proximity to Project Condor

Study Findings

14 CFR Part 77.9 Notification Criteria

The FAA requires notification of proposed structures that exceed 200 feet AGL, or that exceed imaginary surfaces associated with runways at public-use or military-use airports, or any airport with an FAA-approved instrument approach procedure. The size and slope of the imaginary notification surfaces for an airport are directly related to the length of the longest runway at that airport. Proposed structures that exceed notification criteria must undergo aeronautical study to ensure that they would not have an adverse effect on the safety and efficiency of air navigation.

The Jack Northrop Field/Hawthorne Municipal Airport (Hawthorne Airport) §77.9(b)(1) notification surface is the lowest overlying Project Condor (*Figure 2*). The height of the notification surface ranges from 137 to 148 feet AMSL where it overlies the study area. At both 150 and 300 feet AGL, proposed structures will exceed this surface and would require notification to the FAA.

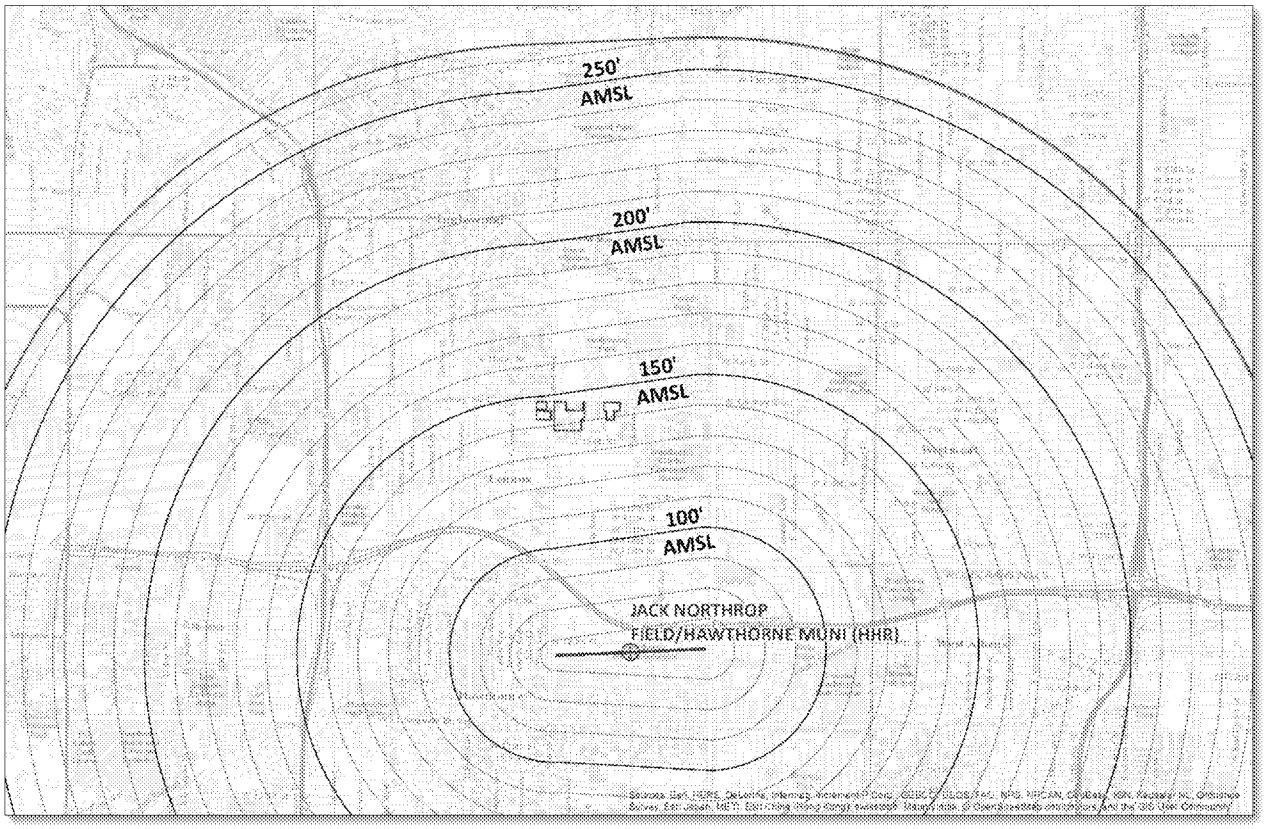

Figure 2: Jack Northrop Field/Hawthorne Municipal 14 CFR Part 77.9 FAA notification surfaces

14 CFR Part 77 Imaginary Surfaces

The FAA uses level and sloping imaginary surfaces to determine if a proposed structure is an obstruction to air navigation. Structures that are identified as obstructions are then subject to a full aeronautical study and increased scrutiny. However, exceeding a Part 77 imaginary surface does not automatically result in the issuance of a determination of hazard. Proposed structures must have airspace impacts that constitute a substantial adverse effect in order to warrant the issuance of determinations of hazard.

14 CFR Part 77 imaginary surfaces (e.g., *Figure 3*) overlying Project Condor:

Los Angeles International Airport (LAX)
77.17(a)(2): 338 to 384 feet AMSL
77.19: 289 to 370 feet AMSL

Compton/Woodley Airport (CPM)
77.17(a)(2): 565 to 597 feet AMSL

Jack Northrop Field/Hawthorne Municipal Airport (HHR)
77.17(a)(2): 285 to 309 feet AMSL
77.19: 216 to 370 feet AMSL

At 150 feet AGL, the proposed building will exceed Hawthorne Municipal Airport 14 CFR Part 77.19 imaginary surfaces and will be identified as an obstruction *(Figure 3)*. At 300 feet AGL, the temporary construction equipment will also exceed Los Angeles International Airport and Hawthorne Municipal Airport Part 77.17(a)(2) and 77.19 imaginary surfaces. Proposed structures that exceed these surfaces will be identified as obstructions and may require marking and lighting in accordance with FAA Advisory Circular 70/7460-1L.

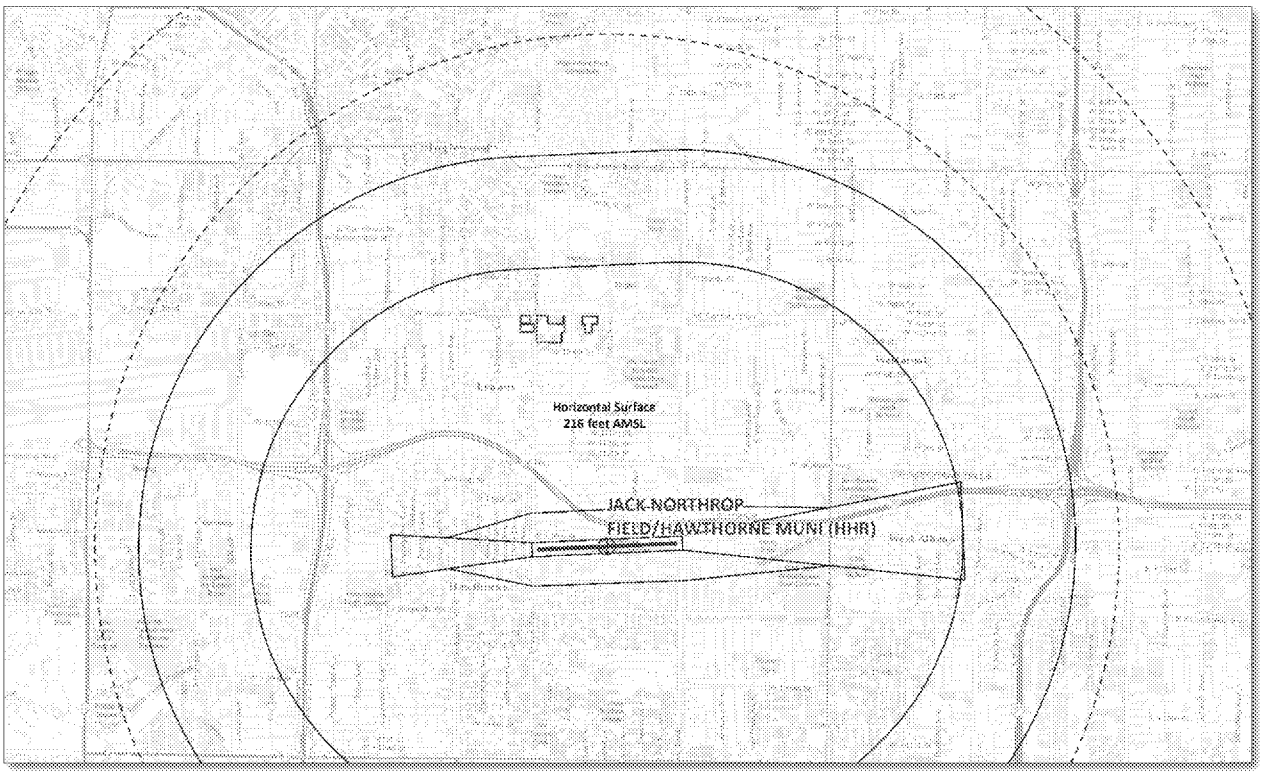

Figure 3: Jack Northrop Field/Hawthorne Municipal Airport 14 CFR Part 77.17(a)(2) (dashed blue) and 77.19 (black) imaginary surfaces

Visual Flight Rules (VFR) Traffic Pattern Airspace

VFR traffic pattern airspace is used by pilots operating during visual meteorological conditions. The airspace dimensions are based upon the category of aircraft which, in turn, is based upon the approach speed of the aircraft. 14 CFR Part 77.17(a)(2) and 77.19 (as applied to a *visual* runway) imaginary surfaces establish the obstacle clearance surface heights within VFR traffic pattern airspace.

Los Angeles International Airport (LAX)

Considering the air carrier nature of operations at Los Angeles International Airport, it is unlikely that the FAA will protect for VFR traffic pattern airspace. Therefore, Los Angeles Airport VFR traffic pattern airspace should not limit 150 or 300 foot AGL structures within the defined study area.

Jack Northrop Field/Hawthorne Municipal Airport (HHR)

Hawthorne Airport VFR traffic pattern operations are restricted to the south of Runway 07/25 (*Figure 4*). Therefore, Hawthorne Municipal Airport VFR traffic pattern airspace should not limit 150 or 300 foot AGL structures within the defined study area.

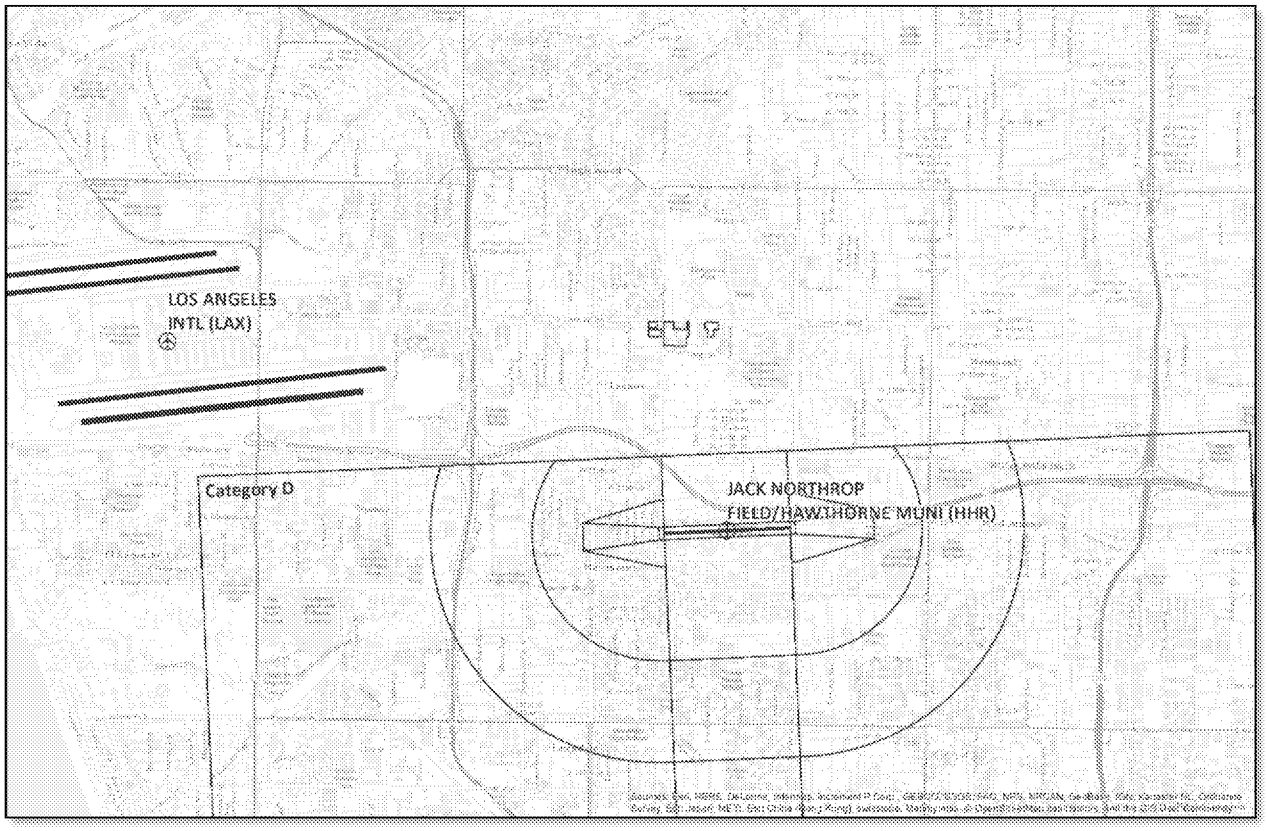

Figure 4: Jack Northrop Field/Hawthorne Municipal Airport VFR traffic pattern airspace in proximity to Project Condor (red)

Visual Glide Slope Indicators

Visual Glide Slope Indicators (VGSI) provide a visual aid to aircraft approaching to land. Different light combinations indicate an approaching aircraft's position relative to the published visual glide path angle. Proposed obstacles that exceed VGSI obstacle clearance surfaces would require an increase to the published visual glidepath angle and/or threshold crossing height. If the FAA determines this impact to constitute a substantial adverse effect it could be used as the basis for determinations of hazard.

Proposed structures that exceed the 10° obstacle clearance surface (blue, *Figure 5*) would require an increase to the visual glidepath angle and/or threshold crossing height. However, in most cases the only resolution is to remove the VGSI from service, which would likely result in the issuance of determinations of hazard. Proposed structures outside of the 10° splay that only exceed the 15° splay (purple, *Figure 5*) may still be approved. However, a Flight Inspection is required to identify the lateral limits of the PAPI visible light beam to determine if "baffling" is necessary. The costs associated with the Flight Inspection and potential subsequent baffling would be the responsibility of Project Condor.

VGSI obstacle clearance surfaces (e.g., *Figure 5*) are in excess of other lower surfaces and should not limit 150 or 300 foot AGL structures within the defined study area.

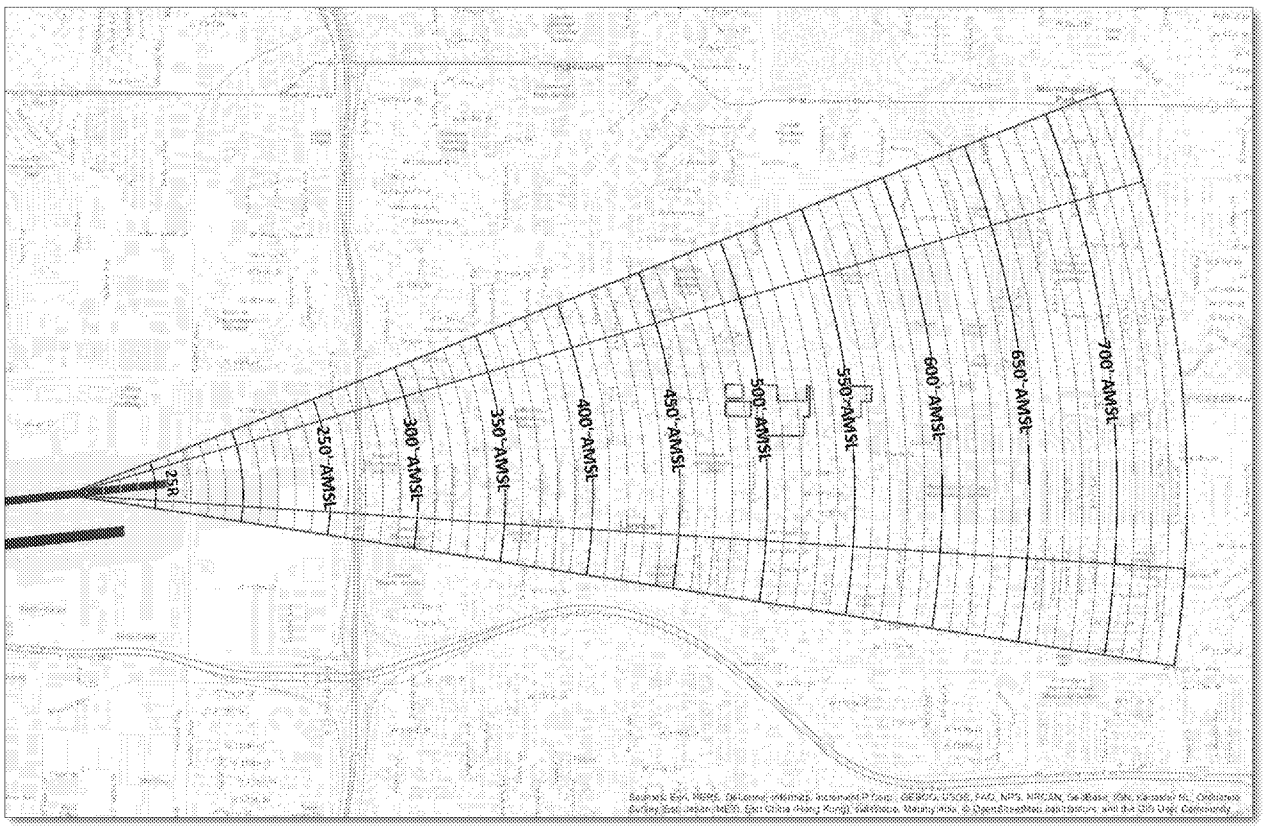

Figure 5: Los Angeles International Airport (LAX) Runway 25R PAPI

Instrument Departure Procedures and Diverse Vector Areas

In order to ensure that aircraft departing during marginal weather conditions do not fly into terrain or obstacles, the FAA publishes instrument departure procedures that provide obstacle clearance to pilots as they transition between the terminal and enroute environments. These procedures contain specific routing and minimum climb gradients to ensure clearance from terrain and obstacles. Similarly, diverse vector areas (DVA) allow air traffic controllers to vector departing aircraft below the minimum vectoring altitude (MVA) while also ensuring that the aircraft does not fly into terrain or obstacles.

Proposed structures that exceed instrument departure procedure obstacle clearance surfaces would require an increase to instrument departure procedure and/or DVA minimum climb gradients. If the FAA determines that this impact would constitute a substantial adverse effect, it could be used as the basis for determinations of hazard.

Los Angeles International Airport (LAX)

Obstacle Departure Procedure (ODP) (e.g., *Figure 6*)
Runway 07L obstacle clearance surfaces are the lowest overlying Project Condor and range from 355 to 424 feet AMSL. These are one of the lowest height constraints in the eastern section of the study area.

Diverse Vector Area (DVA) (e.g., *Figure 7*)
Runway 07L obstacle clearance surfaces are the lowest overlying Project Condor and range from 355 to 424 feet AMSL. These are one of the lowest height constraints in the eastern section of the study area.

At 150 feet AGL, USGS elevation data indicates that these surfaces should not limit proposed buildings within the defined study area. Depending on placement, USGS elevation data indicates that 300 foot AGL temporary construction equipment would exceed these surfaces and would require a temporary increase to Runway 07L and 07R instrument departure procedure and/or DVA minimum climb gradients.

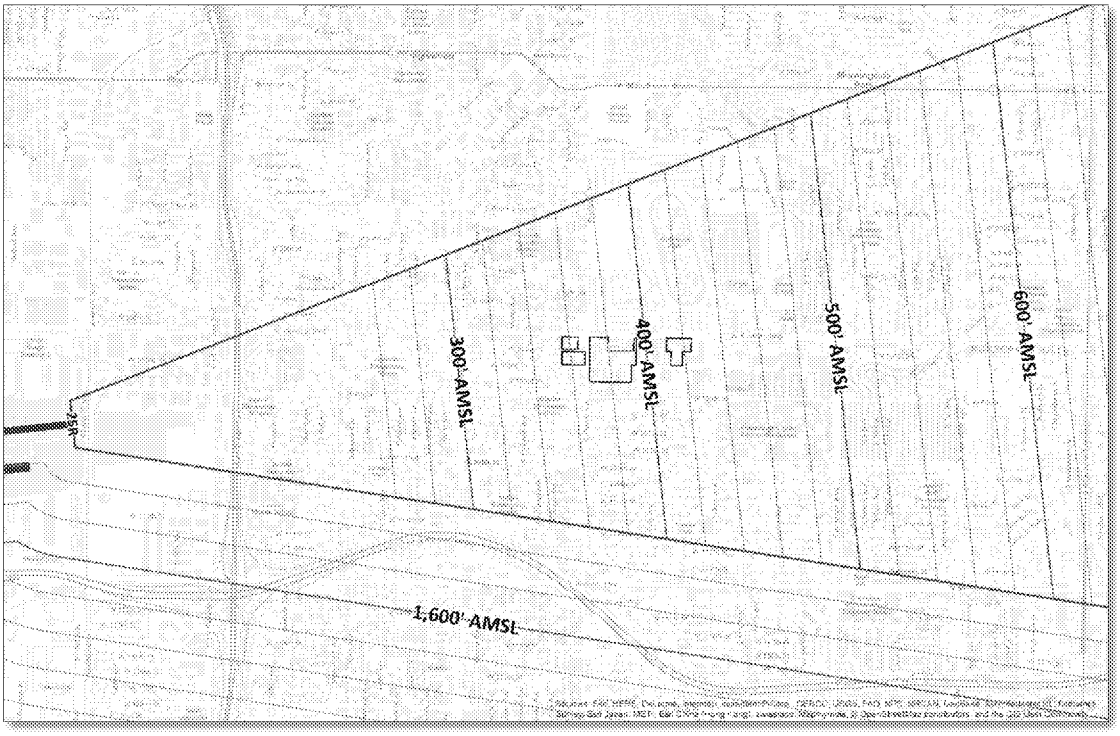

Figure 6: Los Angeles International Airport (LAX) Runway 07L obstacle departure procedure

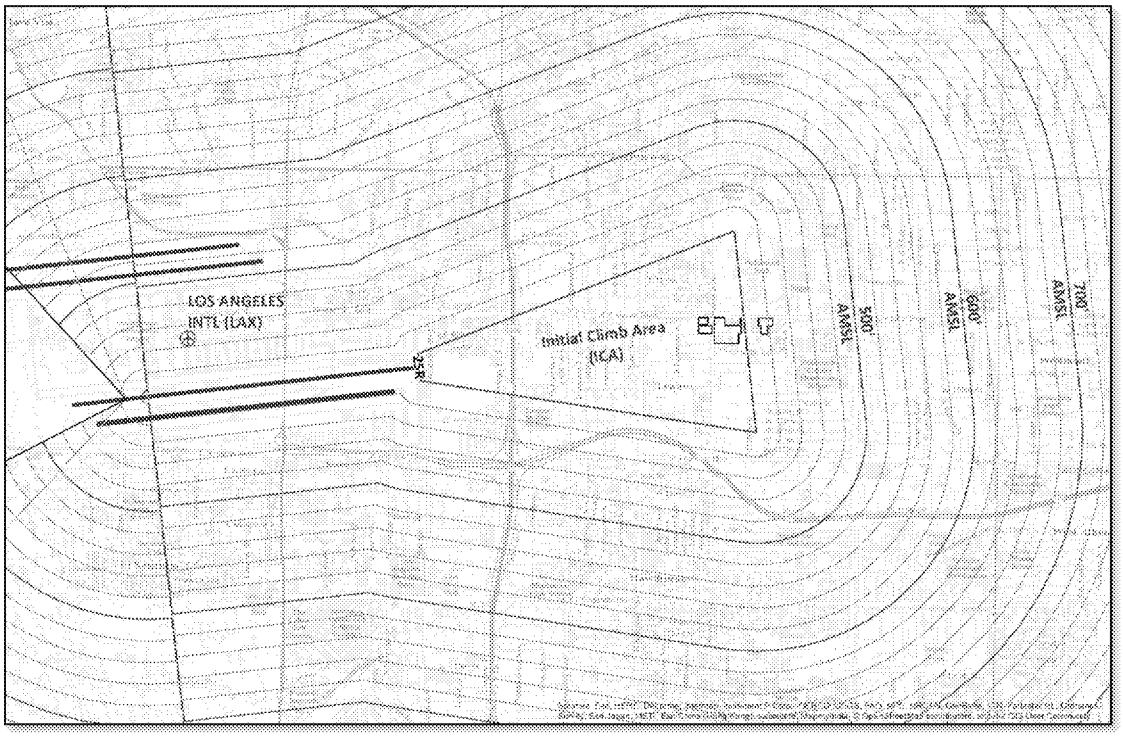

Figure 7: Los Angeles International Airport (LAX) Runway 07L diverse vector area (DVA) assessment

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 publishes instrument approach procedures that provide course guidance to on-board avionics that aid the pilot in locating the runway. Capitol Airspace assessed a total of 29 published instrument approach procedures at two public-use airports in proximity to Project Condor.

Proposed structures that exceed instrument approach procedure obstacle clearance surfaces would require an increase to instrument approach procedure minimum altitudes. Increases to these altitudes, especially critical *decision altitudes (DA)* and *minimum descent altitudes (MDA)*, can directly impact the efficiency of an instrument approach procedures. If the FAA determines this impact to affect a significant volume of operations it could be used as the basis for determinations of hazard.

Instrument procedures assessed:

Los Angeles International (LAX)
ILS or Localizer Approach to Runway 06L
ILS or Localizer Approach to Runway 06R
ILS or Localizer Approach to Runway 07L
ILS or Localizer Approach to Runway 07R
ILS or Localizer Approach to Runway 24L
ILS or Localizer Approach to Runway 24R
ILS or Localizer Approach to Runway 25L
ILS or Localizer Approach to Runway 25R
ILS Approach to Runway 24R (CAT II & III)
ILS Approach to Runway 25L (CAT II & III)
RNAV (RNP) Z Approach to Runway 06L
RNAV (RNP) Z Approach to Runway 06R
RNAV (RNP) Z Approach to Runway 07L
RNAV (RNP) Z Approach to Runway 07R
RNAV (RNP) Z Approach to Runway 24L
RNAV (RNP) Z Approach to Runway 24R
RNAV (RNP) Z Approach to Runway 25L
RNAV (RNP) Z Approach to Runway 25R
RNAV (GPS) Y Approach to Runway 06L
RNAV (GPS) Y Approach to Runway 06R
RNAV (GPS) Y Approach to Runway 07L
RNAV (GPS) Y Approach to Runway 07R
RNAV (GPS) Y Approach to Runway 24L
RNAV (GPS) Y Approach to Runway 24R
RNAV (GPS) Y Approach to Runway 25L
RNAV (GPS) Y Approach to Runway 25R

Jack Northrop Field/Hawthorne Municipal (HHR)
RNAV (GPS) Approach to Runway 25
Localizer Approach to Runway 25
VOR Approach to Runway 25

Los Angeles International Airport (LAX)

ILS or Localizer Approach to Runway 25L (*Figure 8*)

The *LADLE* to Runway 25L final stepdown segment MDA is 540 feet AMSL; the associated obstacle clearance surfaces (including Paragraph 2-9-10 *obstacle identification surface [OIS]*) range from 290 to 450 feet AMSL and are the lowest height constraints in the western half of the study area.

RNAV (GPS) Y Approach to Runway 25L

The *LADLE* to Runway 25L final stepdown segment MDA is 640 feet AMSL; the associated obstacle clearance surfaces (including Paragraph 2-9-10 *[OIS]*) range from 390 to 450 feet AMSL and is in excess of other lower surfaces.

RNAV (GPS) Y Approach to Runway 25R

The *GRIMY* to Runway 25L final stepdown segment MDA is 640 feet AMSL; the associated obstacle clearance surfaces (including Paragraph 2-9-10 *[OIS]*) range from 390 to 450 feet AMSL and is in excess of other lower surfaces.

At 150 feet AGL, USGS elevation data indicates that these surfaces should not limit proposed buildings within the defined study area. Depending on placement, USGS elevation data indicates that 300 foot AGL temporary construction equipment would exceed these surfaces and would require a temporary increase to instrument approach procedure MDAs.

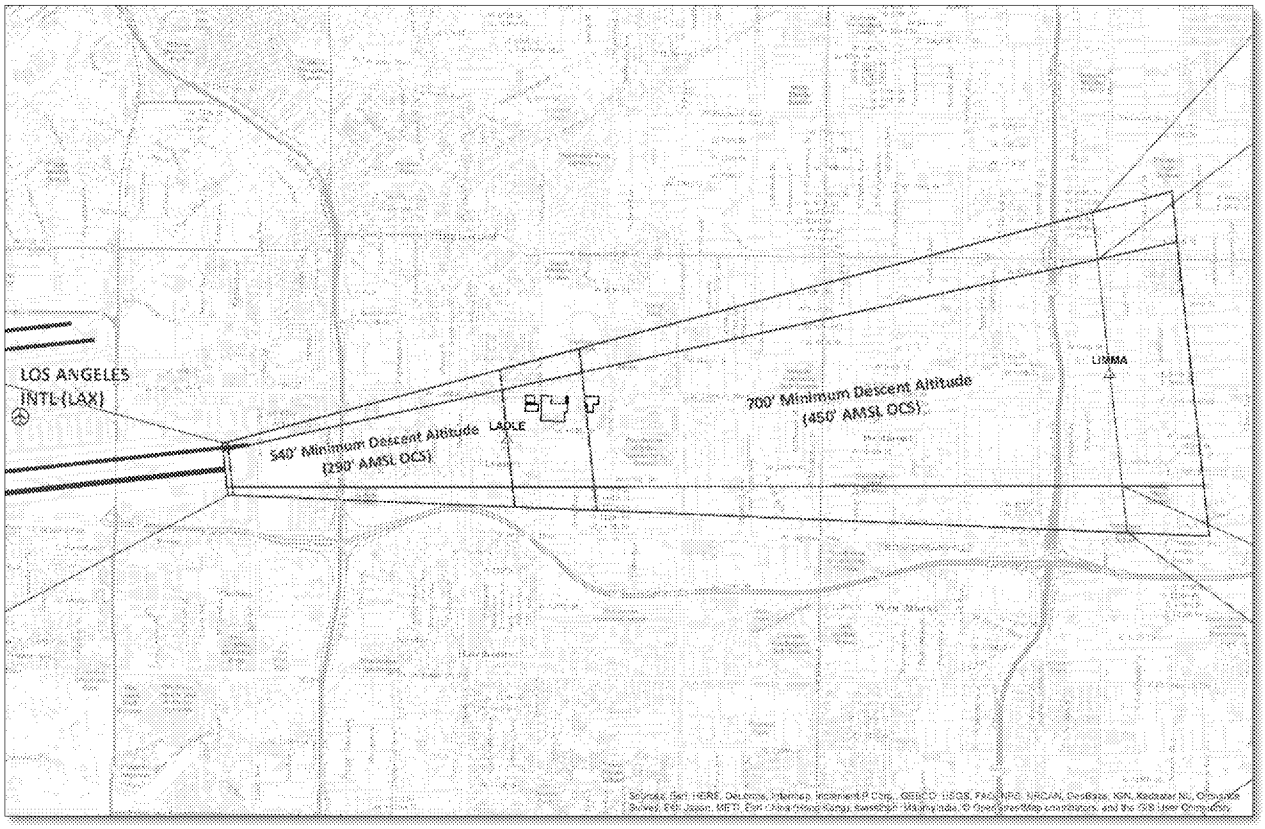

Figure 8: Los Angeles International Airport (LAX) Localizer Approach to Runway 25L

Enroute Airways

Enroute airways provide pilots a means of navigation when flying from airport to airport and are defined by radials between VHF omni-directional ranges (VORs). The FAA publishes minimum 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 normally 2,000 feet in mountainous areas.

Proposed structures that exceed enroute airway obstacle clearance surfaces would require an increase to minimum obstruction clearance altitudes (MOCA) and/or minimum enroute altitudes (MEA). If the FAA determines that this impact would constitute a substantial adverse effect, it could be used as the basis for determinations of hazard.

Low altitude enroute airways obstacle clearance surfaces (e.g., *Figure 9*) are in excess of other lower surfaces and should not limit 150 or 300 foot AGL structures within the defined study area.

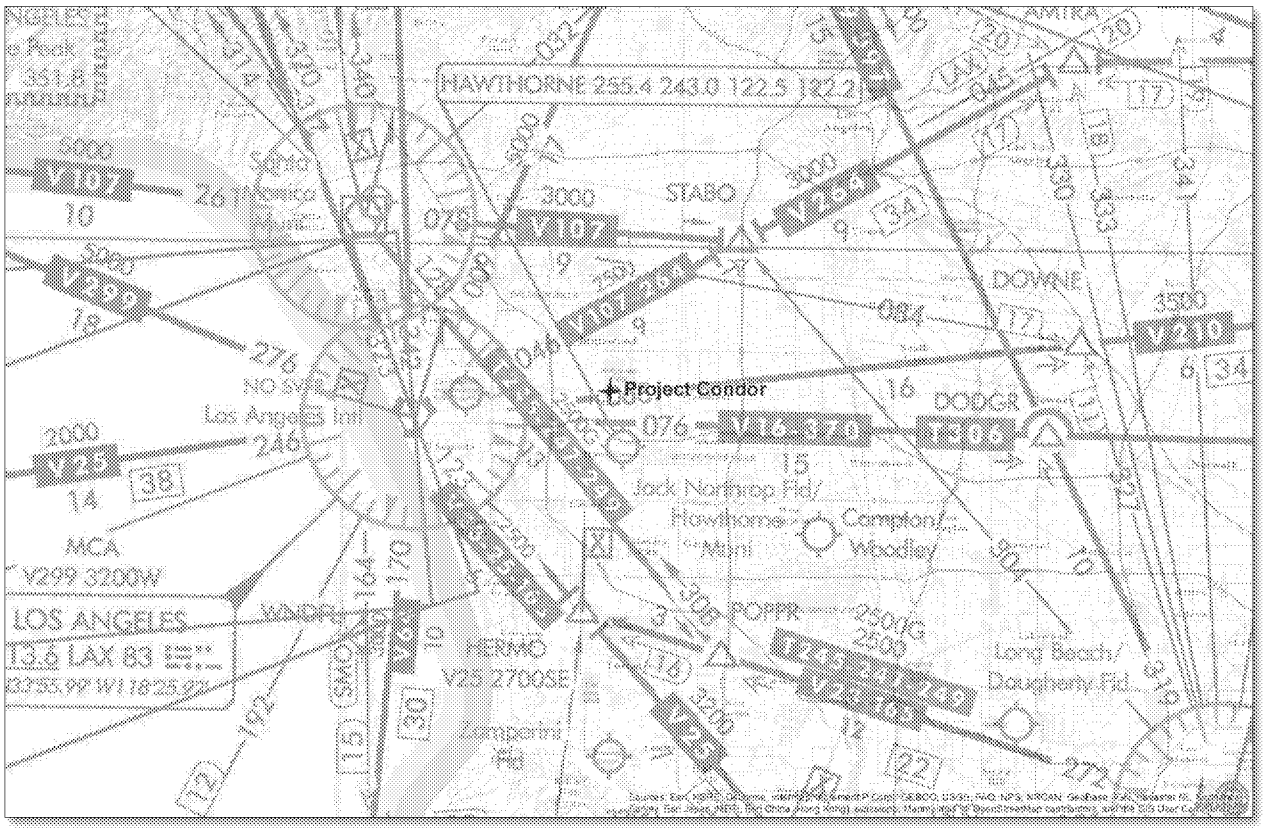

Figure 9: Low altitude enroute chart L-4 and Project Condor

Minimum Vectoring/IFR Altitudes

The FAA publishes minimum vectoring altitude (MVA) and minimum instrument flight rules (IFR) altitude charts that define sectors with the lowest altitudes at which air traffic controllers can issue radar vectors to aircraft based on obstacle clearance. 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.

Proposed structures that exceed minimum vectoring/IFR altitude sector obstacle clearance surfaces would require an increase to the altitudes usable by air traffic control for vectoring aircraft. If the FAA determines that this impact would affect a significant volume of operations, it could result in determinations of hazard.

Minimum vectoring/IFR altitude sector obstacle clearance surfaces (e.g., *Figure 10*) are in excess of other lower surfaces and should not limit 150 or 300 foot AGL structures within the defined study area.

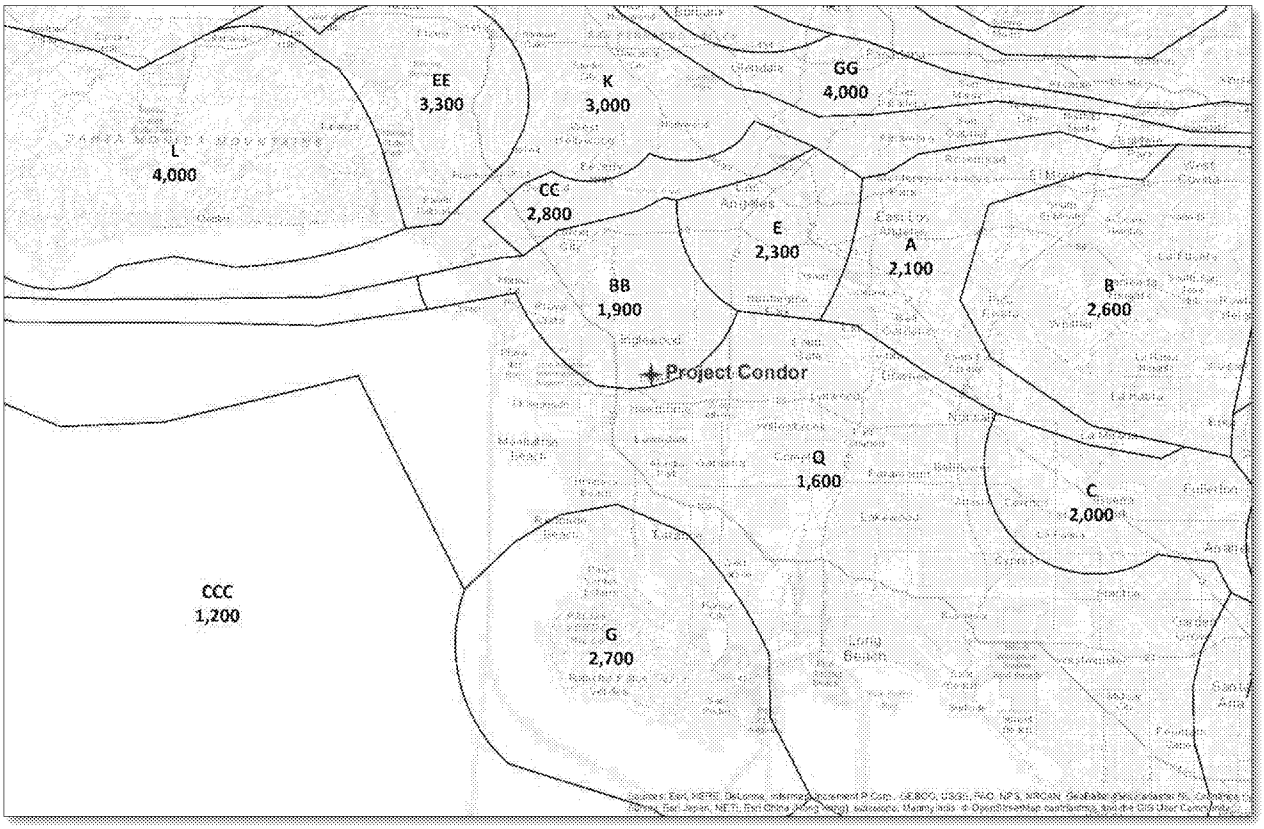

Figure 10: Southern California (SCT) TRACON minimum vectoring altitude sectors (black)

Military Airspace and Training Routes

Since the FAA does not protect for military airspace or training routes, impact on their operations cannot result in a determination of hazard. However, the FAA will notify the military of proposed structures located within these segments of airspace. If the planned development area is located on federal land, impact on military airspace or training routes may result in the denial of permits by the Bureau of Land Management.

Military airspace and training routes do not overlie Project Condor. Therefore, these segments of airspace should not result in military objections to proposed development.

Conclusion

Proposed structures that exceed 14 CFR Part 77 imaginary surfaces (*Figure 3*) will be determined to be obstructions. However, structure heights in excess of 14 CFR Part 77 imaginary surfaces are feasible provided proposed structures do not exceed FAA obstacle clearance surfaces.

Current FAA obstacle clearances overlying Project Condor range from 290 to 424 feet AMSL (*Figure 11*) and are associated with Los Angeles International Airport instrument departure (*Figure 6* & *Figure 7*) and approach procedures (*Figure 8*). Proposed structures that exceed these surfaces would require an increase to instrument departure procedure and/or DVA climb gradients as well as instrument approach procedure minimum descent altitudes.

At 150 feet AGL, USGS elevation data indicates that these surfaces should not limit the proposed buildings within the defined study area. However, USGS elevation data indicates that temporary construction equipment, as high as 300 feet AGL, would exceed these surfaces and would require an increase to Los Angeles International Airport instrument departure procedure and/or DVA climb gradients as well as instrument approach procedure minimum descent altitudes (orange area, *Figure 12*). Unless mitigation options are identified and approved by the FAA, impact on these altitudes could be used as the basis for determinations of hazard.

Lastly, the FAA is in the process of designing and modifying multiple instrument procedures for Los Angeles International Airport. At the time of this report, associated design documentation was not publicly available. Although unlikely, it is possible that the associated obstacle clearance surfaces are lower than those described in this report.

If you have any questions regarding the findings of this study, please contact *Joe Anderson* or *Nick Lee* at (703) 256-2485.

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Proposed structures that exceed 14 CFR Part 77.19 imaginary surfaces will automatically be determined to be obstructions regardless of their location.

Legend

All heights above mean sea level (AMSL)

Obstacle Clearance Surface

Height - AMSL Feet

High : 424

Low : 290

Surface Contour

5 Foot

20 Foot

Project Condor

Composite Height Constraint Map

Plot Date:
11 September 2017
by Nick Lee

Coordinate System:
NAD 1983 UTM Zone 11N

Figure 11

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The USGS 1/3 Arc Second Digital Elevation Model (DEM) data used to create this map has a vertical accuracy of +/- 7 meters.
This map should only be used for general planning purposes and not exact structure siting.

Legend

AGL Clearance

- 150 Foot AGL Buildings Exceed
- 300 Foot AGL Temporary Construction Equipment Exceeds
- Neither 150 or 300 Foot AGL Structures Exceed

Project Condor

Above Ground Level (AGL) Clearance Map

Plot Date:
13 September 2017
by Nick Lee

Coordinate System:
NAD 1983 UTM Zone 11N

Figure 12

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